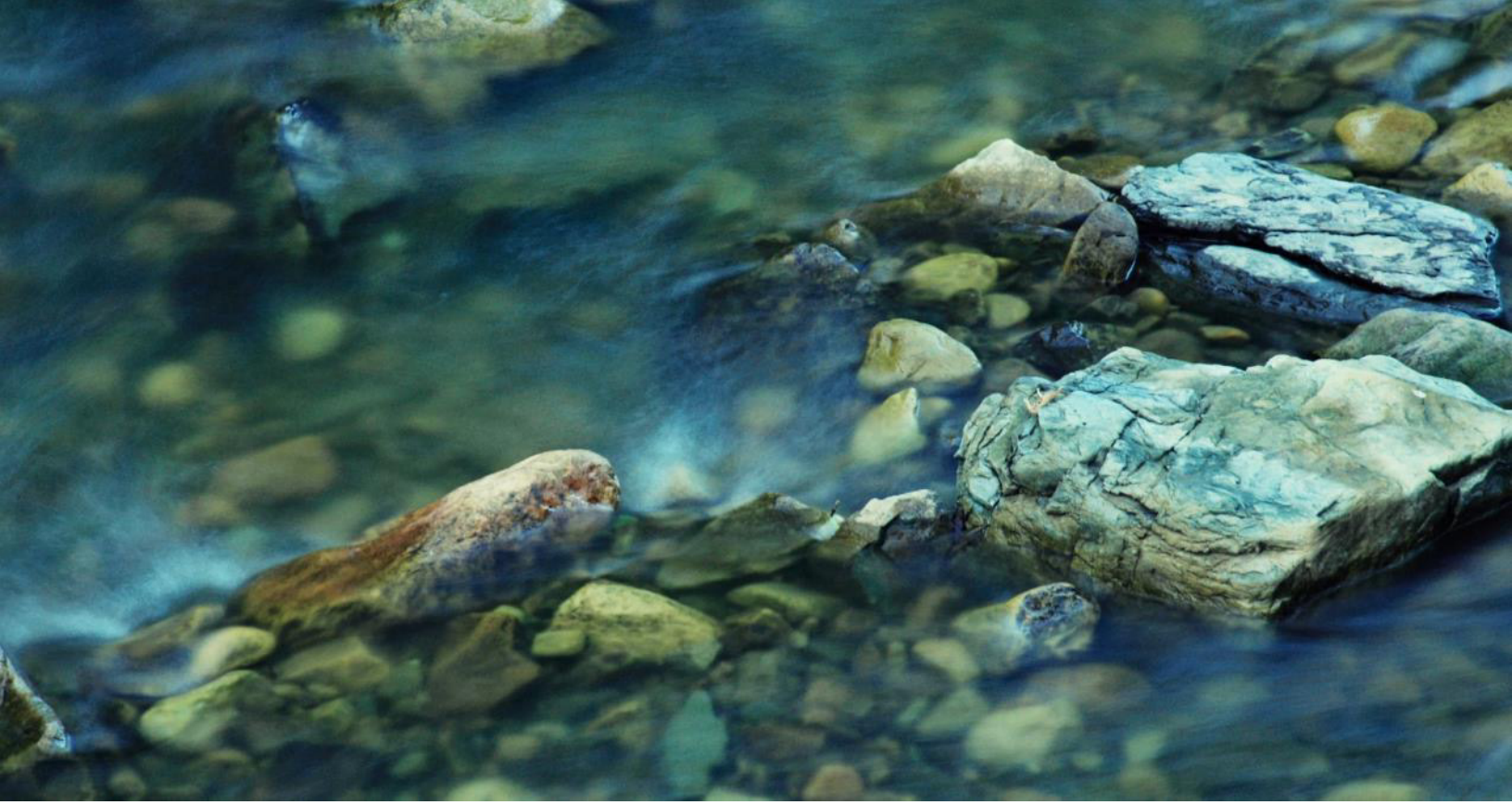

November 2, 2023
Pier 63 Removal Project

ANCHOR QEA

Pier 63 Sediment Sampling Data Report

Prepared for the City of Seattle

November 2, 2023
Pier 63 Removal Project

Pier 63 Sediment Sampling Data Report

Prepared for
City of Seattle Department of Transportation
Seattle Municipal Tower
700 5th Avenue, Suite 3800
Seattle, Washington 98104

Prepared by
Anchor QEA, LLC
1201 3rd Avenue, Suite 2600
Seattle, Washington 98101

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ABBREVIATIONS

µg/kg	microgram per kilogram
AET	apparent effects threshold
City	City of Seattle
cm	centimeter
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSL	cleanup screening level
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EPA	U.S. Environmental Protection Agency
HPAH	high-molecular-weight polycyclic aromatic hydrocarbon
LPAH	low-molecular-weight polycyclic aromatic hydrocarbon
mg/kg	milligram per kilogram
MTCA	Model Toxics Control Act
ng/kg	nanogram per kilogram
OC	organic carbon
OnSite	OnSite Environmental
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
Project	Pier 63 Removal Project
SCO	sediment cleanup objective
SCUM	*Sediment Cleanup User's Manual*
SIM	selected ion monitoring
Site	the area where Pier 63 was once located
SMS	Sediment Management Standards
SQAPP	*Sampling and Quality Assurance Project Plan*
SVOC	semivolatile organic compound
TEQ	toxic equivalence
TOC	total organic carbon
WAC	Washington Administrative Code

1 Introduction

This report presents the sample collection activities and analytical results of five grab sediment samples collected in April 2023 beneath and adjacent to the former Pier 63 (the Site) to satisfy Task 2 of One Time Grant Agreement No. OTGP-2023-SeaCo-00013 executed by the Washington State Department of Ecology (Ecology) and the City of Seattle (City) in 2022.

During the fall of 2022 through January 2023, the City removed Pier 63 from the Seattle waterfront as part of the Pier 63 Removal Project (Project; see Figure 1 for a vicinity map). The pier will not be rebuilt. The City originally intended to replace Pier 63 with a smaller, concrete-decked pier. However, the City determined that complete removal of the pier would result in the best habitat outcome while still allowing the City to meet its park and recreational objectives through the reconstruction of Pier 62 and Waterfront Park (Pier 58), both located to the south of the Site.

1.1 Site Background

Before the Site was known as Pier 63, it was known as Pier 10, or the Virginia Street Dock. It was constructed in 1906 as a pier with a shed. The shed was used for newsprint storage and eventually as at least one residential apartment. The Site was joined with Pier 62 in the 1980s, and the City acquired the piers in 1990 (Sheridan 2017; Hudson et al. 2013). They were used for events during the 1990s but then were used only as informal gather spaces and remained open for public access until they were closed for the reconstruction of Pier 62. Pier 62 was demolished, rebuilt, and then opened to the public in 2020. Pier 63 did not meet current seismic code requirements and was never reopened to the public. The pier was demolished in 2022/2023, as noted previously.

1.2 Existing Data Summary and Site Sampling Locations

Historical sediment data collected in the vicinity of the Site and Pier 58 are presented in Appendix A. These data, dating back to 2004, were obtained from the City's *Waterfront Seattle Program Geotechnical and Environmental Data Report* (Shannon and Wilson 2018) and Ecology's Environmental Information Management (EIM) Database. The Ecology EIM Database is a publicly available repository of environmental data collected in Washington State by both private and public entities. The existing data indicate that elevated concentrations of mercury, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) are present in sediment surrounding the Site.

As part of the grant awarded to the City, Ecology required the City to collect five grab sediment samples adjacent to and beneath Pier 63. Three of the five grab sediment samples were to be taken from specific locations sampled before Pier 63 was demolished. In particular, grab sediment sample P63-SS-01 was collected from former site WS-2, sampled in 2013; grab sediment sample P63-SS-02 was collected from former site WS-1, sampled in 2013; and grab sediment sample P63-SS-02 was

collected from former site P66CAPBH13, sampled in 2004. The remaining two grab sediment samples, P63-SS-04 and P63-SS-05, were collected beneath the former Pier 63.

1.3 Regulatory Context

Ecology maintains a database of known or suspected contaminated sites that require remedial action to meet requirements of the Model Toxics Control Act (MTCA) (Chapters 70A.305 of the Revised Code of Washington and 173-340 of the Washington Administrative Code [WAC]) and the Sediment Management Standards (SMS; Chapter 173-204 WAC). Ecology determined that contamination exists at the Site. As a result, Ecology sent the City an Early Notice Letter dated February 1, 2022.

Results from the 2023 Pier 63 grab sediment sampling event are compared to both SMS and MTCA Method A screening criteria in Section 4.

1.4 Document Organization

The remainder of this document is organized as follows:

- **Section 2 – Sampling Methods:** This section summarizes sampling and processing methods, including location positioning and any deviations from the *Sampling Quality Assurance Project Plan* (SQAPP).
- **Section 3 – Data Quality Assessment:** This section summarizes data quality, including a discussion of laboratory data quality and third-party data validation.
- **Section 4 – Analytical Results:** This section summarizes the sediment sampling results in comparison to both SMS and MTCA Method A screening criteria.
- **Section 5 – Discussion:** This section summarizes the 2023 results in comparison to historical results and the locations inside and outside the former Pier 63 footprint.
- **Section 6 – Recommendations:** This section discusses recommendations for next steps.

2 Sampling Methods

The following section presents sampling and processing methods, including location positioning, sample recovery, and any deviations from the SQAPP.

2.1 Surface Sediment Sampling

Surface sediment grab samples from the biologically active zone (0 to 10 centimeters [cm]) were collected from five locations for chemical analysis using the methods outlined in the SQAPP (Appendix B). Sediment samples were collected by Gravity Marine Services using a Van Veen-type pneumatic power grab sampler deployed from a sampling vessel for all locations. A differential global positioning system was used for positioning to navigate to the target sampling locations and record the actual sampling position at the time of sampling. All five target locations were successfully sampled with no position offset required. Coordinates were recorded digitally and on grab collection field forms (Appendix C) in WGS 84. The sample locations are shown in Figure 2, and coordinates for each location are provided in Table 1.

A total of five samples were collected from two different areas:

- **Outside Former Pier Footprint**: Three sample locations (P63-SS-01, P63-SS-02, and P63-SS-03) are located outside the footprint of former Pier 63.
- **Inside Former Pier Footprint:** Two sample locations (P63-SS-04 and P63-SS-05) are located inside the footprint of former Pier 63.

2.2 Sample Processing

The following protocol was followed to process accepted surface sediment samples:

- Photographs were taken of the grab and labeled to indicate the sample location and date (Appendix D).
- Any debris greater than 5 cm in diameter or length were removed from the grab sample.
- The sample was collected from the top 10 cm of the Van Veen sampler, placed in a decontaminated stainless-steel bowl, and homogenized until uniform in color and texture.
- The sample description was recorded on the Surface Sediment Field Log (Appendix C), including the following information:
  - Grab recovery (as measured with a ruler)
  - Physical sediment description including type, density and consistency, and color
  - Visual stratification, structure, and texture
  - Biological activity (e.g., detritus, shells, tubes, bioturbation, and live or dead organisms)
  - Vegetation and debris with quantitative estimate (e.g., wood debris, wood chips or fibers, paint chips, concrete, sand blast grit, and metal debris)
  - Presence of oil sheen

    - Odor (e.g., hydrogen sulfide and petroleum)
- The homogenized sample was placed into prelabeled sample jars provided by the laboratory for analytical testing. The sample jars were airtight, pre-cleaned, wide-mouth glass jars with Teflon-lined lids. Lids were placed on jars securely to prevent leakage (e.g., no sediment in the threads). Jars were labeled with the Project name, sample ID, date and time of sample collection, and prescribed test analyte.
- Samples were placed in a cooler with ice packs as soon as they were transferred to the jars.
- The spoon and bowl were decontaminated between samples by scrubbing them free of visible sediment, rinsing them with Site water, washing them with laboratory-grade detergent, and then rinsing them with distilled or deionized (analyte-free) water.

Successful sediment grabs were achieved within three attempts at each of the five locations. When multiple attempts were required at a location, it was due to debris (e.g., bottle, wood, or metal) preventing the Van Veen sampler from completely closing. However, none of the sample locations needed to be offset from the proposed location. The field data are summarized in Table 1, field forms are included in Appendix C, and sample photographs are included in Appendix D.

2.3 Sample Documentation and Handling

A record of field activities was maintained using field logs, standardized data collection, and reporting forms to facilitate data recording and subsequent data entry. Chemistry samples were packed in coolers with protective material (e.g., bubble wrap) and ice packs. Information on the labels was checked against field records, and samples were recounted prior to shipping. Samples were delivered under chain of custody to OnSite Environmental (OnSite) in Redmond, Washington. Surface samples collected from Pier 63 were submitted for laboratory analysis with a standard turnaround time requested for all parameters.

3 Data Quality Assessment

This section summarizes the data quality assessment and corrective actions performed during the Project. OnSite performed the metals, PAHs, semivolatile organic compounds (SVOCs), PCBs, pesticides, and total organic carbon (TOC) analyses. OnSite subcontracted the grain size, sulfide, and ammonia to AmTest Laboratories in Kirkland, Washington, and the dioxins/furans to Enthalpy Analytical in El Dorado Hills, California. The initial data validation effort included a Stage 2B review of field and laboratory quality control measures, as described in the SQAPP. Analytical laboratory reports are provided as Appendix E, and the data validation report is provided as Appendix F.

3.1 Initial Data Validation

3.1.1 Analytical Data Validation

Laboratory data packages were validated by Laboratory Data Consultants in Carlsbad, California, following the U.S. Environmental Protection Agency's (EPA's) *National Functional Guidelines for Data Review* (EPA 2020a, 2020b) and using data quality objectives described in the SQAPP. Stage 2B validations were conducted on all laboratory data reports, in accordance with the SQAPP, and the validation report is included in Appendix F. Data qualifiers applied to the results during validation have been incorporated into the final database for this Project, and their definitions are shown on the analytical results in Table 2.

Data qualifiers assigned during data validation include the following:

- "J" indicates that the associated numerical value is an estimated concentration.
- "U" indicates a reporting limit below which the analyte was not detected.
- "UJ" indicates an approximate reporting limit below which the analyte was not detected.

3.1.2 Data Completeness

Samples were collected from all locations and were submitted to the laboratory for analysis or archive as required by the SQAPP. The laboratory followed the specific analytical methods with one exception. OnSite analyzed several PAHs by EPA Method 8270E instead of EPA Method 8270E selected ion monitoring (SIM), as listed in the SQAPP. The reporting limits for anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(j,k)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, and dibenzofuran were lower than the target reporting limit of 0.5 microgram per kilogram (µg/kg) presented in Table 3 of the SQAPP (Appendix B). As a result of meeting the target reporting limit analyzing the PAHs previously listed by EPA Method 8270E, SIM was not needed. All sample analyses requested by Ecology were completed.

4 Analytical Results

The following section presents all analytical results for the five surface sediment grab samples collected for the grant. Samples are presented in two categories for clarity: sediment collected from outside the former Pier 63 footprint and sediment collected from within the former Pier 63 footprint. Per the *Sediment Cleanup User's Manual (SCUM)* guidance, results should be organic carbon (OC)-normalized when the TOC content is between 0.5% and 3.5% (Ecology 2021). If the TOC concentration in the sample is not between 0.5% to 3.5%, the dry weight apparent effects threshold (AET) screening criteria should be used. All five samples were outside of this range, so none of the results were OC-normalized, and the applicable screening criteria are the AET Marine Sediment Cleanup Objectives (SCO) and the AET Marine Cleanup Screening Level (CSL). For bioaccumulative chemicals, the applicable screening criterion is either natural background (if a regional background is not available) or the practical quantitation limit (PQL), whichever is higher. The data were also screened against the MTCA Method A Soil Industrial Level to inform any potential upland sediment disposal. No Site-specific criteria have been established for Pier 63. The five surface sediment samples were analyzed for the following: TOC, grain size, percent solids, ammonia, sulfides, metals, PAHs, SVOCs, PCBs, dioxins/furans, and pesticides.

4.1 Outside the Former Pier 63 Footprint

Samples collected from outside the former Pier 63 footprint are P63-SS-01, P63-SS-02, and P63-SS-03. All locations outside the former Pier 63 footprint were reoccupied historical sample locations (sample locations WS-2, WS-1, and P66CAPBH13, respectively), and analytical results for both the reoccupied locations and the 2023 samples are presented in Table 2.All historical data from the surrounding area are presented in Appendix A.

The following contaminants exceed one or more regulatory screening levels and may be considered contaminants of potential concern:

- Arsenic
- Mercury
- PAHs
- SVOCs
- PCBs
- Dioxins/furans

Concentrations of conventional parameters such as TOC and percent solids ranged from 3.9% to 6.6% and 35% to 46%, respectively (Table 2).

Collectively, samples from outside the Pier 63 footprint resulted in exceedances for arsenic and mercury; one exceedance for an SVOC (dibenzofuran); and exceedances for 13 individual PAHs, all

total PAHs, total PCB Aroclors, and total dioxin/furan toxic equivalence (TEQ). Overall, detected concentrations and exceedances were similar to historical surface sediment sample results.

There were no metals exceedances at P63-SS-01. P63-SS-02 exceeded the AET Marine CSL for mercury with a concentration of 0.77 milligram per kilogram (mg/kg). P63-SS-03 exceeded the MTCA Method A screening level for arsenic and exceeded the AET Marine SCO screening level for mercury with concentrations of 21 mg/kg and 0.44 mg/kg, respectively.

All three sediment samples exceeded screening levels for numerous individual PAHs, as well as for the total carcinogenic PAH (cPAH) TEQ. At P63-SS-01, concentrations exceeding the AET Marine CSL ranged from 420 µg/kg to 5,400 µg/kg, with total high-molecular-weight polycyclic aromatic hydrocarbon (HPAH) at 29,000 µg/kg and total low-molecular-weight polycyclic aromatic hydrocarbon (LPAH) at 5,500 µg/kg. Pyrene exceeded the AET Marine SCO at 2,700 µg/kg, and benzo(a)pyrene exceeded the MTCA Method A screening level at 4,000 µg/kg. Additionally, benzo(a)pyrene exceeded the MTCA Method A screening level at 4,000 µg/kg, and total cPAH TEQ exceeded natural background at 5,200 µg/kg. At P63-SS-02, concentrations exceeding the AET Marine CSL ranged from 630 µg/kg to 7,300 µg/kg, with total HPAH at 40,000 µg/kg and total LPAH at 14,000 µg/kg. Additionally, benzo(a)pyrene exceeded the MTCA Method A screening level at 4,400 µg/kg, and total cPAH TEQ exceeded natural background at 5,900 µg/kg. At P63-SS-03, values exceeding the AET Marine CSL ranged from 610 µg/kg to 6800 µg/kg, with total HPAH at 49,000 and total LPAH at 8,600 µg/kg. Additionally, benzo(a)pyrene exceeded the MTCA Method A screening level at 6,800 µg/kg, and total cPAH TEQ exceeded natural background at 8,900 µg/kg.

All three sediment samples exceeded the PQL for total PCB Aroclors, with concentrations ranging from 23 µg/kg to 91 µg/kg. However, none of the samples exceeded the total PCB Aroclor AET Marine CSL of 130 µg/kg.

All three sediment samples exceeded the PQL of 5 nanograms per kilogram (ng/kg) for total dioxin/furan TEQ, with concentrations ranging from 120 ng/kg to 403 ng/kg.

P63-SS-02 was the only sample to exceed the AET Marine CSL for dibenzofuran (same as SCO) at a concentration of 600 µg/kg.

None of the three samples exceeded the conventional parameter limits or screening levels for pesticides.

4.2 Inside the Former Pier 63 Footprint

Samples collected from inside the former Pier 63 footprint are P63-SS-04 and P63-SS-05. Analytical results for the 2023 samples are presented in Table 2.

The following contaminants exceed one or more regulatory screening levels and may be considered contaminants of potential concern:

- PAHs
- PCBs
- Dioxins/furans

Concentrations of conventional parameters such as TOC and percent solids ranged from 3.9% to 4.9% and 40% to 50%, respectively (Table 2).

Samples collected from inside the Pier 63 footprint resulted in exceedances for 12 individual PAHs, all total PAHs, total PCB Aroclors, and total dioxin/furan TEQ. Overall, detected concentrations and exceedances from inside the footprint were similar to historical sample results collected at nearby sampling locations, as presented in Table 2 and Appendix A.

Both sediment samples exceeded screening levels for numerous PAHs. At P63-SS-04, concentrations exceeding the AET Marine CSL ranged from 240 µg/kg to 9,700 µg/kg, with total HPAH at 32,000 µg/kg and total LPAH at 7,600 µg/kg. Additionally, benzo(a)pyrene exceeded the MTCA Method A screening level at 2,300 µg/kg, and total cPAH TEQ exceeded natural background at 3,200 µg/kg. At P63-SS-05, values exceeding the AET Marine CSL ranged from 560 µg/kg to 9,100 µg/kg, with total HPAH at 32,000 µg/kg and total LPAH at 9,300 µg/kg. Additionally, benzo(a)pyrene exceeded the MTCA Method A screening level at 2,500 µg/kg, and total cPAH TEQ exceeded natural background at 3,500 µg/kg.

PS63-SS-04 exceeded the PQL for PCB Aroclors with a concentration 51 µg/kg. However, neither sample exceeded the total PCB Aroclor AET Marine CSL of 130 µg/kg.

Both sediment samples exceeded the PQL of 5 ng/kg for total dioxin/furan TEQ, with concentrations ranging from 320 ng/kg to 560 ng/kg.

Neither of the two samples exceeded the conventional parameter limits or screening levels for metals, SVOCs, or pesticides.

5 Discussion

The following section discusses analytical results for surface sediment grab samples collected for the grant (2023 samples) in relation to regulatory standards and in relation to historical results, where applicable.

Historical data from PP66CAPBH13 and P66CAPBH12, which are surface sediment samples (0 to 10 cm) in the immediate vicinity of this Site, indicated elevated concentrations of mercury, PAHs, and PCBs (Table 2). Elevated concentrations of PAHs were also reported for historical sample WS-01, but this sample was composited across a much broader depth range (0 to 16.2 feet). Inclusion of subsurface sediments in the composite sample could dilute concentrations if contamination is primarily limited to surface sediments. None of the contaminants exceeded screening levels in historical sample WS-02, but this sample exclusively represents the subsurface conditions (4 to 18.6 feet) (Table 2). Generally, concentrations in all five 2023 surface sediment samples are similar to the historical surface sediment data (PP66CAPBH13 and P66CAPBH12), with the samples exceeding the AET Marine SCO for mercury; the MTCA Method A screening level for benzo(a)pyrene; and the AET Marine CSL for several individual PAHs, as well as for both the total HPAH and LPAH, natural background for total cPAH TEQ, and the PQL for PCB Aroclors. More broadly, the 2023 sediment concentrations outside and inside the former Pier 63 footprint are generally similar to other sediments along the urban waterfront in Elliott Bay, which has numerous potential sources of contamination (e.g., Ecology 1995; Herrera and Anchor QEA 2017).

5.1 Outside the Former Pier 63 Footprint

The 2023 sample P63-SS-01 and historical sample WS-2 were collected from the same location. WS-2 had zero exceedances compared to P63-SS-01, which exceeded the AET SCO for one individual PAH and the AET Marine CSL for seven individual PAHs, as well as total benzofluoranthenes, total HPAH, and total LPAH. P63-SS-01 also exceeded natural background for total cPAH TEQ and MTCA Method A screening level for benzo(a)pyrene. WS-2 was not analyzed for SVOCs, pesticides, PCB Aroclors, or dioxins/furans. WS-2 exclusively represents the subsurface (4 to 18.6 feet) condition, whereas P63-SS-01 exclusively represents the surface (0 to 10 cm) condition, causing the results to be not directly comparable for evaluating sediment concentration trends over time.

The 2023 sample P63-SS-02 and historical sample WS-1 were collected from the same location. WS-1 exceeded the AET Marine CSL for three individual PAHs compared with P63-SS-02, which exceeded the AET Marine CSL for mercury and 11 individual PAHs, as well as total benzofluoranthenes, total HPAH, and total LPAH. P63-SS-02 also exceeded the MTCA Method A screening level for benzo(a)pyrene and the PQL for total PCB Aroclors, whereas WS-1 was below the AET Marine SCO for benzo(a)pyrene and was nondetect for total PCB Aroclors. Both the historical and 2023 sample exceeded natural background for total cPAH TEQ. WS-1 was not analyzed for SVOCs, pesticides, or

dioxins/furans. Overall, concentrations for all contaminants were higher in 2023 when compared to the historical data from the same location, but WS-1 represents a much broader depth range (0 to 16.2 feet) compared to P63-SS-02, which is a surface sediment sample (0 to 10 cm). This discrepancy in the sample depth range causes the results to be not directly comparable for evaluating sediment concentration trends over time.

The 2023 sample P63-SS-03 and historical sample P66CAPBH13 were collected from the same location, and both represent surface sediment (0 to 10 cm) conditions. P66CAPBH13 exceeded the AET Marine SCO for three individual PAHs and total HPAH compared with P63-SS-03, which exceeded the AET Marine SCO for mercury. P66CAPBH13 also exceeded the AET Marine CSL for mercury, four individual PAHs, and total benzofluoranthenes, compared with P63-SS-03, which exceeded the MTCA Method A screening level for arsenic and benzo(a)pyrene and exceeded the AET Marine CSL for 11 individual PAHs, total benzofluoranthenes, total HPAH, and total LPAH. Both the historical and 2023 sample exceeded natural background for total cPAH TEQ. Total PCB Aroclors for P66CAPBH13 exceeded the AET Marine SCO and was a higher concentration (300 µg/kg) than P63-SS-03 (91 µg/kg). P66CAPBH13 was not analyzed for pesticides or dioxins/furans.

5.2 Inside the Former Pier 63 Footprint

No historical results exist for the two sample locations within the former Pier 63 footprint (P63-SS-04 and P63-SS-05), but the results were generally similar to the historical surface sediment samples from outside the former footprint (P66CAPBH13 and P66CAPBH12).

P66CAPBH13, a historical surface sediment location adjacent to the former Pier 63 footprint, exceeded the AET Marine CSL for mercury compared with the 2023 samples inside the former Pier 63 footprint (P63-SS-04 and P63-SS-05), which were below mercury screening levels. P66CAPBH13 exceeded natural background for total cPAH TEQ with a concentration of 3,300 µg/kg, which is similar to exceedances at P63-SS-04 and P63-SS-05 (3,200 µg/kg and 3,500 µg/kg). Additionally, benzo(a)pyrene at P66CAPBH13 exceeded the MTCA Method A screening level with a concentration of 2,500 µg/kg, which is similar to exceedances at P63-SS-04 and P63-SS-05 (2,300 µg/kg and 2,500 µg/kg). Total PCB Aroclors for P66CAPBH13 exceeded the AET Marine SCO and was a higher concentration (300 µg/kg) than P63-SS-04, which exceeded the PQL with a concentration of 51 µg/kg. P63-SS-05 did not exceed the PQL with a concentration of 3.1 µg/kg. P66CAPBH13 was not analyzed for pesticides or dioxins/furans.

P66CAPBH12, another historical surface sediment sample adjacent to the former Pier 63 footprint but not reoccupied for the 2023 sampling, exceeded the AET Marine CSL for nine individual PAHs, total benzofluoranthenes, total HPAH, and total LPAH. P66CAPBH12 exceeded natural background for total cPAH TEQ with a concentration of 4,200 µg/kg, which is similar to exceedances at P63-SS-04 and P63-SS-05 (3,200 µg/kg and 3,500 µg/kg, respectively). Additionally, benzo(a)pyrene exceeded

the MTCA Method A screening level at P66CAPBH12 with a concentration of 3,000 µg/kg, which is similar to exceedances at P63-SS-04 and P63-SS-05 (2,300 µg/kg and 2,500 µg/kg). Total PCB Aroclors for P66CAPBH12 exceeded the AET Marine SCO and was a higher concentration (810 µg/kg) than P63-SS-04, which exceeded the PQL with a concentration of 51 µg/kg. P63-SS-05 did not exceed the PQL with a concentration of 3.1 µg/kg. P66CAPBH12 was not analyzed for pesticides or dioxins/furans.

6 Recommendations

The One Time Grant Agreement No. OTGP-2023-SeaCo-00013 has governed the work described in this report. According to the grant agreement, the overall goal of the Project is "to remove the existing pier structure, which includes creosote--treated timber piles, stringers, and decking," (Ecology 2022), with the full Project including permitting, implementation of temporary erosion and sediment control measures, construction management/administration, and sediment sampling. The goal for the Pier 63 Creosote Pilings Removal Task (Task 1), is "to demolish Pier 63, including creosote pilings removal, in accordance with permit requirements, design plans and specifications." Ecology 2022. The goal for the Sediment Sampling/Analysis Task (Task 2) is "to conduct post construction sediment sampling and analysis in areas of recently removed creosote pilings and report findings to Ecology." Ecology 2022.

The City (i.e., the grant recipient) has removed the pier structure, conducted the post-construction sediment sampling, and, by way of this document, reports to Ecology the findings of the post-construction sediment sampling and analysis. The City will also upload all sediment sample laboratory analytical information into Ecology's EIM database. Based on this, the City has completed the goals and requirements of One Time Grant Agreement No. OTGP-2023-SeaCo-00013. The City has no plans to do further work at the Site and therefore has no recommendations for next steps.

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Tables

Table 1
Field Data Summary

Sample Name	Latitude	Longitude	Number of Attempts	Water Depth of Accepted Attempt (feet)	Sample Recovery (cm)	Sediment Description
P63-SS-01	47.6088089	-122.346161	1	54.8	19	Dark-gray sandy silt with prominent shell fragments and wood debris. No sheen or odor.
P63-SS-02	47.6089869	-122.345851	2	43.2	18	Dark-gray and brown sandy silt with shell fragments, wood debris, kelp, a worm, fragments of concrete, a glass bottle, and a biological sheen. No odor.
P63-SS-03	47.6089755	-122.345625	1	37.6	27	Dark-gray sandy silt full of shells, wood debris, kelp, and a biological sheen. No odor.
P63-SS-04	47.6087123	-122.34501	3	18.4	13	Dark-gray sandy silt with prevalent small shell fragments, kelp, and a biological sheen. No odor.
P63-SS-05	47.608766	-122.345689	3	36.4	20	Dark-gray sandy silt with prevalent shell fragments, whole shells, and a rainbow sheen. Slight odor.

Note:
cm: centimeter

Table 2
Summary of Analytical Results

Chemical	Method[1]	SMS AET Marine SCO	SMS AET Marine CSL	Natural Background or PQL[2]	MTCA Method A Soil Industrial	Task	2023 Pier 63 Sampling				
						Location ID	PS63-SS-01	PS63-SS-02	PS63-SS-03	PS63-SS-04	PS63-SS-05
						Co-located Samples	WS-2	WS-1	P66CAPBH13	--	--
						Sample ID	PS63-SS-01-20230427	PS63-SS-02-20230427	PS63-SS-03-20230427	PS63-SS-04-20230427	PS63-SS-05-20230427
						Sample Date	4/27/2023	4/27/2023	4/27/2023	4/27/2023	4/27/2023
						Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
						Sample Type	N	N	N	N	N
						Matrix	SE	SE	SE	SE	SE
						X	-122.3461613	-122.345851	-122.3456245	-122.3450102	-122.3456886
						Y	47.60880893	47.60898692	47.60897548	47.60871232	47.60876602
Conventional Parameters (mg/kg)											
Ammonia as nitrogen	SM4500NH3H						**140**	**110**	**53**	**63**	**100**
Sulfide	SM4500S2						**123**	**125**	**97**	**58.3**	**121**
Conventional Parameters (pct)											
Total organic carbon	SW9060A (Plumb 1981)						**3.9**	**4.5**	**6.6**	**4.9**	**3.9**
Total solids	SM2540G						**46**	**41**	**35**	**50**	**40**
Petroleum Hydrocarbons (mg/kg)											
Diesel Range Organics	NWTPH-Dx						--	--	--	--	--
Lube Oil Range Organics	NWTPH-Dx						--	--	--	--	--
Grain Size (pct)											
Clay	D422						**6.7**	**11.2**	**11.1**	**4.9**	**4.7**
Gravel	D422						**62.6**	**13.4**	**18.5**	**56.2**	**72.7**
Phi >10	D422						**6.2**	**7.3**	**7**	**3.6**	**3**
Phi 00.0	D422						**7.8**	**3.9**	**4**	**13.8**	**8.1**
Phi 01.0	D422						**2.9**	**5.8**	**5.5**	**5.4**	**2.2**
Phi 02.0	D422						**2.8**	**27.4**	**17.1**	**4**	**1.5**
Phi 03.0	D422						**2.3**	**10.2**	**8.6**	**3.2**	**1.4**
Phi 04.0	D422						**1.6**	**7.6**	**7.3**	**3**	**1.3**
Phi 05.0	D422						**2.4**	**1.5**	**12**	**2**	0.10 U
Phi 06.0	D422						**3.9**	**6.8**	**3.6**	**2**	**3.1**
Phi 07.0	D422						**3.7**	**7.6**	**5.3**	**3.9**	**2.3**
Phi 08.0	D422						**3.4**	**4.5**	**6.9**	**1.7**	**2.8**
Phi 09.0	D422						**0.5**	**2.6**	**2.8**	**0.8**	**1.2**
Phi -1.0	D422						**20.6**	**4**	**3.4**	**31.6**	**28.7**
Phi 10.0	D422						0.10 U	**1.3**	**1.3**	**0.5**	**0.5**
Phi -2.0	D422						**10.5**	**1**	**2.2**	**6.9**	**9.8**
Phi -2.25	D422						**31.5**	**8.43**	**12.9**	**17.7**	**34.2**
Sand	D422						**17.4**	**54.9**	**42.5**	**29.4**	**14.5**
Silt	D422						**13.4**	**20.4**	**27.8**	**9.6**	**8.2**
Metals (mg/kg)											
Arsenic	SW6020B (SW6020A)	57	93	11	20		**10**	**16**	**21**	**5.8**	**6.8**
Barium	SW6020B						**33 J**	**52 J**	**56 J**	**26 J**	**27 J**
Cadmium	SW6020B (SW6020A)	5.1	6.7	0.8	2		**0.39**	**0.85**	**1.1**	**0.35**	**0.36**
Chromium	SW6020B (SW6020A)	260	270	62	2000		**12**	**33**	**42**	**9.3**	**6.6**
Copper	SW6020B	390	390	45			**32 J**	**95 J**	**100 J**	**30 J**	**33 J**

Table 2
Summary of Analytical Results

Chemical	Method[1]	SMS AET Marine SCO	SMS AET Marine CSL	Natural Background or PQL[2]	MTCA Method A Soil Industrial	Task	2023 Pier 63 Sampling				
						Location ID	PS63-SS-01	PS63-SS-02	PS63-SS-03	PS63-SS-04	PS63-SS-05
						Co-located Samples	WS-2	WS-1	P66CAPBH13	--	--
						Sample ID	PS63-SS-01-20230427	PS63-SS-02-20230427	PS63-SS-03-20230427	PS63-SS-04-20230427	PS63-SS-05-20230427
						Sample Date	4/27/2023	4/27/2023	4/27/2023	4/27/2023	4/27/2023
						Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
						Sample Type	N	N	N	N	N
						Matrix	SE	SE	SE	SE	SE
						X	-122.3461613	-122.345851	-122.3456245	-122.3450102	-122.3456886
						Y	47.60880893	47.60898692	47.60897548	47.60871232	47.60876602
Lead	SW6020B (SW6020A)	450	530	21	1000		**17**	**91**	**91**	**20**	**10**
Mercury	SW7471B	0.41	0.59	0.2	2		**0.09**	**0.77**	**0.44**	**0.097**	**0.072**
Nickel	SW6020B			50			**8.1**	**25**	**29**	**5.4**	**4.8**
Selenium	SW6020B (SW6020A)						**2.7**	**4**	**4.5**	**1.8**	**2.5**
Silver	SW6020B (SW6020A)	6.1	6.1	0.24			**0.25**	**0.73**	**0.75**	**0.21**	0.16 U
Zinc	SW6020B	410	960	93			**110 J**	**200 J**	**220 J**	**81 J**	**68 J**
Semivolatile Organics (µg/kg)											
1,2,4-Trichlorobenzene	SW8270E	31	51				450 U	490 U	570 U	400 U	500 U
1,2-Dichlorobenzene	SW8270E	35	50				450 U	490 U	570 U	400 U	500 U
1,2-Dinitrobenzene	SW8270E						450 U	490 U	570 U	400 U	500 U
1,2-Diphenylhydrazine	SW8270E						450 U	490 U	570 U	400 U	500 U
1,3-Dichlorobenzene	SW8270E						450 U	490 U	570 U	400 U	500 U
1,3-Dinitrobenzene	SW8270E						450 U	490 U	570 U	400 U	500 U
1,4-Dichlorobenzene	SW8270E	110	110				450 U	490 U	570 U	400 U	500 U
1,4-Dinitrobenzene	SW8270E						450 U	490 U	570 U	400 U	500 U
2,2'-Oxybis (2-chloropropane)	SW8270E						450 U	490 U	570 U	400 U	500 U
2,3,4,6-Tetrachlorophenol	SW8270E						450 U	490 U	570 U	400 U	500 U
2,3,5,6-Tetrachlorophenol	SW8270E						450 U	490 U	570 U	400 U	500 U
2,3-Dichloroaniline	SW8270E						450 U	490 U	570 U	400 U	500 U
2,4,5-Trichlorophenol	SW8270E						450 U	490 U	570 U	400 U	500 U
2,4,6-Trichlorophenol	SW8270E						450 U	490 U	570 U	400 U	500 U
2,4-Dichlorophenol	SW8270E						900 U	980 U	1100 U	800 U	1000 U
2,4-Dimethylphenol	SW8270E	29	29				450 U	490 U	570 U	400 U	500 U
2,4-Dinitrophenol	SW8270E						3300 UJ	3600 UJ	5200 UJ	2900 UJ	3700 UJ
2,4-Dinitrotoluene	SW8270E						450 U	490 U	570 U	400 U	500 U
2,6-Dinitrotoluene	SW8270E						450 U	490 U	570 U	400 U	500 U
2-Chloronaphthalene	SW8270E						450 U	490 U	570 U	400 U	500 U
2-Chlorophenol	SW8270E						450 U	490 U	570 U	400 U	500 U
2-Methylphenol (o-Cresol)	SW8270E	63	63				450 U	490 U	570 U	400 U	500 U
2-Nitroaniline	SW8270E						450 U	490 U	570 U	400 U	500 U
2-Nitrophenol	SW8270E						450 U	490 U	570 U	400 U	500 U
3,3'-Dichlorobenzidine	SW8270E						2300 U	2400 U	2900 U	2000 U	2500 U
3-Methylphenol & 4-Methylphenol (m&p-Cresol)	SW8270E						450 U	490 U	570 U	400 U	500 U
3-Nitroaniline	SW8270E						450 U	490 U	570 U	400 U	500 U
4-Bromophenyl-phenyl ether	SW8270E						450 U	490 U	570 U	400 U	500 U

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Chemical	Method[1]	SMS AET Marine SCO	SMS AET Marine CSL	Natural Background or PQL[2]	MTCA Method A Soil Industrial	Task	2023 Pier 63 Sampling				
						Location ID	PS63-SS-01	PS63-SS-02	PS63-SS-03	PS63-SS-04	PS63-SS-05
						Co-located Samples	WS-2	WS-1	P66CAPBH13	--	--
						Sample ID	PS63-SS-01-20230427	PS63-SS-02-20230427	PS63-SS-03-20230427	PS63-SS-04-20230427	PS63-SS-05-20230427
						Sample Date	4/27/2023	4/27/2023	4/27/2023	4/27/2023	4/27/2023
						Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
						Sample Type	N	N	N	N	N
						Matrix	SE	SE	SE	SE	SE
						X	-122.3461613	-122.345851	-122.3456245	-122.3450102	-122.3456886
						Y	47.60880893	47.60898692	47.60897548	47.60871232	47.60876602
4-Chloro-3-methylphenol	SW8270E						450 U	490 U	570 U	400 U	500 U
4-Chloroaniline	SW8270E						2300 U	2400 U	2900 U	2000 U	2500 U
4-Chlorophenyl phenyl ether	SW8270E						450 U	490 U	570 U	400 U	500 U
4-Nitroaniline	SW8270E						450 U	490 U	570 U	400 U	500 U
4-Nitrophenol	SW8270E						450 U	490 U	570 U	400 U	500 U
Aniline	SW8270E						2300 U	2400 U	2900 U	2000 U	2500 U
Benzoic acid	SW8270E	650	650				900 U	980 U	1100 U	800 U	1000 U
Benzyl alcohol	SW8270E	57	73				450 U	490 U	570 U	400 U	500 U
Bis(2-chloroethoxy)methane	SW8270E						450 U	490 U	570 U	400 U	500 U
Bis(2-chloroethyl)ether	SW8270E						450 U	490 U	570 U	400 U	500 U
Bis(2-ethylhexyl)adipate	SW8270E						2300 U	2400 U	2900 U	2000 U	2500 U
Bis(2-ethylhexyl)phthalate	SW8270E (SW8270D)	1300	1900				2300 U	2400 U	2900 U	2000 U	2500 U
Butylbenzyl phthalate	SW8270E	63	900				2300 U	2400 U	2900 U	2000 U	2500 U
Carbazole	SW8270E						**410**	**980**	570 U	200 U	500 U
Dibenzofuran	SW8270E (SW8270D)	540	540				230 U	**600**	570 U	**440**	**370**
Diethyl phthalate	SW8270E	200	1200				1100 U	1200 U	1400 U	1000 U	1200 U
Dimethyl phthalate	SW8270E	71	160				450 U	490 U	570 U	400 U	500 U
Di-n-butyl phthalate	SW8270E	1400	1400				2300 U	2400 U	2900 U	2000 U	2500 U
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	SW8270E						3100 UJ	3300 UJ	4400 UJ	2700 UJ	3400 UJ
Di-n-octyl phthalate	SW8270E	6200	6200				2300 U	2400 U	2900 U	2000 U	2500 U
Hexachlorobenzene	SW8270E	22	70				450 U	490 U	570 U	400 U	500 U
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	SW8270E	11	120				450 U	490 U	570 U	400 U	500 U
Hexachlorocyclopentadiene	SW8270E						2300 U	2400 U	2900 U	2000 U	2500 U
Hexachloroethane	SW8270E						450 U	490 U	570 U	400 U	500 U
Isophorone	SW8270E						450 U	490 U	570 U	400 U	500 U
Nitrobenzene	SW8270E						450 U	490 U	570 U	400 U	500 U
n-Nitrosodimethylamine	SW8270E						450 U	490 U	570 U	400 U	500 U
n-Nitrosodi-n-propylamine	SW8270E						450 U	490 U	570 U	400 U	500 U
n-Nitrosodiphenylamine	SW8270E	28	40				450 U	490 U	570 U	400 U	500 U
Pentachlorophenol	SW8270E	360	690				3100 UJ	3300 UJ	5700 UJ	2700 UJ	3400 UJ
Phenol	SW8270E	420	1200				450 U	490 U	570 U	400 U	500 U
Pyridine	SW8270E						4500 UJ	4900 UJ	5700 UJ	4000 UJ	5000 UJ
Polycyclic Aromatic Hydrocarbons (µg/kg)											
1-Methylnaphthalene	SW8270ESIM (SW8270DSIM)						36 U	**59**	**58**	**98**	**48**
2-Methylnaphthalene	SW8270ESIM (SW8270DSIM)	670	670				**64**	**120**	**81**	**36**	**44**

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						Co-located Samples	WS-2	WS-1	P66CAPBH13	--	--
						Sample ID	PS63-SS-01-20230427	PS63-SS-02-20230427	PS63-SS-03-20230427	PS63-SS-04-20230427	PS63-SS-05-20230427
						Sample Date	4/27/2023	4/27/2023	4/27/2023	4/27/2023	4/27/2023
						Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
						Sample Type	N	N	N	N	N
						Matrix	SE	SE	SE	SE	SE
						X	-122.3461613	-122.345851	-122.3456245	-122.3450102	-122.3456886
						Y	47.60880893	47.60898692	47.60897548	47.60871232	47.60876602
Acenaphthene	SW8270E/SIM (SW8270DSIM)	500	500				82	720	610	610	560
Acenaphthylene	SW8270E/SIM (SW8270DSIM)	1300	1300				460	540	830	240	330
Anthracene	SW8270E (SW8270DSIM)	960	960				3100	3600	2600	1500	2800
Benzo(a)anthracene	SW8270E (SW8270DSIM)	1300	1600				2700	3600	4100	3000	3400
Benzo(a)pyrene	SW8270E (SW8270DSIM)	1600	1600		2000		4000	4400	6800	2300	2500
Benzo(b)fluoranthene	SW8270E (SW8270DSIM)						5100	6200	9000	3200	3400
Benzo(k)fluoranthene	SW8270DSIM						--	--	--	--	--
Benzo(j,k)fluoranthene	SW8270E						1700	1700	2700	1100	1200
Benzo(g,h,i)perylene	SW8270E (SW8270DSIM)	670	720				1600	2000	3200	860	840
Chrysene	SW8270E (SW8270DSIM)	1400	2800				5400	5800	6800	3400	4300
Dibenzo(a,h)anthracene	SW8270E/SIM (SW8270DSIM)	230	230				420	630	950	240	220
Fluoranthene	SW8270E (SW8270DSIM)	1700	2500				3200	7300	5900	9700	9100
Fluorene	SW8270E/SIM (SW8270DSIM)	540	540				330	2000	750	840	870
Indeno(1,2,3-c,d)pyrene	SW8270E	600	690				1700	2100	3300	940	950
Naphthalene	SW8270ESIM (SW8270DSIM)	2100	2100		5000		53	120	170	42	63
Phenanthrene	SW8270E (SW8270DSIM)	1500	1500				1500	7000	3600	4400	4700
Pyrene	SW8270E (SW8270DSIM)	2600	3300				2700	5900	6700	7600	6300
Total Benzofluoranthenes (b,j,k) (U = 0 max limit)		3200	3600				6800	7900	12000	4300	4600
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0 max limit)				21			5200	5900	8900	3200	3500
Total HPAH (SMS) (U = 0 max limit)		12000	17000				29000	40000	49000	32000	32000
Total LPAH (SMS) (U = 0 max limit)		5200	5200				5500	14000	8600	7600	9300
Pesticides (µg/kg)											
4,4'-DDD (p,p'-DDD)	SW8081B						4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
4,4'-DDE (p,p'-DDE)	SW8081B						4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
4,4'-DDT (p,p'-DDT)	SW8081B				4000		4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
Aldrin	SW8081B						2.3 U	4.9 U	2.9 U	2.0 U	2.5 U
Chlordane, alpha- (Chlordane, cis-)	SW8081B						4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
Chlordane, gamma-	SW8081B						4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
Dieldrin	SW8081B						4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
Endosulfan sulfate	SW8081B						4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
Endosulfan, alpha- (I)	SW8081B						2.3 U	4.9 U	2.9 U	2.0 U	2.5 U

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						Location ID	PS63-SS-01	PS63-SS-02	PS63-SS-03	PS63-SS-04	PS63-SS-05
						Co-located Samples	WS-2	WS-1	P66CAPBH13	--	--
						Sample ID	PS63-SS-01-20230427	PS63-SS-02-20230427	PS63-SS-03-20230427	PS63-SS-04-20230427	PS63-SS-05-20230427
						Sample Date	4/27/2023	4/27/2023	4/27/2023	4/27/2023	4/27/2023
						Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
						Sample Type	N	N	N	N	N
						Matrix	SE	SE	SE	SE	SE
						X	-122.3461613	-122.345851	-122.3456245	-122.3450102	-122.3456886
						Y	47.60880893	47.60898692	47.60897548	47.60871232	47.60876602
Endosulfan, beta (II)	SW8081B						4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
Endrin	SW8081B						4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
Endrin aldehyde	SW8081B						4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
Endrin ketone	SW8081B						4.5 UJ	9.8 UJ	5.7 UJ	4.0 UJ	5.0 UJ
Heptachlor	SW8081B						2.3 U	4.9 U	2.9 U	2.0 U	2.5 U
Heptachlor epoxide	SW8081B						2.3 U	4.9 U	2.9 U	2.0 U	2.5 U
Hexachlorobenzene	SW8081B	22	70				2.3 UJ	4.9 UJ	2.9 UJ	2.0 UJ	2.5 UJ
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	SW8081B	11	120				2.3 UJ	4.9 UJ	2.9 UJ	2.0 UJ	2.5 UJ
Hexachlorocyclohexane (BHC), alpha-	SW8081B						2.3 U	4.9 U	2.9 U	2.0 U	2.5 U
Hexachlorocyclohexane (BHC), beta-	SW8081B						2.3 U	4.9 U	2.9 U	2.0 U	2.5 U
Hexachlorocyclohexane (BHC), delta-	SW8081B						2.3 U	4.9 U	2.9 U	2.0 U	2.5 U
Hexachlorocyclohexane (BHC), gamma- (Lindane)	SW8081B				10		2.3 U	4.9 U	2.9 U	2.0 U	2.5 U
Methoxychlor	SW8081B						4.5 U	9.8 U	5.7 U	4.0 U	5.0 U
Toxaphene	SW8081B						23 U	49 U	29 U	20 U	25 U
Dioxins/Furans (ng/kg)											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B						**305**	**401**	**1730**	**7400**	**521**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B						**42600**	**43100**	**131000**	**341000 J**	**89200**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B						**262 J**	**245 J**	**1020 J**	**1530 J**	**621 J**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B						**5730**	**5600**	**17900**	**25000**	**13800**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B						**13**	**10.7**	**47.6**	**158**	**24.2**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B						**22.2**	**17.5**	**72.3**	**71**	**51.7**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B						**30.7**	**24.7**	**79.1**	**132**	**72.6**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B						**16.5 J**	**12.4 J**	**49.9 J**	**56.7 J**	**39.9 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B						**229**	**222**	**679**	**659**	**541**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B						**14.4 J**	**3.54 J**	**33.6 J**	**14.7 J**	**30.4 J**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B						**68.7**	**51.4**	**187**	**273**	**151**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B						**10.5**	**9.41**	**31.2**	**21.2**	**22.2**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B						**15.3**	**10.2**	**32.2**	**51.2**	**37**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B						**23.2 J**	**11.6 J**	**62.2 J**	**32.1 J**	**48.1 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B						**21.9**	**20.3**	**68.7**	**27.4**	**48**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B						**3.68**	**3.54**	**11.5**	**6.25**	**6.8**
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B						**0.834**	**0.624 J**	**2.39**	**3.37**	**2.51**
Total Heptachlorodibenzofuran (HpCDF)	E1613B						**833 J**	**810 J**	**3410 J**	**5980 J**	**1910 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B						**11700**	**13600**	**32700**	**34300**	**18600**
Total Hexachlorodibenzofuran (HxCDF)	E1613B						**836 J**	**660 J**	**2760 J**	**2560 J**	**1960 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B						**1170**	**1200 J**	**3550**	**3290**	**2360**

Table 2
Summary of Analytical Results

Chemical	Method[1]	SMS AET Marine SCO	SMS AET Marine CSL	Natural Background or PQL[2]	MTCA Method A Soil Industrial					
					Task	2023 Pier 63 Sampling				
					Location ID	PS63-SS-01	PS63-SS-02	PS63-SS-03	PS63-SS-04	PS63-SS-05
					Co-located Samples	WS-2	WS-1	P66CAPBH13	--	--
					Sample ID	PS63-SS-01-20230427	PS63-SS-02-20230427	PS63-SS-03-20230427	PS63-SS-04-20230427	PS63-SS-05-20230427
					Sample Date	4/27/2023	4/27/2023	4/27/2023	4/27/2023	4/27/2023
					Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
					Sample Type	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE
					X	-122.3461613	-122.345851	-122.3456245	-122.3450102	-122.3456886
					Y	47.60880893	47.60898692	47.60897548	47.60871232	47.60876602
Total Pentachlorodibenzofuran (PeCDF)	E1613B					**256**	**218 J**	**801**	**609**	**543 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B					**61.0 J**	**48.6 J**	**239 J**	**194**	**163 J**
Total Tetrachlorodibenzofuran (TCDF)	E1613B					**43.2 J**	**32.3 J**	**110 J**	**53.9 J**	**60.2 J**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B					**10.7 J**	**6.27 J**	**65.6 J**	**16.6 J**	**14.8 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0 max limit)				5		**137 J**	**120 J**	**403 J**	**560 J**	**320 J**
PCB Aroclors (µg/kg)										
Aroclor 1016	SW8082A					23 U	24 U	140 U	20 U	25 U
Aroclor 1221	SW8082A					23 U	24 U	140 U	20 U	25 U
Aroclor 1232	SW8082A					23 U	24 U	140 U	20 U	25 U
Aroclor 1242	SW8082A					2.3 U	2.4 U	14 U	2.0 U	2.5 U
Aroclor 1248	SW8082A					2.3 U	2.4 U	14 U	2.0 U	2.5 U
Aroclor 1254	SW8082A					**10**	**30**	**46**	**25**	2.5 U
Aroclor 1260	SW8082A					**13**	**40**	**45**	**26**	**3.1**
Aroclor 1262	SW8082A					2.3 U	2.4 U	14 U	2.0 U	2.5 U
Aroclor 1268	SW8082A					2.3 U	2.4 U	14 U	2.0 U	2.5 U
Total PCB Aroclors (U = 0 max limit)		130	1000	12		**23**	**70**	**91**	**51**	**3.1**

Table 2
Summary of Analytical Results

Chemical	Method[1]	SMS AET Marine SCO	SMS AET Marine CSL	Natural Background or PQL[2]	MTCA Method A Soil Industrial	Task	Historical Sampling			
						Location ID	WS-2	WS-1	P66CAPBH13	P66CAPBH12
						Co-located Samples	PS63-SS-01	PS63-SS-02	PS63-SS-03	--
						Sample ID	--	--	BH13-SR	BH12-SR
						Sample Date	10/17/2013	10/14/2013	3/26/2004	3/26/2004
						Depth	4-18.6 feet	0-16.2 feet	0-10 cm	0-10 cm
						Sample Type	N	N	N	N
						Matrix	SE	SE	SE	SE
						X	-122.3461755	-122.345875	1267388.875	1267267.875
						Y	47.60881406	47.60897444	225810.1094	225934.0938
Conventional Parameters (mg/kg)										
Ammonia as nitrogen	SM4500NH3H						--	--	--	
Sulfide	SM4500S2						--	--	**3600**	**3900**
Conventional Parameters (pct)										
Total organic carbon	SW9060A (Plumb 1981)						--	--	**4.9**	**5.9**
Total solids	SM2540G						--	--	**43**	**45**
Petroleum Hydrocarbons (mg/kg)										
Diesel Range Organics	NWTPH-Dx						25.5 U	**168**	--	**--**
Lube Oil Range Organics	NWTPH-Dx						63.8 U	**657**	--	**--**
Grain Size (pct)										
Clay	D422						--	--	--	**--**
Gravel	D422						--	--	--	**--**
Phi >10	D422						--	--	--	**--**
Phi 00.0	D422						--	--	--	**--**
Phi 01.0	D422						--	--	--	**--**
Phi 02.0	D422						--	--	--	**--**
Phi 03.0	D422						--	--	--	**--**
Phi 04.0	D422						--	--	--	**--**
Phi 05.0	D422						--	--	--	**--**
Phi 06.0	D422						--	--	--	**--**
Phi 07.0	D422						--	--	--	**--**
Phi 08.0	D422						--	--	--	**--**
Phi 09.0	D422						--	--	--	**--**
Phi -1.0	D422						--	--	--	**--**
Phi 10.0	D422						--	--	--	**--**
Phi -2.0	D422						--	--	--	**--**
Phi -2.25	D422						--	--	--	**--**
Sand	D422						--	--	--	**--**
Silt	D422						--	--	--	**--**
Metals (mg/kg)										
Arsenic	SW6020B (SW6020A)	57	93	11	20		**7.7**	**7.62**	--	**--**
Barium	SW6020B						--	--	--	**--**
Cadmium	SW6020B (SW6020A)	5.1	6.7	0.8	2		0.21 U	**0.42**	--	**--**
Chromium	SW6020B (SW6020A)	260	270	62	2000		**19**	**22**	--	**--**
Copper	SW6020B	390	390	45			--	--	--	**--**

Table 2
Summary of Analytical Results

Chemical	Method[1]	SMS AET Marine SCO	SMS AET Marine CSL	Natural Background or PQL[2]	Task	Historical Sampling			
					Location ID	WS-2	WS-1	P66CAPBH13	P66CAPBH12
					Co-located Samples	PS63-SS-01	PS63-SS-02	PS63-SS-03	--
					Sample ID	--	--	BH13-SR	BH12-SR
					Sample Date	10/17/2013	10/14/2013	3/26/2004	3/26/2004
					Depth	4-18.6 feet	0-16.2 feet	0-10 cm	0-10 cm
					Sample Type	N	N	N	N
					Matrix	SE	SE	SE	SE
					X	-122.3461755	-122.345875	1267388.875	1267267.875
					Y	47.60881406	47.60897444	225810.1094	225934.0938
					MTCA Method A Soil Industrial				
Lead	SW6020B (SW6020A)	450	530	21	1000	**2.18**	**37.6**	--	--
Mercury	SW7471B	0.41	0.59	0.2	2	0.31 U	**0.28**	**1.9 J**	**1.2 J**
Nickel	SW6020B			50		--	--	--	--
Selenium	SW6020B (SW6020A)					0.51 U	0.38 U	--	--
Silver	SW6020B (SW6020A)	6.1	6.1	0.24		0.10 U	**0.49**	--	--
Zinc	SW6020B	410	960	93		--	--	--	--
Semivolatile Organics (µg/kg)									
1,2,4-Trichlorobenzene	SW8270E	31	51			--	--	--	--
1,2-Dichlorobenzene	SW8270E	35	50			--	--	--	--
1,2-Dinitrobenzene	SW8270E					--	--	--	--
1,2-Diphenylhydrazine	SW8270E					--	--	--	--
1,3-Dichlorobenzene	SW8270E					--	--	--	--
1,3-Dinitrobenzene	SW8270E					--	--	--	--
1,4-Dichlorobenzene	SW8270E	110	110			--	--	--	--
1,4-Dinitrobenzene	SW8270E					--	--	--	--
2,2'-Oxybis (2-chloropropane)	SW8270E					--	--	--	--
2,3,4,6-Tetrachlorophenol	SW8270E					--	--	--	--
2,3,5,6-Tetrachlorophenol	SW8270E					--	--	--	--
2,3-Dichloroaniline	SW8270E					--	--	--	--
2,4,5-Trichlorophenol	SW8270E					--	--	--	--
2,4,6-Trichlorophenol	SW8270E					--	--	--	--
2,4-Dichlorophenol	SW8270E					--	--	--	--
2,4-Dimethylphenol	SW8270E	29	29			--	--	--	--
2,4-Dinitrophenol	SW8270E					--	--	--	--
2,4-Dinitrotoluene	SW8270E					--	--	--	--
2,6-Dinitrotoluene	SW8270E					--	--	--	--
2-Chloronaphthalene	SW8270E					--	--	--	--
2-Chlorophenol	SW8270E					--	--	--	--
2-Methylphenol (o-Cresol)	SW8270E	63	63			--	--	--	--
2-Nitroaniline	SW8270E					--	--	--	--
2-Nitrophenol	SW8270E					--	--	--	--
3,3'-Dichlorobenzidine	SW8270E					--	--	--	--
3-Methylphenol & 4-Methylphenol (m&p-Cresol)	SW8270E					--	--	--	--
3-Nitroaniline	SW8270E					--	--	--	--
4-Bromophenyl-phenyl ether	SW8270E					--	--	--	--

Table 2
Summary of Analytical Results

Chemical	Method[1]	SMS AET Marine SCO	SMS AET Marine CSL	Natural Background or PQL[2]	Task	Historical Sampling			
					Location ID	WS-2	WS-1	P66CAPBH13	P66CAPBH12
					Co-located Samples	PS63-SS-01	PS63-SS-02	PS63-SS-03	--
					Sample ID	--	--	BH13-SR	BH12-SR
					Sample Date	10/17/2013	10/14/2013	3/26/2004	3/26/2004
					Depth	4-18.6 feet	0-16.2 feet	0-10 cm	0-10 cm
					Sample Type	N	N	N	N
					Matrix	SE	SE	SE	SE
					X	-122.3461755	-122.345875	1267388.875	1267267.875
					Y	47.60881406	47.60897444	225810.1094	225934.0938
					MTCA Method A Soil Industrial				
4-Chloro-3-methylphenol	SW8270E					--	--	--	--
4-Chloroaniline	SW8270E					--	--	--	--
4-Chlorophenyl phenyl ether	SW8270E					--	--	--	--
4-Nitroaniline	SW8270E					--	--	--	--
4-Nitrophenol	SW8270E					--	--	--	--
Aniline	SW8270E					--	--	--	--
Benzoic acid	SW8270E	650	650			--	--	--	--
Benzyl alcohol	SW8270E	57	73			--	--	--	--
Bis(2-chloroethoxy)methane	SW8270E					--	--	--	--
Bis(2-chloroethyl)ether	SW8270E					--	--	--	--
Bis(2-ethylhexyl)adipate	SW8270E					--	--	--	--
Bis(2-ethylhexyl)phthalate	SW8270E (SW8270D)	1300	1900			--	--	**260**	**420**
Butylbenzyl phthalate	SW8270E	63	900			--	--	--	--
Carbazole	SW8270E					--	--	--	--
Dibenzofuran	SW8270E (SW8270D)	540	540			--	--	**150**	**400**
Diethyl phthalate	SW8270E	200	1200			--	--	--	--
Dimethyl phthalate	SW8270E	71	160			--	--	--	--
Di-n-butyl phthalate	SW8270E	1400	1400			--	--	--	--
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	SW8270E					--	--	--	--
Di-n-octyl phthalate	SW8270E	6200	6200			--	--	--	--
Hexachlorobenzene	SW8270E	22	70			--	--	--	--
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	SW8270E	11	120			--	--	--	--
Hexachlorocyclopentadiene	SW8270E					--	--	--	--
Hexachloroethane	SW8270E					--	--	--	--
Isophorone	SW8270E					--	--	--	--
Nitrobenzene	SW8270E					--	--	--	--
n-Nitrosodimethylamine	SW8270E					--	--	--	--
n-Nitrosodi-n-propylamine	SW8270E					--	--	--	--
n-Nitrosodiphenylamine	SW8270E	28	40			--	--	--	--
Pentachlorophenol	SW8270E	360	690			--	--	--	--
Phenol	SW8270E	420	1200			--	--	--	--
Pyridine	SW8270E					--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
1-Methylnaphthalene	SW8270ESIM (SW8270DSIM)					59U	**176**	--	--
2-Methylnaphthalene	SW8270ESIM (SW8270DSIM)	670	670			59U	**226**	120U	**400**

Table 2
Summary of Analytical Results

Chemical	Method[1]	SMS AET Marine SCO	SMS AET Marine CSL	Natural Background or PQL[2]	Task	Historical Sampling			
					Location ID	WS-2	WS-1	P66CAPBH13	P66CAPBH12
					Co-located Samples	PS63-SS-01	PS63-SS-02	PS63-SS-03	--
					Sample ID	--	--	BH13-SR	BH12-SR
					Sample Date	10/17/2013	10/14/2013	3/26/2004	3/26/2004
					Depth	4-18.6 feet	0-16.2 feet	0-10 cm	0-10 cm
					Sample Type	N	N	N	N
					Matrix	SE	SE	SE	SE
					X	-122.3461755	-122.345875	1267388.875	1267267.875
					Y	47.60881406	47.60897444	225810.1094	225934.0938
					MTCA Method A Soil Industrial				
Acenaphthene	SW8270E/SIM (SW8270DSIM)	500	500			59U	**619**	**290**	**140**
Acenaphthylene	SW8270E/SIM (SW8270DSIM)	1300	1300			59U	**112**	**230**	**470**
Anthracene	SW8270E (SW8270DSIM)	960	960			59U	**626**	**1100**	**1600**
Benzo(a)anthracene	SW8270E (SW8270DSIM)	1300	1600			59U	**726**	**1500**	**2900**
Benzo(a)pyrene	SW8270E (SW8270DSIM)	1600	1600		2000	59U	**1110**	**2500**	**3000**
Benzo(b)fluoranthene	SW8270E (SW8270DSIM)					59U	**1530**	**3100**	**3600**
Benzo(k)fluoranthene	SW8270DSIM					59U	**500**	**2300**	**3600**
Benzo(j,k)fluoranthene	SW8270E					--	**--**	--	**--**
Benzo(g,h,i)perylene	SW8270E (SW8270DSIM)	670	720			59U	**547**	**660**	**1100**
Chrysene	SW8270E (SW8270DSIM)	1400	2800			59U	**1100**	**2200**	**4100**
Dibenzo(a,h)anthracene	SW8270E/SIM (SW8270DSIM)	230	230			59U	**87**	**270**	**490**
Fluoranthene	SW8270E (SW8270DSIM)	1700	2500			**200**	**1670**	**2400**	**2800**
Fluorene	SW8270E/SIM (SW8270DSIM)	540	540			59U	**563**	**300**	**490**
Indeno(1,2,3-c,d)pyrene	SW8270E	600	690			--	**--**	--	**1100**
Naphthalene	SW8270ESIM (SW8270DSIM)	2100	2100		5000	59U	**246**	**180**	**130**
Phenanthrene	SW8270E (SW8270DSIM)	1500	1500			**109**	**1820**	**1900**	**2000**
Pyrene	SW8270E (SW8270DSIM)	2600	3300			**152**	**3810**	**5200**	**12000**
Total Benzofluoranthenes (b,j,k) (U = 0 max limit)		3200	3600			59U	**2030**	**5400**	**7200**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0 max limit)				21		59U	**1450**	**3300**	**4200**
Total HPAH (SMS) (U = 0 max limit)		12000	17000			**352**	**9523**	**15500**	**27500**
Total LPAH (SMS) (U = 0 max limit)		5200	5200			**109**	**4212**	**4000**	**5230**
Pesticides (µg/kg)									
4,4'-DDD (p,p'-DDD)	SW8081B					--	--	--	**--**
4,4'-DDE (p,p'-DDE)	SW8081B					--	--	--	**--**
4,4'-DDT (p,p'-DDT)	SW8081B				4000	--	--	--	**--**
Aldrin	SW8081B					--	--	--	**--**
Chlordane, alpha- (Chlordane, cis-)	SW8081B					--	--	--	**--**
Chlordane, gamma-	SW8081B					--	--	--	**--**
Dieldrin	SW8081B					--	--	--	**--**
Endosulfan sulfate	SW8081B					--	--	--	**--**
Endosulfan, alpha- (I)	SW8081B					--	--	--	**--**

Table 2
Summary of Analytical Results

Chemical	Method[1]	SMS AET Marine SCO	SMS AET Marine CSL	Natural Background or PQL[2]	Task	Historical Sampling			
					Location ID	WS-2	WS-1	P66CAPBH13	P66CAPBH12
					Co-located Samples	PS63-SS-01	PS63-SS-02	PS63-SS-03	--
					Sample ID	--	--	BH13-SR	BH12-SR
					Sample Date	10/17/2013	10/14/2013	3/26/2004	3/26/2004
					Depth	4-18.6 feet	0-16.2 feet	0-10 cm	0-10 cm
					Sample Type	N	N	N	N
					Matrix	SE	SE	SE	SE
					X	-122.3461755	-122.345875	1267388.875	1267267.875
					Y	47.60881406	47.60897444	225810.1094	225934.0938
					MTCA Method A Soil Industrial				
Endosulfan, beta (II)	SW8081B					--	--	--	--
Endrin	SW8081B					--	--	--	--
Endrin aldehyde	SW8081B					--	--	--	--
Endrin ketone	SW8081B					--	--	--	--
Heptachlor	SW8081B					--	--	--	--
Heptachlor epoxide	SW8081B					--	--	--	--
Hexachlorobenzene	SW8081B	22	70			--	--	--	--
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	SW8081B	11	120			--	--	--	--
Hexachlorocyclohexane (BHC), alpha-	SW8081B					--	--	--	--
Hexachlorocyclohexane (BHC), beta-	SW8081B					--	--	--	--
Hexachlorocyclohexane (BHC), delta-	SW8081B					--	--	--	--
Hexachlorocyclohexane (BHC), gamma- (Lindane)	SW8081B				10	--	--	--	--
Methoxychlor	SW8081B					--	--	--	--
Toxaphene	SW8081B					--	--	--	--
Dioxins/Furans (ng/kg)									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B					--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B					--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B					--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B					--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B					--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B					--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B					--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B					--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B					--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B					--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B					--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B					--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B					--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B					--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B					--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B					--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B					--	--	--	--
Total Heptachlorodibenzofuran (HpCDF)	E1613B					--	--	--	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B					--	--	--	--
Total Hexachlorodibenzofuran (HxCDF)	E1613B					--	--	--	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B					--	--	--	--

Table 2
Summary of Analytical Results

Chemical	Method[1]	SMS AET Marine SCO	SMS AET Marine CSL	Natural Background or PQL[2]	Task	Historical Sampling			
					Location ID	WS-2	WS-1	P66CAPBH13	P66CAPBH12
					Co-located Samples	PS63-SS-01	PS63-SS-02	PS63-SS-03	--
					Sample ID	--	--	BH13-SR	BH12-SR
					Sample Date	10/17/2013	10/14/2013	3/26/2004	3/26/2004
					Depth	4-18.6 feet	0-16.2 feet	0-10 cm	0-10 cm
					Sample Type	N	N	N	N
					Matrix	SE	SE	SE	SE
					X	-122.3461755	-122.345875	1267388.875	1267267.875
					Y	47.60881406	47.60897444	225810.1094	225934.0938
					MTCA Method A Soil Industrial				
Total Pentachlorodibenzofuran (PeCDF)	E1613B					--	--	--	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B					--	--	--	--
Total Tetrachlorodibenzofuran (TCDF)	E1613B					--	--	--	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B					--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0 max limit)				5		--	--	--	--
PCB Aroclors (µg/kg)									
Aroclor 1016	SW8082A					--	0.12 U	39 U	79 U
Aroclor 1221	SW8082A					--	0.12 U	39 U	79 U
Aroclor 1232	SW8082A					--	0.12 U	39 U	79 U
Aroclor 1242	SW8082A					--	0.12 U	39 U	79 U
Aroclor 1248	SW8082A					--	0.12 U	39 U	**180J**
Aroclor 1254	SW8082A					--	0.12 U	**220J**	**400**
Aroclor 1260	SW8082A					--	0.12 U	**88**	**230**
Aroclor 1262	SW8082A					--	0.12 U	--	--
Aroclor 1268	SW8082A					--	0.12 U	--	--
Total PCB Aroclors (U = 0 max limit)		130	1000	12		--	0.12 U	**300J**	**810 J**

Table 2
Summary of Analytical Results

Notes:

1. Different analytical methods for historical samples are listed in parantheses.
2. The maximum of natural background or the practical quantitation limit, per WAC 173-204-500 (5)(a)(i)(A).

Total organic carbon out of range (less than 0.5% or greater than 3.5%)

Detected concentration is greater than AET Marine SCO.
Detected concentration is greater than AET Marine CSL.
Detected concentration is greater than either the natural background value or the applicable PQL.

Model Toxics Cleanup Act Method A Soil Industrial

Detected concentration is greater than MTCA Method A Soil Cleanup Levels for Industrial Properties.

SW8270E/SW8270ESIM

Lab used EPA Method 8270E for certain PAHs due to surpassing reporting limits or meeting criteria, deviating from the SQAPP's listed EPA Method 8270E SIM; all requested analyses completed.

µg/kg: microgram per kilogram
AET: apparent effects threshold
cm: centimeter
CSL: Cleanup Screening Level
EPA: U.S. Environmental Protection Agency
HPAH: high-molecular-weight polycyclic aromatic hydrocarbon
J: estimated value
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
mg/kg: milligram per kilogram
µg/kg: microgram per kilogram
MTCA: Model Toxics Control Act
ng/kg: nanogram per kilogram
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
pct: percent
PQL: practical quantitation limit
SCO: Sediment Cleanup Objective
SIM: selected ion monitoring
SMS: Sediment Management Standards
TEQ: toxicity equivalence
U: compound analyzed for, but not detected above detection limit
UJ: compound analyzed for, but not detected above estimated detection limit

Figures

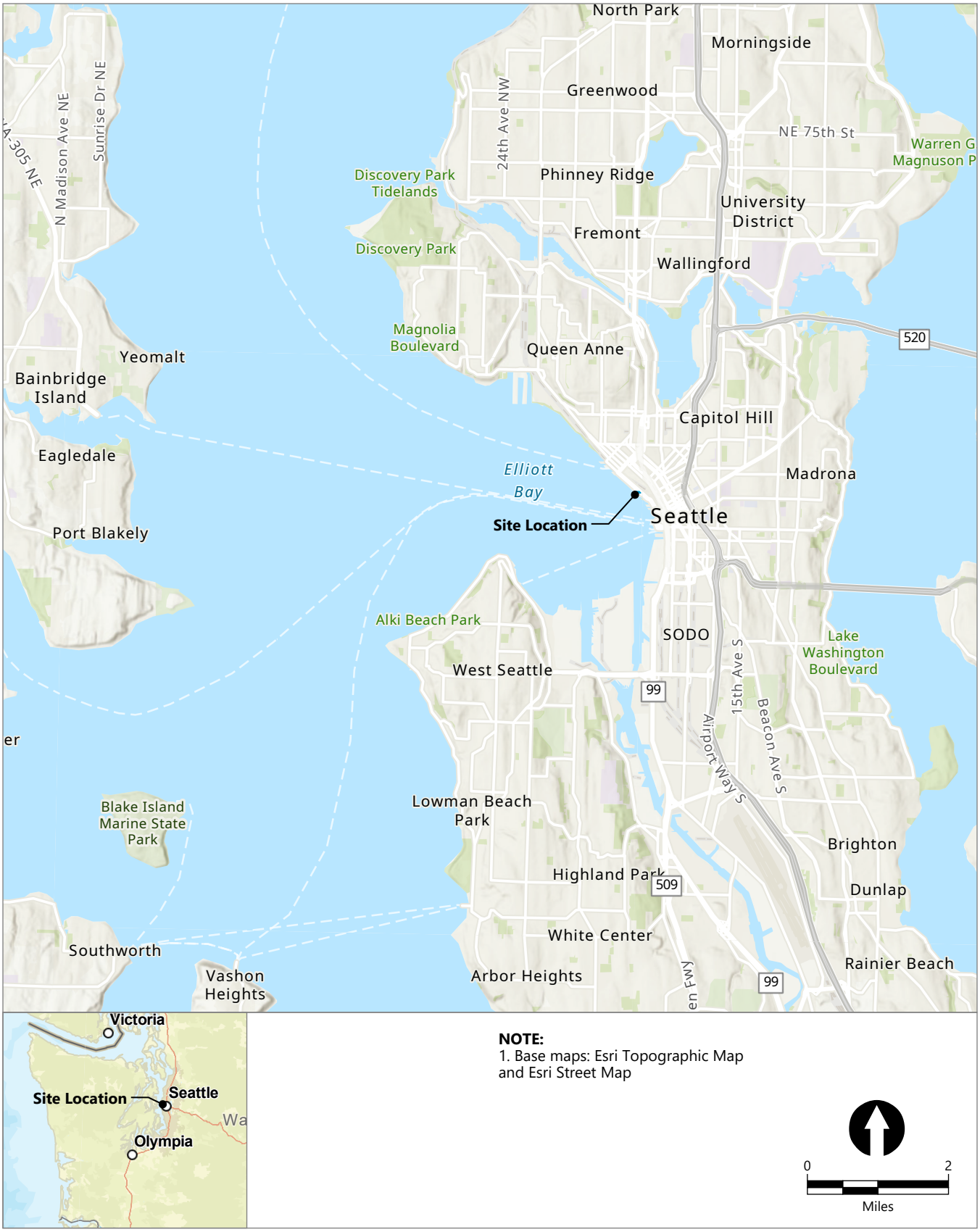

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Figure 1
Vicinity Map
Pier 63 Removal Project
Pier 63 Sediment Sampling Data Report

LEGEND:

- Sediment Sample Location
- Former Pier 63 Location

NOTES:

1. Aerial image: King County (2021)
2. Pier 63 was removed as of January 2023

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Figure 2
Sediment Sampling Locations
Pier 63 Removal Project
Pier 63 Sediment Sampling Data Report

Appendix A
Existing Data Summary

1201 3rd Avenue, Suite 2600
Seattle, Washington 98101
206.287.9130

ANCHOR QEA

Memorandum

November 8, 2019

To: Kit Loo and Jill Macik, Seattle Department of Transportation
David Graves, City of Seattle Parks and Recreation

From: Joy Dunay and Cindy Fields, Anchor QEA, LLC

cc: Sasha Visconty, Axis Environmental
Josh Jensen and Heather Page, Anchor QEA, LLC

Re: Piers 58 and 63 Existing Sediment Data Review

Introduction

This memorandum provides a summary of available data evaluated in the vicinity of the proposed Piers 58 and 63 Replacement Project. Historical data between 2004 and the present were obtained from the City of Seattle's *Waterfront Seattle Program Geotechnical and Environmental Data Report* (Shannon & Wilson 2018) and the Washington State Department of Ecology's (Ecology's) Environmental Information Management (EIM) Database. The following provides a summary of these available data, including a screening of the data against state standards for sediment quality to evaluate the potential ecological and human health risks associated with site sediments.

Data Sources

The following provides a summary of the available data from the *Waterfront Seattle Program Geotechnical and Environmental Data Report* and Ecology's EIM Database.

Waterfront Seattle Program Geotechnical and Environmental Data Report

Environmental data were collected by Shannon & Wilson in 2013 and 2014 in the vicinity of the Pier 58 and 63 site boundaries to support the City of Seattle's Waterfront Seattle Program (Shannon & Wilson 2018). The objective of the sampling was to characterize existing fill and shallow native soils that would be excavated and disposed of as investigative derived waste and to support disposal options. The sediment was not evaluated consistent with any remedial program or state cleanup standards. To support the evaluation, two sediment samples (WS-6 and WS-7) were collected at Pier 58, and five sediment samples (WS-1 through WS-5) were collected adjacent to Pier 63 (Figures 1 and 2).

Environmental sediment samples were collected using hollow-stem auger and/or mud rotary drilling methods. Each sample represents a composite of select intervals within a subsurface boring, as specified in the soil boring log (Appendix A); the samples do not provide discreet data at specific sediment elevations (such as the bioactive zone [upper 10 centimeters]). Additionally, because the samples were not pulled from a consecutive interval, they do not represent the entire depth range provided in the data report. The seven samples represent subsurface composites over large, deep

intervals (up to 20.2 feet below mudline). Samples were analyzed for all or a subset of the following tests: diesel range organics, lube oil range organics, Resource Conservation and Recovery Act (RCRA) metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyl (PCB) Aroclors.

Ecology's EIM Database

The Ecology EIM Database is a publicly available repository of environmental data collected in Washington state by both private and public entities. The database was reviewed for existing data within the vicinity of Piers 58 and 63 and reviewed for acceptability using several factors, as described below:

- Data within 10 years are generally accepted by regulatory agencies as being representative of current sediment quality conditions.
- Data completeness is required to understand the validity of the data; specifically, sampling depths and collection methods are required to know what the chemical data represents.
- Relevancy to the study was used to determine which data points were included. For example, specialized chemical compounds (i.e., polybrominated diphenyl ethers) that were collected for specific purposes, but do not have regulatory screening levels to assess them, were omitted.

Table 1 provides the sediment and tissue data available from EIM and the data acceptability of each sample.

Two sediment samples (from one location) and two tissue samples (from one location) were deemed acceptable near Pier 58 (Figure 1). Surface sediment samples were collected from the same location in 2007 and 2013. Samples were collected from the upper 2 centimeters (cm; dioxins/furans only) and upper 3 cm (all other results) and analyzed for total organic carbon (TOC), metals, semivolatile organic compounds (SVOCs), PAHs, pesticides, PCB Aroclors, and dioxins/furans. Mussel tissue was sampled in 2013 and 2018. Caged mussels were deployed and retrieved from the intertidal area of the Seattle Aquarium. Tissue samples were analyzed for metals, hexachlorobenzene, PAHs, pesticides, and PCB congeners. The 2007 data were included, even though they were older than 10 years, because they were the only dioxin/furan data found in the vicinity of the site.

Seven sediment samples (five from one location) were deemed acceptable near Pier 63 (Figure 2). Surface sediment from location 303D_LTDF01 was sampled in 2007, 2009, 2011, 2013, and 2015 as part of the King County Routine Marine Ambient Monitoring Study. Samples were collected from the upper 2 cm and tested for sulfide, total solids, TOC, metals, SVOCs, PAHs, PCB Aroclors, and pesticides. Two surface sediment samples were collected in 2004 from the upper 10 cm and analyzed for mercury, bis(2-ehtylhexyl)phthalate, PAHs, and PCB Aroclors. Three data points are older than 10 years, but were included due to the limited recent data available in the vicinity of the site.

Sediment Quality Assessment

Table 2 shows the existing sediment data compared to Washington State Sediment Management Standards (SMS) marine benthic screening levels provided in the Sediment Cleanup User Manual (SCUM II; Ecology 2017). These screening criteria are used to determine if there are potential effects to the benthic community relative to Sediment Cleanup Objective (SCO). Concentrations below the SCO are anticipated to have no effect; concentrations between SCO and Cleanup Screening Level (CSL) are anticipated to have minor adverse effects; and concentrations above the CSL are likely to have adverse effects to the benthic community.

For sediment in marine environments, there are benthic numeric criteria for 47 chemicals and narrative criteria for others (i.e., natural or regional background or risk-based thresholds). Some of the marine chemical criteria are based on dry weight, such as metals, while others are normalized with the organic carbon (OC) content of the sediment. Per SCUM II guidance, OC-normalized results are only applicable to samples with TOC content within 0.5% to 3.5%. If the TOC concentration in the sample is outside of 0.5% to 3.5%, dry weight apparent effects threshold (AET) criteria are used. The SMS marine benthic criteria are used in lieu of site-specific criteria, which are typically established for cleanup sites. No site-specific criteria have been established for Pier 58 or 63. Additional screening was applied using the preliminary Elliott Bay Regional Background Concentrations (Anchor QEA 2016). These screening levels were included because they provide realistic potential criteria for nearshore areas within Elliott Bay.

The chemical profile of samples collected from areas adjacent to Piers 58 and 63 are similar so are evaluated together. The following chemicals exceed one or more regulatory screening levels and may be considered contaminants of potential concern (COPCs):

- **Mercury** is elevated above the CSL at several locations. Surface concentrations are generally higher than the subsurface composites, but exceedances are present at both depths.
- **Copper** is elevated above the CSL at one surface location near Pier 58. Copper was not collected at any other surface sample locations, so the extent of elevated concentrations of this metal is unknown. There was no copper exceedance in subsurface samples.
- **PAHs** are elevated well above the CSL at several locations. Concentrations are elevated in both the surface and subsurface samples. Additionally, carcinogenic PAHs (cPAHs) are above the preliminary regional background concentration (Anchor QEA 2016).
- **PCBs** are elevated above the SCO at several surface locations.
- **Dioxins/furans** were above the preliminary regional background concentration in the one surface sample collected in 2007. These compounds are common urban COPCs and are elevated in other areas of Elliott Bay.

Tissue Quality Assessment

Table 3 provides available tissue data collected near Piers 58 and 63. Tissue data are useful to understand the bioavailability and human health risks of COPCs. Tissue criteria are site-specific, risk-based concentrations, which have not been established for Elliott Bay. In lieu of site-specific criteria, SCUM II (Ecology 2017), Suquamish Tribe-designated, adult-human health risk-based tissue concentrations are used as screening levels.

Recent mussel tissue data, collected from the same area in 2013 and 2018, were available from the underpier intertidal area by Pier 59 (Seattle Aquarium). In each event, caged mussels were deployed for approximately 2 months and then retrieved, shucked, and composited into a single tissue sample. Data indicate that risk-based tissue concentrations may be exceeded for several compounds, including arsenic, cadmium, cPAHs, and DDTs. Other sediment COPCs do not have SCUM II criteria for comparison (mercury, copper, PCBs, dioxins/furans) and are therefore unavailable for use in this assessment.

Conclusions

The existing data indicate that elevated concentrations of mercury, copper, PAHs, PCBs, and dioxins/furans are present in surface and/or subsurface sediments near Piers 58 and 63. Although only limited tissue data are available, they indicate that the sediment contaminants are bioavailable and could potentially pose ecological and/or human health risks.

References

Anchor QEA (Anchor QEA, LLC), 2016. *Elliott Bay Preliminary Regional Background Evaluation*, Sediment Cleanup Action Plan, Seattle Multimodal Terminal at Colman Dock. Prepared for Washington State Department of Transportation. November 2016.

Ecology (Washington State Department of Ecology), 2017. *Sediment Cleanup User's Manual II (SCUM II).* Publication No. 12-09-057. December 2017 Revision.

Shannon & Wilson, 2018. *Waterfront Seattle Program, Geotechnical and Environmental Data Report*. Prepared for Seattle Department of Transportation, City of Seattle, Washington. March 2018.

Figures

LEGEND:

◯ Historical Sample (Approximate Location)

NOTE:
1. Aerial imagery sourced from King County, WA (2017)

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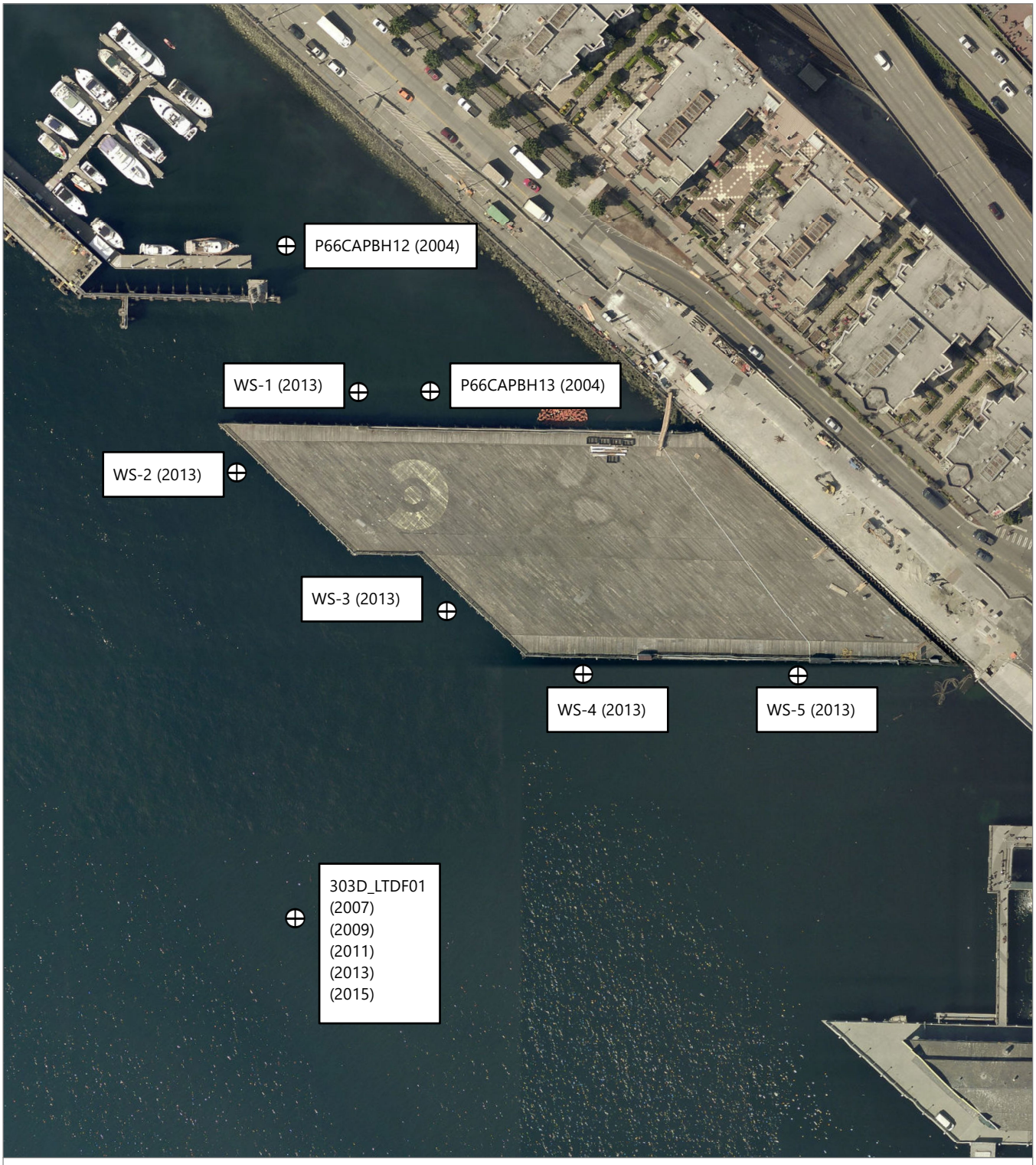
Figure 1
Pier 58 Historical Sample Locations
Pier 58 and 63 Existing Sediment Data Review Memorandum
Piers 58 and 63 Replacement Project



LEGEND:

◯ Historical Sample (Approximate Location)

NOTE:
1. Aerial imagery sourced from King County, WA (2017)
2. WS-1 is the mid-point of borings WS-1/1A and WS-1B

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Figure 2
Pier 63 Historical Sample Locations
Pier 58 and 63 Existing Sediment Data Review Memorandum
Piers 58 and 63 Replacement Project

Tables

Table 1
Environmental Information Management System Results

Pier	Location ID	Location Name	Study Name	Matrix	Sampling Date	Depth	Collection Method	Data Acceptability Status and Rationale[1]
58	EBCHEMSS-07	1985 Elliott Bay sediment survey	1985 Elliott Bay sediment survey	Sediment	1985	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
58	ELLTBAY	ELLTBAY	PSAMP - fish sampled for tissue and bioaccumuation analysis	Tissue	1989-1996	Not recorded in EIM	Not recorded in EIM	No: no chemistry, recency criteria not met
58	UWI-EB-188	Elliott Bay-188	Surface Sediment and Fish Tissue Chemistry in Greater Elliott Bay (Seattle) - Urban Waters Initiative	Sediment	2007	0-2 cm	Van Veen Grab Sampler	Yes: only D/F data available at Pier 58
58	UWI-EB-188	Elliott Bay-188	Urban Waters Initiative	Sediment	2013	0-3 cm	Van Veen Grab Sampler	Yes: recency criteria met
58	EB_P59	Elliott Bay, Seattle Aqrm, Pier 59	WDFW Mussel Watch Pilot Expansion project - toxic contaminants in Puget Sound nearshore biota: a large-scale synoptic survey using transplanted mussels (*Mytilus trossulus*)	Tissue	2013	Surface	Handpick	Yes: recency criteria met
58	EB_P59	Elliott Bay, Seattle Aqrm, Pier 59	Stormwater Action Monitoring Program Puget Nearshore Mussels	Tissue	2018	Surface	Handpick	Yes: recency criteria met
63	TPPSS0065	TPPS	TPPS Preliminary survey	Sediment	1982	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	EBCHEMSS-08	1985 Elliott Bay sediment survey	1985 Elliott Bay sediment survey	Sediment	1985	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	P53MON89LTDG02	P53MON89	Pier 53/55 Metro's Monitoring Report, 1989	Sediment	1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	HSSEAT88LTDF06	HSSEAT88	Metro's Hot Spot Invest. Waterfront, 1988	Sediment	1988-1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	HSSEAT88LTDG03	HSSEAT88	Metro's Hot Spot Invest. Waterfront, 1988	Sediment	1988-1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	HSSEAT88LTDG05	HSSEAT88	Metro's Hot Spot Invest. Waterfront, 1988	Sediment	1988-1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	HSSEAT88LTDG06	HSSEAT88	Metro's Hot Spot Invest. Waterfront, 1988	Sediment	1988-1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	HSSEAT89LTDG02	HSSEAT89	Metro's Hot Spot Invest. Waterfront, 1988	Sediment	1988-1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	PIER6465HC-SS03	PIER6465	Pier 64/65 Sediment Quality Assessment	Sediment	1990	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	METPSA92LTDF01	METPSA92	Metro's Puget Sound Ambient Monitoring, 1992	Sediment	1992	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	ELLIOTB1	Elliot Bay Sediment Trap Station EB-1	Elliot Bay Waterfront Recontamination Study	Sediment	1993-1994	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	CPSD9497LTDF01	CPSD9497	Ambient Subtidal Monitoring 1994-1997	Sediment	1995-1996	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	EVS95-WF-01	WF-01	Elliott Bay Duwamish River Fish Tissue & Bioaccumulation Investigation	Tissue	1995	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	EVS95-WF-02	WF-02		Tissue	1995	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	EVS95-WF-03	WF-03		Tissue	1995	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	PIER6465HC-B02	PIER6465	Pier 64/65 Sediment Quality Assessment	Sediment	1990	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	P66CAPBH12	P66CAP	Pier 66 Sediment Cap/Central Waterfront	Sediment	2004	0-10 cm	Not recorded in EIM	Yes: limited data available, so included
63	P66CAPBH13	P66CAP	Pier 66 Sediment Cap/Central Waterfront	Sediment	2004	0-10 cm	Not recorded in EIM	Yes: limited data available, so included
63	303D_LTDF01	LTDF01	King County Routine Marine Ambient Monitoring	Sediment	2007-2015	0-2 cm	Not recorded in EIM	Yes: recency criteria met; 2007 data part of temporal trend

Notes:

1. Data acceptability was based on a number of factors, including data recency (<10 years), data completeness, and relevancy to project.

cm: centimeter
D/F: dioxins/furans
EIM: Environmental Information Management System
PSAMP: Puget Sound Ambient Monitoring Program
TPPS: Metro Toxicant Protreatment Planning Study
WDFW: Washington Department of Fish and Wildlife

Table 2
Existing Sediment Data Near Piers 63 and 58

							King County Routine Marine Ambient Monitoring Study					Pier 66 Cap	
						Study	LTDF01	LTDF01	LTDF01	LTDF01	LTDF01	P66CAPBH13	P66CAPBH12
						Location ID							
						Sample Date	06/26/07	06/29/09	06/13/11	06/03/13	06/23/15	03/26/04	03/26/04
						Depth	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-10 cm	0-10 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background							
Conventional Parameters (mg/kg)													
Sulfide	SM4500S2D	--	--	--	--	--	1.086U	1.1U	**23.2**	**5.8**	**2.9J**	**3600**	**3900**
Conventional Parameters (%)													
Total organic carbon	Plumb 1981	--	--	--	--	--	**0.57%**	**3.01%**	**2.22%**	**3.56%**	**2.26%**	**4.9**	**5.9**
Total Solids	SM2540G	--	--	--	--	--	**54.3**	**44.2**	**53.5**	**45.5**	**54.4**	**43**	**45**
Petroleum Hydrocarbons (mg/kg)													
Diesel Range Organics	NWTPH-Dx	--	--	--	--	--	--	--	--	--	--	--	--
Lube Oil Range Organics	NWTPH-Dx	--	--	--	--	--	--	--	--	--	--	--	--
Metals (mg/kg)													
Antimony	SW6020A	--	--	--	--	--	2.0UJ	1.7UJ	1.4UJ	--	--	--	--
Arsenic	SW6020A	57	93	57	93	13	**2.5J**	**11J**	**9.7J**	**11J**	**11J**	--	--
Cadmium	SW6020A	5.1	6.7	5.1	6.7	--	**0.05J**	**0.41J**	**0.34J**	**0.24J**	**0.33**	--	--
Chromium	SW6020A	260	270	260	270	--	**9.2**	**39**	**34**	**38**	**33**	--	--
Copper	SW6020A	390	390	390	390	--	**12**	**52**	**46**	**65**	**44**	--	--
Lead	SW6020A	450	530	450	530	--	**19**	**59**	**56**	**61**	**55**	--	--
Mercury	SW7471B	0.41	0.59	0.41	0.59	0.38	**0.09**	**0.40**	**0.40**	**0.46**	**0.49**	**1.9J**	**1.2J**
Selenium	SW6020A	--	--	--	--	--	--	2.9U	--	--	--	--	--
Silver	SW6020A	6.1	6.1	6.1	6.1	--	**0.26J**	**0.93J**	**0.52J**	**0.51J**	**0.825J**	--	--
Zinc	SW6020A	410	960	410	960	--	**19**	**93**	**75**	**88**	**76**	--	--
Semivolatile Organics (µg/kg)													
1,2,4-Trichlorobenzene	SW8270D	31	51	--	--	--	0.11U	0.23U	0.82U	1.2U	0.97U	--	--
1,2-Dichlorobenzene	SW8270D	35	50	--	--	--	0.22U	0.45U	8.3U	11.7U	9.8U	--	--
1,4-Dichlorobenzene	SW8270D	110	110	--	--	--	**0.56**	0.45U	12.5U	17.6U	14.7U	--	--
2,4-Dimethylphenol	SW8270D	29	29	29	29	--	1.09U	2.3U	8.2U	12U	9.7U	--	--
2-Methylphenol (o-Cresol)	SW8270D	63	63	63	63	--	2.17U	4.5U	8.2U	12U	9.7U	--	--
4-Methylphenol (p-Cresol)	SW8270D	670	670	670	670	--	4.34U	9U	41U	59U	50U	--	--
Benzoic acid	SW8270D	650	650	650	650	--	**29**	**405**	**140J**	**325**	197U	--	--
Benzyl alcohol	SW8270D	57	73	57	73	--	2.2U	4.5U	20.7U	29.2U	24.4U	--	--
bis(2-Ethylhexyl)phthalate	SW8270D	1300	3100	--	--	--	**149**	89.4UJ	**114**	**86.4**	**53.9**	**260**	**420**
Butylbenzyl phthalate	SW8270D	63	900	--	--	--	**14.2**	**17.2**	**14.3J**	17.6U	14.7U	--	--
Diethyl phthalate	SW8270D	200	1200	--	--	--	4.34U	9U	17U	**131**	20U	--	--
Dimethyl phthalate	SW8270D	71	160	--	--	--	4.34U	9U	16.6U	23.5U	19.7U	--	--
Di-n-butyl phthalate	SW8270D	1400	1400	--	--	--	**5.5**	**15J**	**22J**	24U	**22J**	--	--
Di-n-octyl phthalate	SW8270D	6200	6200	--	--	--	4.34U	9U	16.6U	23.5U	19.7U	--	--
Hexachlorobenzene	SW8270D	22	70	--	--	--	0.11U	0.23U	0.82U	1.2U	0.97U	--	--
Hexachlorobutadiene	SW8270D	11	120	--	--	--	0.54U	1.1U	4.1U	5.9U	5U	--	--
n-Nitrosodiphenylamine	SW8270D	28	40	--	--	--	4.34U	9U	20.7U	29.2U	24.4U	--	--
Pentachlorophenol	SW8270D	360	690	360	690	--	10.9U	23U	125U	176U	147U	--	--
Phenol	SW8270D	420	1200	420	1200	--	4.34U	9U	41U	59U	50U	--	--
Semivolatile Organics (mg/kg-OC)													
1,2,4-Trichlorobenzene	SW8270D	--	--	0.81	1.8	--	0.0191U	0.008U	0.04U	0.03U	0.04U	--	--
1,2-Dichlorobenzene	SW8270D	--	--	2.3	2.3	--	0.038U	0.015U	0.38U	0.33U	0.43U	--	--
1,4-Dichlorobenzene	SW8270D	--	--	3.1	9	--	**0.097**	0.015U	0.56U	0.49U	0.65U	--	--
bis(2-Ethylhexyl)phthalate	SW8270D	--	--	47	78	--	**26.2**	2.97UJ	**5.14**	**2.43**	**2.38**	--	--
Butylbenzyl phthalate	SW8270D	--	--	4.9	64	--	**2.49**	**0.571**	0.64J	0.49U	0.65U	--	--
Diethyl phthalate	SW8270D	--	--	61	110	--	0.762U	0.299U	0.77U	**3.68**	0.88U	--	--
Dimethyl phthalate	SW8270D	--	--	53	53	--	0.762U	0.299U	0.75U	0.66U	0.87U	--	--
Di-n-butyl phthalate	SW8270D	--	--	220	1,700	--	**0.962**	**0.498J**	0.99J	0.67U	**0.97J**	--	--
Di-n-octyl phthalate	SW8270D	--	--	58	4500	--	0.762U	0.299U	0.75U	0.66U	0.87U	--	--
Hexachlorobenzene	SW8270D	--	--	0.38	2.3	--	0.019U	0.008U	0.04U	0.03U	0.04U	--	--
Hexachlorobutadiene	SW8270D	--	--	3.9	6.2	--	0.095U	0.037U	0.18U	0.17U	0.22U	--	--
n-Nitrosodiphenylamine	SW8270D	--	--	11	11	--	0.762U	0.299U	0.93U	0.82U	1.08U	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)													
1-Methylnaphthalene	SW8270DSIM	--	--	--	--	--	--	--	--	--	**12J**	--	--
2-Methylnaphthalene	SW8270DSIM	670	670	--	--	--	**3.4**	**19.4**	**11J**	**81.1**	**13J**	120U	**400**
Acenaphthene	SW8270DSIM	500	500	--	--	--	**15.4**	**32.6**	**30.1**	**147**	**26.5**	**290**	**140**
Acenaphthylene	SW8270DSIM	1300	1300	--	--	--	**8.9**	**35.7**	**36.4**	**90.8**	**35.3**	**230**	**470**
Anthracene	SW8270DSIM	960	960	--	--	--	**61**	**221**	**181**	**495**	**151**	**1100**	**1600**

Table 2
Existing Sediment Data Near Piers 63 and 58

						Study	King County Routine Marine Ambient Monitoring Study					Pier 66 Cap	
						Location ID	LTDF01	LTDF01	LTDF01	LTDF01	LTDF01	P66CAPBH13	P66CAPBH12
						Sample Date	06/26/07	06/29/09	06/13/11	06/03/13	06/23/15	03/26/04	03/26/04
						Depth	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-10 cm	0-10 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background							
Benzo(a)anthracene	SW8270DSIM	1300	1600	--	--	--	**146**	**511**	**327**	**813**	**307**	**1500**	**2900**
Benzo(a)pyrene	SW8270DSIM	1600	1600	--	--	--	**197**	**550**	**523**	**1030**	**403**	**2500**	**3000**
Benzo(b,j,k)fluoranthenes	SW8270DSIM	3,200	3,600	--	--	--	**333**	**1120**	**897**	**2080**	**871**	**5400**	**7200**
Benzo(g,h,i)perylene	SW8270DSIM	670	720	--	--	--	**74**	**269**	**258**	**301**	**169**	**660**	**1100**
Chrysene	SW8270DSIM	1,400	2800	--	--	--	**200**	**597**	**469**	**1400**	**460**	**2200**	**4100**
Dibenzo(a,h)anthracene	SW8270DSIM	230	230	--	--	--	**37**	**126**	**119J**	**115**	**56.1**	**270**	**490**
Dibenzofuran	SW8270DSIM	540	540	--	--	--	**6.6**	**22.9**	**22.2**	**83.7**	**23**	**150**	**400**
Fluoranthene	SW8270DSIM	1700	2500	--	--	--	**206**	**640**	**574**	**2100**	**465**	**2400**	**2800**
Fluorene	SW8270DSIM	540	540	--	--	--	**18**	**50.7**	**55**	**158**	**41**	**300**	**490**
Indeno(1,2,3-cd)pyrene	SW8270DSIM	600	690	--	--	--	**90**	**271**	**232**	**431**	**193**	**720**	**1100**
Naphthalene	SW8270DSIM	2100	2100	--	--	--	**6.2**	**21.4**	**25.8**	**132**	**28.9**	**180**	**130**
Phenanthrene	SW8270DSIM	1500	1,500	--	--	--	**113**	**419**	**351**	**1250**	**272**	**1900**	**2000**
Pyrene	SW8270DSIM	2600	3300	--	--	--	**241**	**799**	**703**	**2370**	**603**	**5200**	**12000**
Total cPAH TEQ (U = 0)	Calculated	--	--	--	--	380	**259**	**758**	**685**	**1388**	**550**	**3300**	**4200**
Total HPAH (U = 0)	Calculated	12000	17000	--	--	--	**1190**	**3763**	**4102J**	**10640**	**3527**	**15500**	**27500**
Total LPAH (U = 0)	Calculated	5200	5200	--	--	--	**223**	**780.4**	**679.3**	**2273**	**555**	**4000**	**5230**
Polycyclic Aromatic Hydrocarbons (mg/kg-OC)													
1-Methylnaphthalene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	SW8270DSIM	--	--	38	64	--	**0.60**	**0.64**	**0.50J**	**2.28**	**0.58J**	--	--
Acenaphthene	SW8270DSIM	--	--	16	57	--	**2.71**	**1.08**	**1.36**	**4.13**	**1.17**	--	--
Acenaphthylene	SW8270DSIM	--	--	66	66	--	**1.56**	**1.19**	**1.64**	**2.55**	**1.56**	--	--
Anthracene	SW8270DSIM	--	--	220	1200	--	**10.8**	**7.34**	**8.15**	**13.9**	**6.68**	--	--
Benzo(a)anthracene	SW8270DSIM	--	--	110	270	--	**25.5**	**17.0**	**14.7**	**22.8**	**13.60**	--	--
Benzo(a)pyrene	SW8270DSIM	--	--	99	210	--	**34.5**	**18.3**	**23.6**	**28.9**	**17.80**	--	--
Benzo(b)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(j,k)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b,j,k)fluoranthenes	SW8270DSIM	--	--	230	450	--	**58**	**37**	**40.4**	**58.4**	**38.50**	--	--
Benzo(g,h,i)perylene	SW8270DSIM	--	--	31	78	--	**13.05**	**8.94**	**11.6**	**8.46**	**7.50**	--	--
Chrysene	SW8270DSIM	--	--	110	460	--	**35.15**	**19.8**	**21.1**	**39.3**	**20.40**	--	--
Dibenzo(a,h)anthracene	SW8270DSIM	--	--	12	33	--	**6.51**	**4.19**	**5.4J**	**3.23**	**2.48**	--	--
Dibenzofuran	SW8270DSIM	--	--	--	--	--	**1.15**	**0.76**	**1.0**	**2.35**	**1.02**	--	--
Fluoranthene	SW8270DSIM	--	--	160	1200	--	**36.1**	**21.3**	**25.9**	**59**	**20.60**	--	--
Fluorene	SW8270DSIM	--	--	23	79	--	**3.12**	**1.68**	**2.48**	**4.44**	**1.81**	--	--
Indeno(1,2,3-c,d)pyrene	SW8270DSIM	--	--	34	88	--	**15.7**	**9.0**	**10.5**	**12.1**	**8.54**	--	--
Naphthalene	SW8270DSIM	--	--	99	170	--	**1.09**	**0.71**	**1.16**	**3.71**	**1.28**	--	--
Phenanthrene	SW8270DSIM	--	--	100	480	--	**19.8**	**13.9**	**15.8**	**35.1**	**12.00**	--	--
Pyrene	SW8270DSIM	--	--	1000	1400	--	**42.2**	**26.5**	**31.7**	**66.6**	**26.70**	--	--
Total HPAH (DMMP) (U = 0)	Calculated	--	--	960	5300	--	**267**	**162**	**185J**	**299**	**156**	--	--
Total LPAH (DMMP) (U = 0)	Calculated	--	--	370	780	--	**39.1**	**25.9**	**30.6**	**63.8**	**24.5**	--	--
Pesticides (µg/kg)													
4,4'-DDD	SW8081B	--	--	--	--	--	**1.08**	1.5U	**3.07**	**6.62**	**3.09**	--	--
4,4'-DDE	SW8081B	--	--	--	--	--	**1.21**	1.5U	1.5U	0.95J	1.5U	--	--
4,4'-DDT	SW8081B	--	--	--	--	--	**7.49**	1.5U	1.5U	0.88U	2U	--	--
Aldrin	SW8081B	--	--	--	--	--	0.72U	1.5U	1.5U	--	--	--	--
cis-Chlordane	SW8081B	--	--	--	--	--	0.36U	0.75U	0.75U	--	--	--	--

Table 2
Existing Sediment Data Near Piers 63 and 58

						Study	King County Routine Marine Ambient Monitoring Study					Pier 66 Cap	
						Location ID	LTDF01	LTDF01	LTDF01	LTDF01	LTDF01	P66CAPBH13	P66CAPBH12
						Sample Date	06/26/07	06/29/09	06/13/11	06/03/13	06/23/15	03/26/04	03/26/04
						Depth	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-10 cm	0-10 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background							
trans-Chlordane	SW8081B	--	--	--	--	--	0.36U	0.75U	0.75U	--	--	--	--
Dieldrin	SW8081B	--	--	--	--	--	0.72U	1.5U	1.5U	--	--	--	--
Heptachlor	SW8081B	--	--	--	--	--	0.36U	0.75U	0.75U	--	--	--	--
cis-Nonachlor	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--
trans-Nonachlor	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--
Oxychlordane	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--
Sum 4,4 DDT, DDE, DDD (U = 0)	Calculated	--	--	--	--	--	**9.78**	1.5U	**3.07**	**6.62**	**3.09**	--	--
Sum of cis-Chlordane and trans-Chlordane (U = 0)	Calculated	--	--	--	--	--	0.36U	0.75U	0.75U	--	--	--	--
Dioxin Furans (ng/kg)													
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Tetrachlorodibenzofuran (TCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	Calculated	--	--	--	--	--	--	--	--	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	Calculated	--	--	--	--	14	--	--	--	--	--	--	--
PCB Aroclors (µg/kg)													
Aroclor 1016	SW8082A	--	--	--	--	--	2.86U	4.5U	3.7U	4.4U	7.4U	39U	79U
Aroclor 1221	SW8082A	--	--	--	--	--	1.81U	3.8U	7.5U	13U	22U	39U	79U
Aroclor 1232	SW8082A	--	--	--	--	--	1.81U	3.8U	7.5U	13U	22U	39U	79U
Aroclor 1242	SW8082A	--	--	--	--	--	0.91U	1.9U	**8.07**	**11J**	**8.6J**	39U	79U
Aroclor 1248	SW8082A	--	--	--	--	--	**5.92**	**12.2**	3.7U	4.4U	7.4U	39U	**180J**
Aroclor 1254	SW8082A	--	--	--	--	--	**25.58**	**39.4**	**48.6**	**65.9**	53.7	**220J**	**400**
Aroclor 1260	SW8082A	--	--	--	--	--	**14.44**	**40.7**	**36.6**	**59.3**	**59**	**88**	**230**
Aroclor 1262	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1268	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (U = 0)	Calculated	130	1,000	--	--	95	**45.9**	**92.3**	**93.3**	**136.2J**	**121.3J**	**300J**	**810J**
PCB Aroclors (mg/kg-OC)													
Aroclor 1016	SW8082A	--	--	--	--	--	0.50U	0.15U	0.17U	0.12U	0.33U	--	--
Aroclor 1221	SW8082A	--	--	--	--	--	0.32U	0.13U	0.34U	0.37U	0.97U	--	--
Aroclor 1232	SW8082A	--	--	--	--	--	0.32U	0.13U	0.34U	0.37U	0.97U	--	--
Aroclor 1242	SW8082A	--	--	--	--	--	0.16U	0.06U	**0.36**	**0.31J**	**0.38J**	--	--
Aroclor 1248	SW8082A	--	--	--	--	--	**1.04**	**0.41**	0.17U	0.12U	0.33U	--	--
Aroclor 1254	SW8082A	--	--	--	--	--	**4.49**	**1.3**	**2.19**	**1.85**	**2.38**	--	--
Aroclor 1260	SW8082A	--	--	--	--	--	**2.53**	**1.4**	**1.65**	**1.67**	**2.61**	--	--
Aroclor 1262	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1268	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (U = 0)	Calculated	--	--	12	65	--	**8.06**	**3.07**	**4.2**	**3.83J**	**5.37J**	--	--

Table 2
Existing Sediment Data Near Piers 63 and 58

						Study	Shannon & Wilson Waterfront Geotechnical and Environmental Study					Shannon & Wilson		PSAMP and NOAA	
						Location ID	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7	UWI-EB-188	UWI-EB-188
						Sample Date	10/14/13	10/17/13	10/21/13	10/10/13	10/08/13	10/24/13	10/28/13	06/19/07	06/05/13
						Depth	0-16.2 feet	4-18.6 feet	0-14.2 feet	0.5-13.8 feet	4.5-20.2 feet	0-20 feet	0-13.5 feet	0-2 cm	0-3 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 58	Pier 58	Pier 58	Pier 58
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background									
Conventional Parameters (mg/kg)															
Sulfide	SM4500S2D	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conventional Parameters (%)															
Total organic carbon	Plumb 1981	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.13**
Total Solids	SM2540G	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Petroleum Hydrocarbons (mg/kg)															
Diesel Range Organics	NWTPH-Dx	--	--	--	--	--	**168**	25.5U	20U	20.4U	**216**	**1130**	--	--	--
Lube Oil Range Organics	NWTPH-Dx	--	--	--	--	--	**657**	63.8U	51U	**74**	**130**	**579**	--	--	--
Metals (mg/kg)															
Antimony	SW6020A	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	SW6020A	57	93	57	93	13	**7.62**	**7.7**	**4.42**	**4.54**	**4.35**	**10.5**	**4**	--	**10.5**
Cadmium	SW6020A	5.1	6.7	5.1	6.7	--	**0.42**	0.21U	0.19U	0.21U	**0.20**	**1.33**	0.18U	--	**0.41**
Chromium	SW6020A	260	270	260	270	--	**22.0**	**19.0**	**18.1**	**30.2**	**20.5**	**32.4**	**18.5**	--	**53.7**
Copper	SW6020A	390	390	390	390	--	--	--	--	--	--	--	--	--	**480**
Lead	SW6020A	450	530	450	530	--	**37.6**	**2.18**	**8.54**	**19.3**	**18.7**	**150**	**7.58**	--	**62.2**
Mercury	SW7471B	0.41	0.59	0.41	0.59	0.38	**0.28**	0.31U	0.29U	0.32U	0.26U	**1.37**	**0.53**	--	**0.988**
Selenium	SW6020A	--	--	--	--	--	0.38U	0.51U	0.49U	0.51U	**0.49**	**0.8**	0.46U	--	**0.654**
Silver	SW6020A	6.1	6.1	6.1	6.1	--	**0.49**	0.10U	0.10U	0.10U	**0.15**	**2.74**	0.09U	--	**1.14**
Zinc	SW6020A	410	960	410	960	--	--	--	--	--	--	--	--	--	**124**
Semivolatile Organics (µg/kg)															
1,2,4-Trichlorobenzene	SW8270D	31	51	--	--	--	--	--	--	--	--	--	--	--	14U
1,2-Dichlorobenzene	SW8270D	35	50	--	--	--	--	--	--	--	--	--	--	--	14U
1,4-Dichlorobenzene	SW8270D	110	110	--	--	--	--	--	--	--	--	--	--	--	**13J**
2,4-Dimethylphenol	SW8270D	29	29	29	29	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (o-Cresol)	SW8270D	63	63	63	63	--	--	--	--	--	--	--	--	--	140U
4-Methylphenol (p-Cresol)	SW8270D	670	670	670	670	--	--	--	--	--	--	--	--	--	140U
Benzoic acid	SW8270D	650	650	650	650	--	--	--	--	--	--	--	--	--	720UJ
Benzyl alcohol	SW8270D	57	73	57	73	--	--	--	--	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate	SW8270D	1300	3100	--	--	--	--	--	--	--	--	--	--	--	**410J**
Butylbenzyl phthalate	SW8270D	63	900	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl phthalate	SW8270D	200	1200	--	--	--	--	--	--	--	--	--	--	--	140U
Dimethyl phthalate	SW8270D	71	160	--	--	--	--	--	--	--	--	--	--	--	27U
Di-n-butyl phthalate	SW8270D	1400	1400	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	SW8270D	6200	6200	--	--	--	--	--	--	--	--	--	--	--	140UJ
Hexachlorobenzene	SW8270D	22	70	--	--	--	--	--	--	--	--	--	--	--	14U
Hexachlorobutadiene	SW8270D	11	120	--	--	--	--	--	--	--	--	--	--	--	14U
n-Nitrosodiphenylamine	SW8270D	28	40	--	--	--	--	--	--	--	--	--	--	--	14UJ
Pentachlorophenol	SW8270D	360	690	360	690	--	--	--	--	--	--	--	--	--	140U
Phenol	SW8270D	420	1200	420	1200	--	--	--	--	--	--	--	--	--	270U
Semivolatile Organics (mg/kg-OC)															
1,2,4-Trichlorobenzene	SW8270D	--	--	0.81	1.8	--	--	--	--	--	--	--	--	--	0.45U
1,2-Dichlorobenzene	SW8270D	--	--	2.3	2.3	--	--	--	--	--	--	--	--	--	0.45U
1,4-Dichlorobenzene	SW8270D	--	--	3.1	9	--	--	--	--	--	--	--	--	--	**0.42J**
bis(2-Ethylhexyl)phthalate	SW8270D	--	--	47	78	--	--	--	--	--	--	--	--	--	**13J**
Butylbenzyl phthalate	SW8270D	--	--	4.9	64	--	--	--	--	--	--	--	--	--	
Diethyl phthalate	SW8270D	--	--	61	110	--	--	--	--	--	--	--	--	--	4.5U
Dimethyl phthalate	SW8270D	--	--	53	53	--	--	--	--	--	--	--	--	--	0.9U
Di-n-butyl phthalate	SW8270D	--	--	220	1,700	--	--	--	--	--	--	--	--	--	
Di-n-octyl phthalate	SW8270D	--	--	58	4500	--	--	--	--	--	--	--	--	--	4.5UJ
Hexachlorobenzene	SW8270D	--	--	0.38	2.3	--	--	--	--	--	--	--	--	--	0.5U
Hexachlorobutadiene	SW8270D	--	--	3.9	6.2	--	--	--	--	--	--	--	--	--	0.5U
n-Nitrosodiphenylamine	SW8270D	--	--	11	11	--	--	--	--	--	--	--	--	--	0.5U
Polycyclic Aromatic Hydrocarbons (µg/kg)															
1-Methylnaphthalene	SW8270DSIM	--	--	--	--	--	**176**	59U	123	55U	1560	592	196	--	**177**
2-Methylnaphthalene	SW8270DSIM	670	670	--	--	--	**226**	59U	**145**	55U	**2640**	**819**	**271**	--	**290**
Acenaphthene	SW8270DSIM	500	500	--	--	--	**619**	59U	**82**	55U	**3080**	**3560**	**271**	--	**213**
Acenaphthylene	SW8270DSIM	1300	1300	--	--	--	**112**	59U	58U	55U	**166**	**245**	57U	--	**193**
Anthracene	SW8270DSIM	960	960	--	--	--	**626**	59U	58U	55U	**1250**	**5750**	**344**	--	**747**

Table 2
Existing Sediment Data Near Piers 63 and 58

						Study	Shannon & Wilson Waterfront Geotechnical and Environmental Study					Shannon & Wilson		PSAMP and NOAA	
						Location ID	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7	UWI-EB-188	UWI-EB-188
						Sample Date	10/14/13	10/17/13	10/21/13	10/10/13	10/08/13	10/24/13	10/28/13	06/19/07	06/05/13
						Depth	0-16.2 feet	4-18.6 feet	0-14.2 feet	0.5-13.8 feet	4.5-20.2 feet	0-20 feet	0-13.5 feet	0-2 cm	0-3 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 58	Pier 58	Pier 58	Pier 58
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background									
Benzo(a)anthracene	SW8270DSIM	1300	1600	--	--	--	**726**	59U	58U	55U	**1260**	**3760**	**203**	--	**692**
Benzo(a)pyrene	SW8270DSIM	1600	1600	--	--	--	**1110**	59U	58U	55U	**1210**	**1560**	**89**	--	**1400**
Benzo(b,j,k)fluoranthenes	SW8270DSIM	3,200	3,600	--	--	--	**2030**	59U	58U	**59**	**2476**	**3076**	**210**	--	**2490**
Benzo(g,h,i)perylene	SW8270DSIM	670	720	--	--	--	**547**	59U	58U	55U	**470**	**775**	57U	--	**853**
Chrysene	SW8270DSIM	1,400	2800	--	--	--	**1100**	59U	58U	55U	**1620**	**4620**	**260**	--	**1310**
Dibenzo(a,h)anthracene	SW8270DSIM	230	230	--	--	--	**87**	59U	58U	55U	**94**	**129**	57U	--	**250**
Dibenzofuran	SW8270DSIM	540	540	--	--	--	**--**	**--**	**--**	**--**	--	--	--	--	**282**
Fluoranthene	SW8270DSIM	1700	2500	--	--	--	**1670**	**200**	58U	**99**	**5530**	**19900**	**809**	--	**1590**
Fluorene	SW8270DSIM	540	540	--	--	--	**563**	59U	58U	55U	**2750**	**2580**	**306**	--	**274**
Indeno(1,2,3-cd)pyrene	SW8270DSIM	600	690	--	--	--	**473**	59U	58U	55U	**432**	**629**	57U	--	**735**
Naphthalene	SW8270DSIM	2100	2100	--	--	--	**246**	59U	**941**	**62**	**5380**	**1670**	**535**	--	**850**
Phenanthrene	SW8270DSIM	1500	1,500	--	--	--	**1820**	**109**	58U	**69**	**8590**	**4780**	**669**	--	**1250**
Pyrene	SW8270DSIM	2600	3300	--	--	--	**3810**	**152**	58U	**202**	**4990**	**13200**	**736**	--	**2120**
Total cPAH TEQ (U = 0)	Calculated	--	--	--	--	380	**1450**	59U	58U	**40**	**1650**	**2370**	**140**	--	**1830**
Total HPAH (U = 0)	Calculated	12000	17000	--	--	--	**9523**	**352**	**58U**	**301**	**15606**	**44573**	**2097**	--	**11440**
Total LPAH (U = 0)	Calculated	5200	5200	--	--	--	**4212**	**109**	**1168**	**131**	**23856**	**19404**	**2396**	--	**3527**
Polycyclic Aromatic Hydrocarbons (mg/kg-OC)															
1-Methylnaphthalene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--	--	**5.7**
2-Methylnaphthalene	SW8270DSIM	--	--	38	64	--	--	--	--	--	--	--	--	--	**9.3**
Acenaphthene	SW8270DSIM	--	--	16	57	--	--	--	--	--	--	--	--	--	**6.8**
Acenaphthylene	SW8270DSIM	--	--	66	66	--	--	--	--	--	--	--	--	--	**6.2**
Anthracene	SW8270DSIM	--	--	220	1200	--	--	--	--	--	--	--	--	--	**24**
Benzo(a)anthracene	SW8270DSIM	--	--	110	270	--	--	--	--	--	--	--	--	--	**22**
Benzo(a)pyrene	SW8270DSIM	--	--	99	210	--	--	--	--	--	--	--	--	--	**45**
Benzo(b)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--	--	**38**
Benzo(k)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--	--	**42**
Benzo(j,k)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b,j,k)fluoranthenes	SW8270DSIM	--	--	230	450	--	--	--	--	--	--	--	--	--	**80**
Benzo(g,h,i)perylene	SW8270DSIM	--	--	31	78	--	--	--	--	--	--	--	--	--	**27**
Chrysene	SW8270DSIM	--	--	110	460	--	--	--	--	--	--	--	--	--	**42**
Dibenzo(a,h)anthracene	SW8270DSIM	--	--	12	33	--	--	--	--	--	--	--	--	--	**8**
Dibenzofuran	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--	--	**9**
Fluoranthene	SW8270DSIM	--	--	160	1200	--	--	--	--	--	--	--	--	--	**21**
Fluorene	SW8270DSIM	--	--	23	79	--	--	--	--	--	--	--	--	--	**8.8**
Indeno(1,2,3-c,d)pyrene	SW8270DSIM	--	--	34	88	--	--	--	--	--	--	--	--	--	**23**
Naphthalene	SW8270DSIM	--	--	99	170	--	--	--	--	--	--	--	--	--	**27**
Phenanthrene	SW8270DSIM	--	--	100	480	--	--	--	--	--	--	--	--	--	**40**
Pyrene	SW8270DSIM	--	--	1000	1400	--	--	--	--	--	--	--	--	--	**68**
Total HPAH (DMMP) (U = 0)	Calculated	--	--	960	5300	--	--	--	--	--	--	--	--	--	**365**
Total LPAH (DMMP) (U = 0)	Calculated	--	--	370	780	--	--	--	--	--	--	--	--	--	**113**
Pesticides (µg/kg)															
4,4'-DDD	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**5.7**
4,4'-DDE	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**1.5**
4,4'-DDT	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**18**
Aldrin	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.51**
cis-Chlordane	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**1**

Table 2
Existing Sediment Data Near Piers 63 and 58

						Study	Shannon & Wilson Waterfront Geotechnical and Environmental Study					Shannon & Wilson		PSAMP and NOAA	
						Location ID	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7	UWI-EB-188	UWI-EB-188
						Sample Date	10/14/13	10/17/13	10/21/13	10/10/13	10/08/13	10/24/13	10/28/13	06/19/07	06/05/13
						Depth	0-16.2 feet	4-18.6 feet	0-14.2 feet	0.5-13.8 feet	4.5-20.2 feet	0-20 feet	0-13.5 feet	0-2 cm	0-3 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 58	Pier 58	Pier 58	Pier 58
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background									
trans-Chlordane	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**1.2**
Dieldrin	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**1**
Heptachlor	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**1**
cis-Nonachlor	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Nonachlor	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Oxychlordane	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**2**
Sum 4,4 DDT, DDE, DDD (U = 0)	Calculated	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sum of cis-Chlordane and trans-Chlordane (U = 0)	Calculated	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)															
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**0.416**	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**3.09**	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**4.23**	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**19.5**	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**7.49**	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**630**	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**6510**	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**2.22**	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**2.09**	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**2.25**	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**13.3**	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**3.67**	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**2.02**	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**5.13**	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**129**	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**8.32**	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**434**	--
Total Tetrachlorodibenzofuran (TCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	Calculated	--	--	--	--	--	--	--	--	--	--	--	--	**20**	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	Calculated	--	--	--	--	14	--	--	--	--	--	--	--	**20**	--
PCB Aroclors (µg/kg)															
Aroclor 1016	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	5.1U
Aroclor 1221	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	10U
Aroclor 1232	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	10U
Aroclor 1242	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	**12J**
Aroclor 1248	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	30UJ
Aroclor 1254	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	**71J**
Aroclor 1260	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	**66J**
Aroclor 1262	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	57UJ
Aroclor 1268	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	5.1U
Total PCBs (U = 0)	Calculated	130	1,000	--	--	95	0.12U	--	--	--	0.09U	0.15U	--	--	**149**
PCB Aroclors (mg/kg-OC)															
Aroclor 1016	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.16U
Aroclor 1221	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.32U
Aroclor 1232	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.32U
Aroclor 1242	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.38J
Aroclor 1248	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.96UJ
Aroclor 1254	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	**2.3J**
Aroclor 1260	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	**2.1J**
Aroclor 1262	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	1.8UJ
Aroclor 1268	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.16U
Total PCBs (U = 0)	Calculated	--	--	12	65	--	--	--	--	--	--	--	--	--	**4.76J**

Table 3
Existing Tissue Data Near Pier 58

		Study	Elliott Bay, Seattle Aqrm Pier 59	
		Location ID	EB_P59	EB_P59
		Sample Date	01/09/13	02/27/18
		Depth	--	--
		Matrix	Tissue	Tissue
		Location	Pier 58	Pier 58
		Suquamish Tribal Adult - Human Health Risk-Based Tissue Concentrations		
Metals (mg/kg)				
Arsenic	SW6020A	0.00012	**0.80**	--
Cadmium	SW6020A	0.16	**0.30**	--
Copper	SW6020A	--	**0.80**	--
Lead	SW6020A	--	**0.06**	--
Mercury	SW7471B	--	**0.006**	--
Zinc	SW6020A	--	**12.1**	--
Semivolatile Organics (µg/kg)				
Hexachlorobenzene	SW8270D	--	0.35U	0.14U
Polycyclic Aromatic Hydrocarbons (µg/kg)				
Acenaphthene	SW8270DSIM	--	**2.7**	**17**
Acenaphthylene	SW8270DSIM	--	0.34U	**0.99**
Anthracene	SW8270DSIM	--	**13**	**37**
Benzo(a)anthracene	SW8270DSIM	--	**23J**	**160**
Benzo(a)pyrene	SW8270DSIM	--	**9.8**	**50**
Benzo(b,j,k)fluoranthenes	SW8270DSIM	--	**39**	**198**
Benzo(g,h,i)perylene	SW8270DSIM	--	**4**	**8.2**
Chrysene	SW8270DSIM	--	**24J**	**150**
Dibenzo(a,h)anthracene	SW8270DSIM	--	**1.6**	**4.9**
Fluoranthene	SW8270DSIM	--	**70J**	**570**
Fluorene	SW8270DSIM	--	**4.3**	**30**
Indeno(1,2,3-cd)pyrene	SW8270DSIM	--	**4.6**	**12**
Naphthalene	SW8270DSIM	--	**1.4J**	**3.2**
Phenanthrene	SW8270DSIM	--	**29J**	**270**
Pyrene	SW8270DSIM	--	**38J**	**410**
Total cPAH TEQ (U = 0)	Calculated	0.024	**17J**	**89**
Total HPAH (U = 0)	Calculated	--	**144J**	**1563**
Total LPAH (U = 0)	Calculated	--	**50J**	**358**
Pesticides (µg/kg)				
4,4'-DDD	SW8081B	--	0.34U	0.14U
4,4'-DDE	SW8081B	--	**0.53**	**0.93**
4,4'-DDT	SW8081B	--	0.35U	0.14U
Aldrin	SW8081B	--	0.35U	0.14U
cis-Chlordane	SW8081B	--	0.35U	0.14U
trans-Chlordane	SW8081B	--	0.34U	0.14U
Dieldrin	SW8081B	--	0.34U	**0.17**
Heptachlor	SW8081B	--	0.35U	0.44U
cis-Nonachlor	SW8081B	--	0.34U	0.14U
trans-Nonachlor	SW8081B	--	0.35U	0.14U
Oxychlordane	SW8081B	--	0.35U	0.14U
Sum 4,4 DDT, DDE, DDD (U = 0)	Calculated	0.52	**0.53**	**1.21**
PCBs (µg/kg)				
Total PCB Congeners (U = 0)	Calculated	--	**7.05**	**20.41**

Table 3
Existing Tissue Data Near Pier 58

Notes:
Bold = Detected result
Detected concentration exceeds at least one screening level
Detected concentration exceeds two or more screening levels
-- Data are not available.
Analytical method versions may vary slightly between studies.
Totals are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum.
Total LPAH consists of the sum of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.
Total HPAH consists of the sum of fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(b,j,k)fluoranthenes, benzo(a)pyrene, indeno(1,2,3,-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.
Total cPAH TEQ (7 minimum CAEPA 2005) calculation includes benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene.
Total DDT consists of the sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT.
µg/kg: microgram per kilogram
HPAH: high-molecular-weight polycyclic aromatic hydrocarbon
J: Estimated value
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
mg/kg: milligram per kilogram
PCB: polychlorinated biphenyl
U: compound analyzed, but not detected above detection limit
UJ: compound analyzed, but not detected above estimated detection limit

Appendix A
Soil Boring Log

Total Depth:	*26 ft.*	Northing:	*~ 225,806 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -39 ft.*	Easting:	*~ 1,267,339 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very loose, dark gray to gray, slightly silty, slightly fine gravelly SAND; wet; scattered wood, abundant fine organics, angular gravel, strong organic odor; (He/Hf) SW-SM.

7.5

Very loose, gray, silty, fine to medium SAND; wet; trace of wood and shell fragments, sulfur odor; (Hb/Hf) SM.

9.0

Loose to medium dense, gray, trace of silt to slightly silty, fine to medium SAND; wet; trace of wood and shell fragments, slight sulfur odor; (Hb) SP/SP-SM.

13.5

Loose to medium dense, gray, slightly silty, fine to medium SAND; wet; trace of red andesite; (Hb) SP-SM.

18.0

Medium dense to dense, gray, sandy GRAVEL, trace of silt; wet; subrounded to angular gravel; (Hb) GP.

- Samples S-8 and S-9 were collected in WS-1A. Blow counts may be artificially high due to the presence of gravel.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

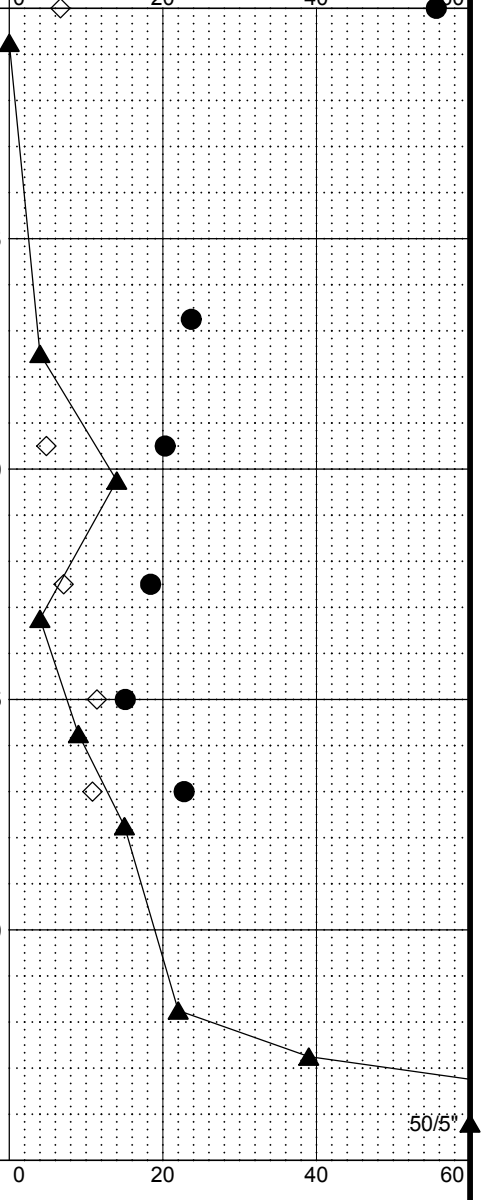
PID, ppm: 0 | 0 | 0 | 0 | 0

Samples: 1, 2, 3, 4, 5, 6, 7, 8, 9*

Ground Water: 0/18" (WOR)

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-1/1A

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-1
Sheet 1 of 2

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*26 ft.*	Northing:	*~ 225,806 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -39 ft.*	Easting:	*~ 1,267,339 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60

- Cobbles below 25 feet based on drill action.

26.0

BOTTOM OF BORING
COMPLETED 10/15/2013

NOTE: On 10/14/2013 boring WS-1 was drilled with mud rotary methods and 5" casing, reaching refusal in gravel at 25 feet. All cuttings and drill mud were lost into this gravel layer. On 10/15/2013, the boring was moved about 5 feet west to WS-1A. Boring WS-1A was drilled with mud rotary methods using HWT casing advancer and 4.5" casing, reaching refusal in gravel at 26 feet. WS-1 and WS-1A were backfilled with bentonite grout to the mudline.

30
35
40
45

0 20 40 60

◇ % Fines (<0.075mm)
● % Water Content

LEGEND

* Sample Not Recovered
E Environmental Sample Obtained
2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-1/1A

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-1
Sheet 2 of 2

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

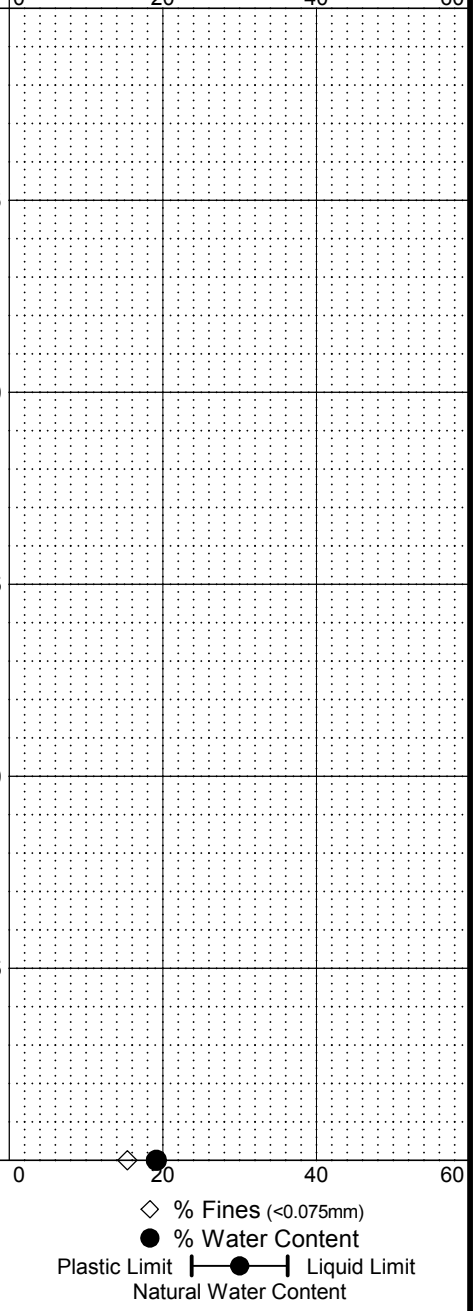
Total Depth:	*70.4 ft.*	Northing:	*~ 225,806 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -41 ft.*	Easting:	*~ 1,267,312 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION	Depth, ft.	Symbol	Samples	Ground Water Depth, ft.
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.				
See log of WS-1/WS-1A, located approximately 26 and 21 feet east, respectively, for soil descriptions.				
- No sampling. Gravelly below 17 feet based on drill action	17.0			
- Cobbles and gravel below 25 feet based on drill action.				
Dense to very dense, gray-green, silty, fine to medium SAND; wet; interbedded with sandy	28.0			

CONTINUED NEXT SHEET

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-1B

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-2
Sheet 1 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 *Log: MJW Rev: WTL/JKF Typ: PVH*

Total Depth:	*70.4 ft.*	Northing:	*~ 225,806 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -41 ft.*	Easting:	*~ 1,267,312 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

silt; (Qpgo) SM.

- Gravelly from about 38 to 40 feet based on drill action.
- Fine to medium sandy silt layer at 40 feet.
- Harder drilling below 47 feet.

50.3

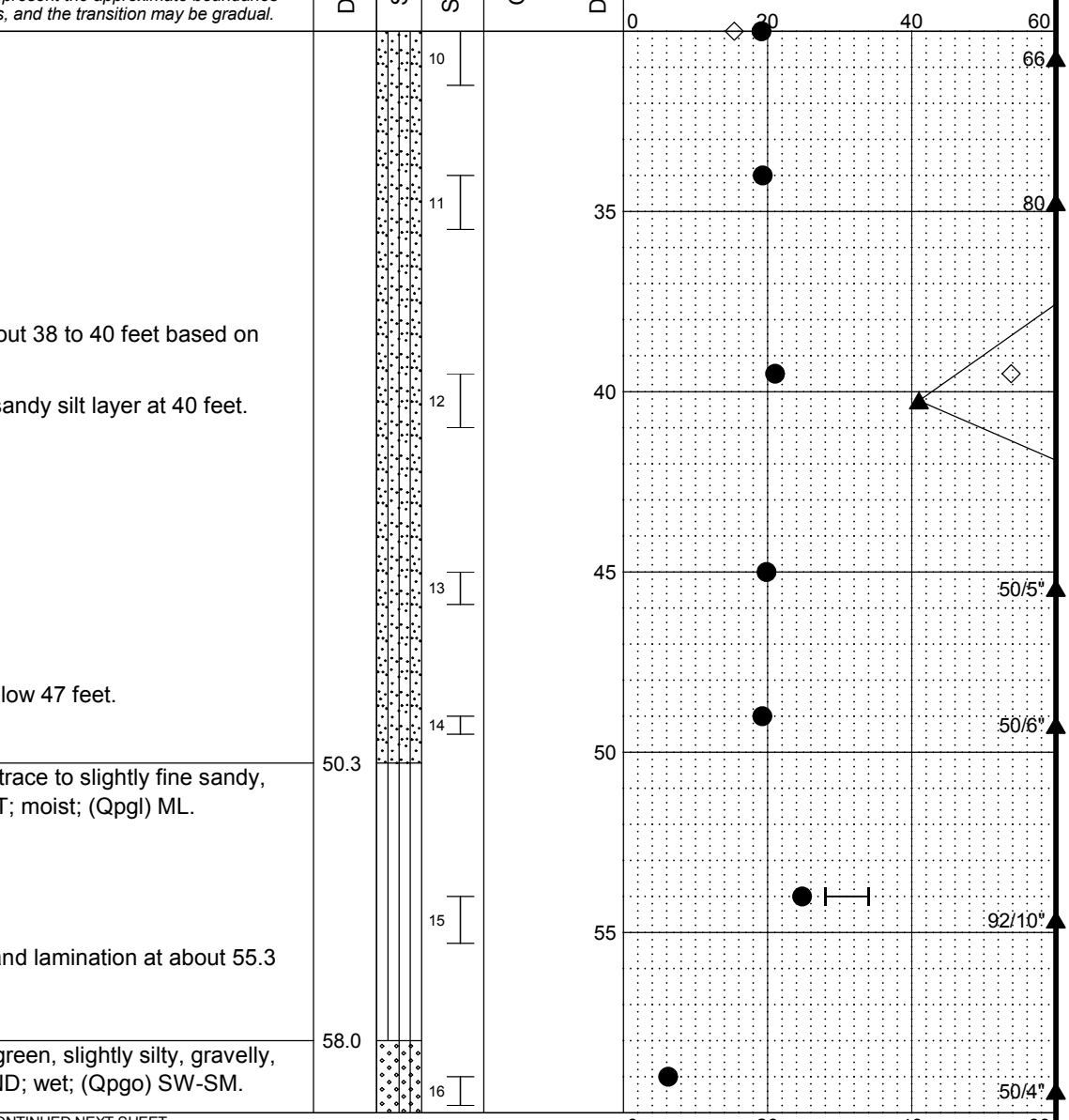
Hard, gray-green, trace to slightly fine sandy, slightly clayey SILT; moist; (Qpgl) ML.

- Fine to coarse sand lamination at about 55.3 feet.

58.0

Very dense, gray-green, slightly silty, gravelly, fine to coarse SAND; wet; (Qpgo) SW-SM.

CONTINUED NEXT SHEET



LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-1B

March 2018 | 21-1-21504-432

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FIG. A.1-2
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*70.4 ft.*	Northing:	*~ 225,806 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -41 ft.*	Easting:	*~ 1,267,312 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

Depth, ft.	Description
65.3	Very dense, blue-gray to gray-green, slightly fine gravelly, slightly silty SAND; wet; trace of red andesite; (Qpgo) SP-SM.
70.4	BOTTOM OF BORING COMPLETED 10/15/2013

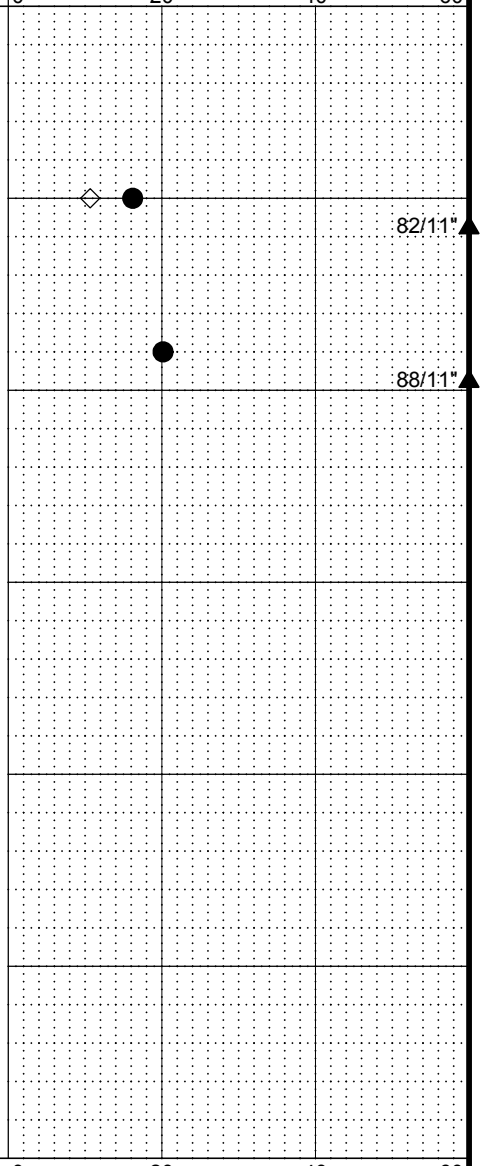
NOTE: On 10/16/2013, boring WS-1B was drilled about 21 feet west of WS-1A and was completed using mud-filled 4-1/4" ID hollow-stem auger. Auger was filled with bentonite slurry during drilling operations. WS-1B was backfilled with bentonite grout to the mudline.

17

18

82/11"

88/11"



LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-1B

March 2018 | 21-1-21504-432

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FIG. A.1-2
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*80.5 ft.*	Northing:	*~ 225,733 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -63 ft.*	Easting:	*~ 1,267,221 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

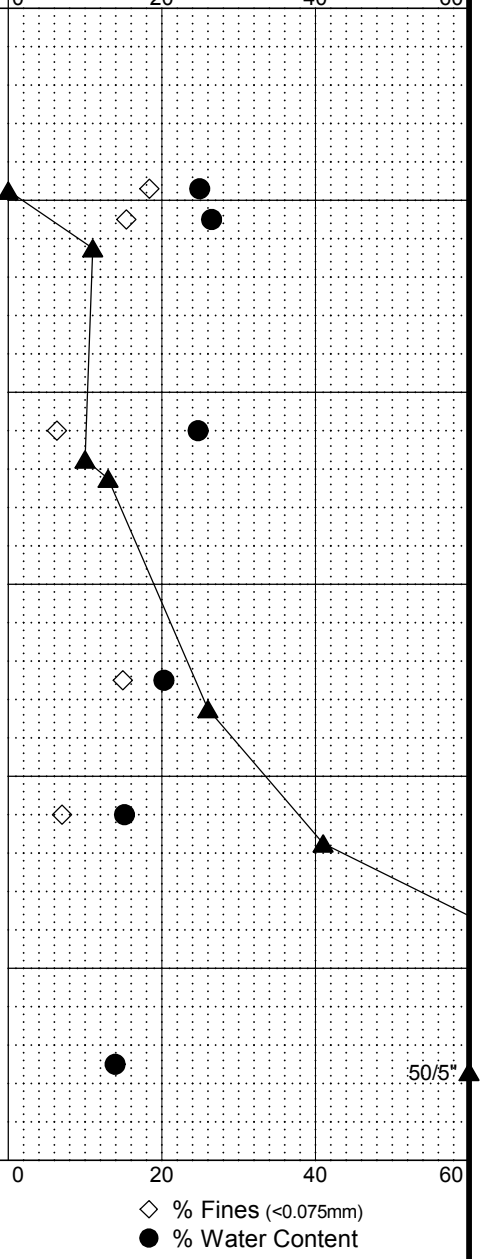
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft.	Soil Description
	Very loose, brown, slightly clayey, slightly fine sandy, organic SILT; wet; (He/Hf) OL/OH.
4.7	Medium dense, gray, silty, fine to medium SAND; wet; scattered wood and shell fragments, faint wood preservative odor; (Hb/Hf) SM.
10.0	Loose to medium dense, olive green, trace to slightly silty, fine to medium SAND; wet; trace of wood fragments; (Hb) SP-SM/SP. - Sample S-4 was driven partially within zone disturbed by sample S-3.
17.0	Medium dense, dark gray, silty, fine to medium SAND; wet; trace of red andesite grains; (Hb) SM.
21.0	Dense, gray, slightly silty, slightly fine gravelly SAND; wet; trace of shell fragments and organics; (Hb) SW-SM.
23.0	Medium dense to very dense, gray, slightly silty, sandy GRAVEL; wet; interbedded with gravelly, fine to medium sand, trace of shell fragments, subangular to angular gravel; (Hb) GP. - Blow counts may be artificially high due to the presence of gravel.

Sample	PID, ppm	Ground Water Depth, ft.
1	0	
2	0	
3	0	
4	0	
5		
6		
7		

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-2

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-3
Sheet 1 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*80.5 ft.*	Northing:	*~ 225,733 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -63 ft.*	Easting:	*~ 1,267,221 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very dense, gray, slightly silty, sandy GRAVEL; wet; layer description is based on poor sample recovery; (Qpgo/Qpgd) GP-GM.

30.0

Very dense, gray, slightly silty to silty, fine to medium SAND, trace of gravel; wet; (Qpgo) SP-SM/SM.

37.0

39.0

Very dense, gray-green, slightly gravelly, silty SAND to slightly gravelly, slightly silty SAND; wet; (Qpgo/Qpgd) SM/SP-SM.

- Small pocket of light green, clayey silt at about 42.5 feet.

- 2-inch layer of silty, fine sand, trace of gravel, diamict texture, at about 48 feet.

52.0

Very dense, gray-green, slightly silty, fine to medium SAND; wet; (Qpgo) SP-SM

- 1/4-inch seam of sandy silt at about 53 feet.

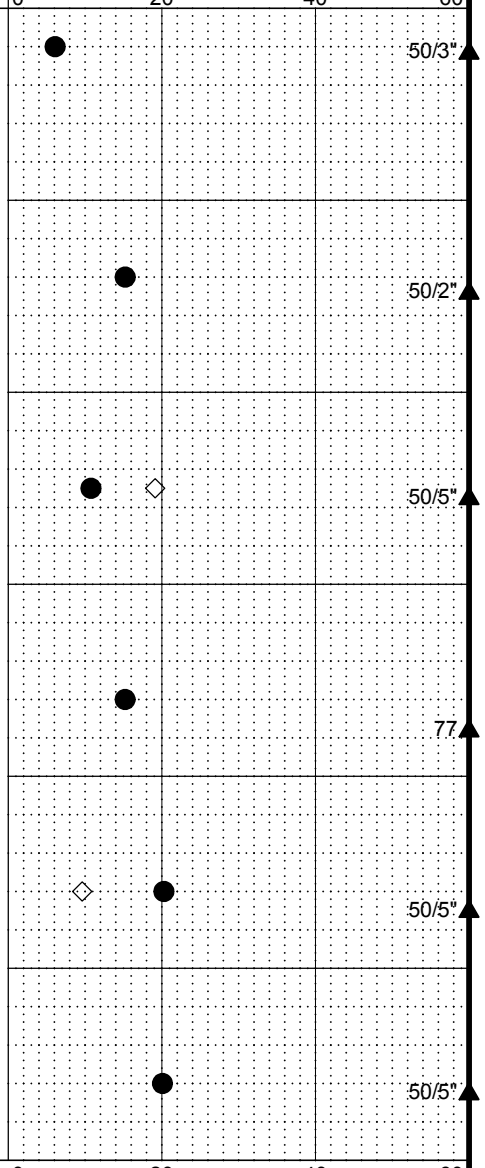
- 2-inch dark green layer with trace of gravel at about 58 feet.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

Samples: 8, 9, 10, 11, 12, 13

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-2

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-3
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*80.5 ft.*	Northing:	*~ 225,733 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -63 ft.*	Easting:	*~ 1,267,221 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

- Blue-gray below about 60 feet.

- Layers of silty sand at about 66.5 feet.

BOTTOM OF BORING
COMPLETED 10/18/2013

NOTE: On 10/17/2013, boring was drilled with mud rotary methods and 5" casing, reaching refusal in gravel at 23 feet. All shallow cuttings and drill mud were lost into this gravel layer. On 10/18/2013, boring was redrilled at the same location with a mud-filled 4-1/4" ID hollow stem auger to 80.5 feet. Boring was backfilled with bentonite grout to the mudline.

Depth, ft.: 80.5

Symbol

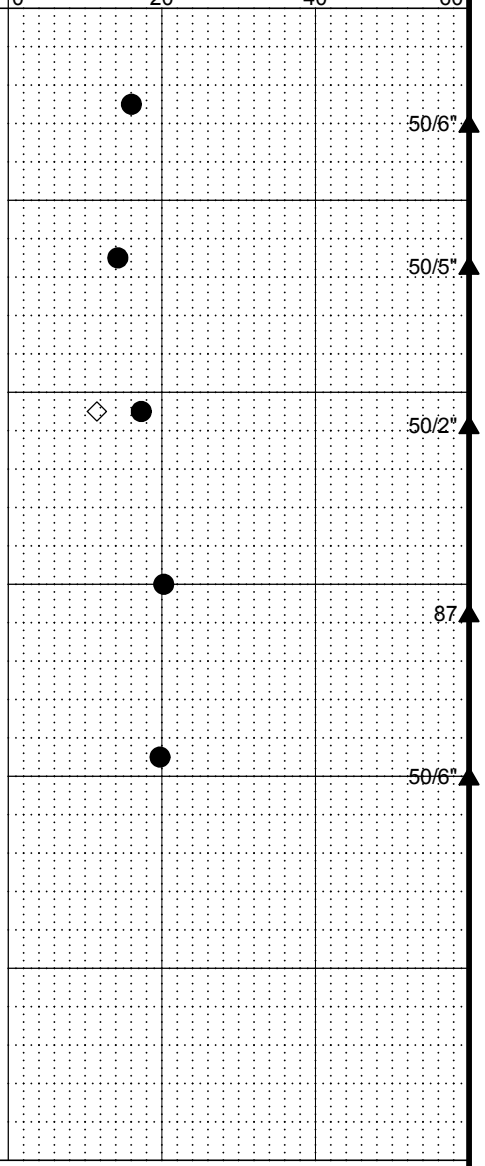
PID, ppm

Samples: 14, 15, 16, 17, 18

Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-2

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-3
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	79 ft.	Northing:	~ 225,611 ft.	Drilling Method:	HSA and Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ -53 ft.	Easting:	~ 1,267,400 ft.	Drilling Company:	Holt Services	Rod Diam.:	2-5/8" NWJ
Vert. Datum:	NAVD 88	Station:	~	Drill Rig Equipment:	CME 85 Truck	Hammer Type:	Automatic
Horiz. Datum:	NAD 83/91	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very soft, black grading to gray, fine sandy, silty CLAY; wet; scattered shells, trace of wood, strong wood preservative odor; (He/Hf) CL.

4.0

Dense, gray, slightly gravelly, silty, fine to medium SAND; wet; scattered wood fragments, wood preservative odor; (Hb/Hf) SM.

7.0

Medium dense, dark gray, slightly silty SAND; wet; trace of shell and wood fragments, slight sulfur or wood preservative odor; (Hb) SW-SM.

12.0

Dense, olive-gray, slightly fine gravelly, slightly silty SAND; wet; scattered shell fragments; (Hb) SP-SM.

15.0

Dense, gray SAND, trace of silt and gravel; wet; abundant shell fragments, scattered wood fragments, gravel in sampler shoe; (Hb) SW.

17.0

Medium dense to dense, gray-brown to yellow-brown, silty, sandy GRAVEL; wet; rounded to subangular gravel; (Hb/Qvro) GM.

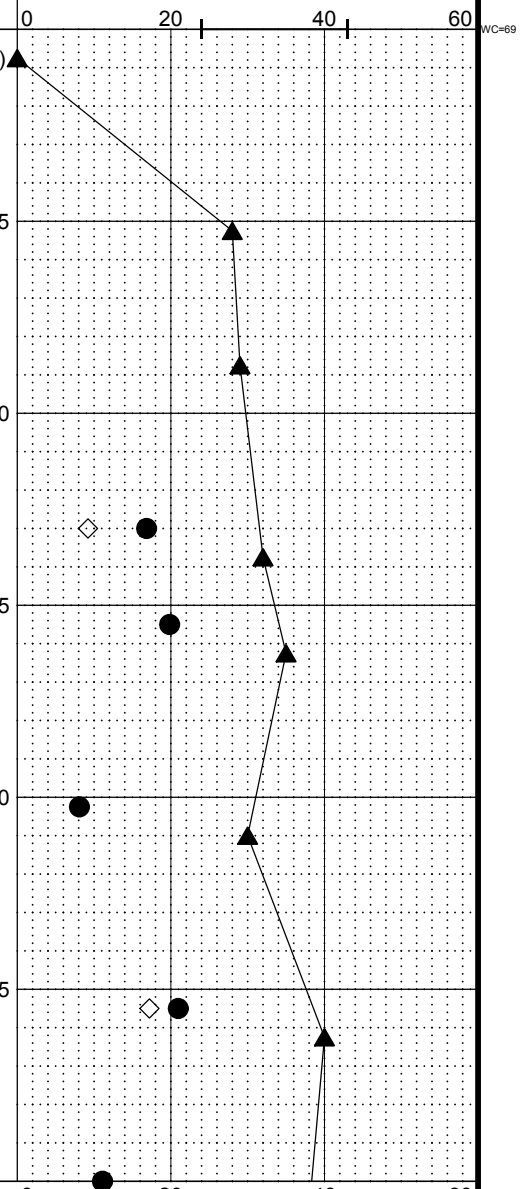
24.0

Dense, gray-brown, silty, fine to medium SAND; wet; micaceous; (Qvro) SM.

Depth, ft.	Symbol	PID, ppm	Samples	Ground Water Depth, ft.
0		0	1	0/18" (WOR)
4.0		0	2	
7.0		0	3	
12.0		0	4	
15.0			5	
17.0			6	
24.0			7	

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-3

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-4
Sheet 1 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	79 ft.	Northing:	~ 225,611 ft.	Drilling Method:	HSA and Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ -53 ft.	Easting:	~ 1,267,400 ft.	Drilling Company:	Holt Services	Rod Diam.:	2-5/8" NWJ
Vert. Datum:	NAVD 88	Station:	~	Drill Rig Equipment:	CME 85 Truck	Hammer Type:	Automatic
Horiz. Datum:	NAD 83/91	Offset:	~	Other Comments:			

SOIL DESCRIPTION

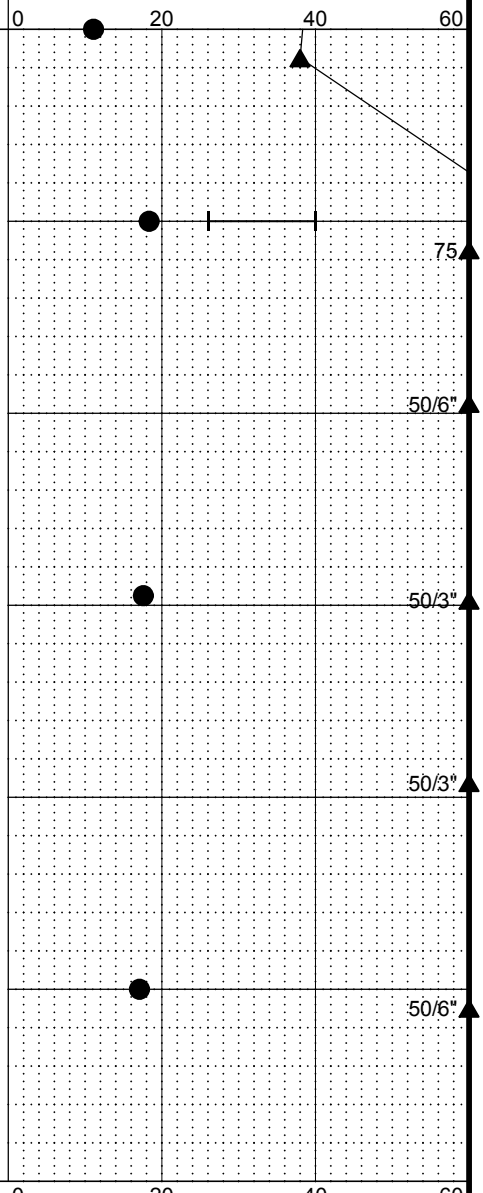
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft.	Soil Description
30.0	Dense, olive-green, silty, sandy, clayey GRAVEL; moist; diamict texture; (Qvri) GC.
33.0	Hard, light green, clayey SILT, trace of sand and gravel; moist; iron oxide staining; (Qpgl) ML.
38.0	Very dense, yellow-brown, slightly silty, sandy GRAVEL; wet; layer description is based on poor sample recovery; (Qpgo) GP-GM.
43.0	Hard, mottled olive-green and light green, slightly clayey SILT, trace of sand and gravel; moist to wet; weathered; (Qpgm) ML.
47.5	Very dense, blue-green, silty, clayey, sandy, fine GRAVEL; moist; diamict; (Qpgm) GC.
53.0	Very dense, blue-green, silty, fine to medium SAND, trace of gravel; wet; 2-inch layer of gravelly, sandy clay, diamict; (Qpgd) SM.
58.0	

Symbol | PID, ppm | Samples: 8, 9, 10, 11, 12, 13 | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-3

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-4
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	79 ft.	Northing:	~ 225,611 ft.	Drilling Method:	HSA and Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ -53 ft.	Easting:	~ 1,267,400 ft.	Drilling Company:	Holt Services	Rod Diam.:	2-5/8" NWJ
Vert. Datum:	NAVD 88	Station:	~	Drill Rig Equipment:	CME 85 Truck	Hammer Type:	Automatic
Horiz. Datum:	NAD 83/91	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

Very dense, gray-green, slightly silty SAND, trace of gravel; wet; micaceous; (Qpgo) SP-SM.

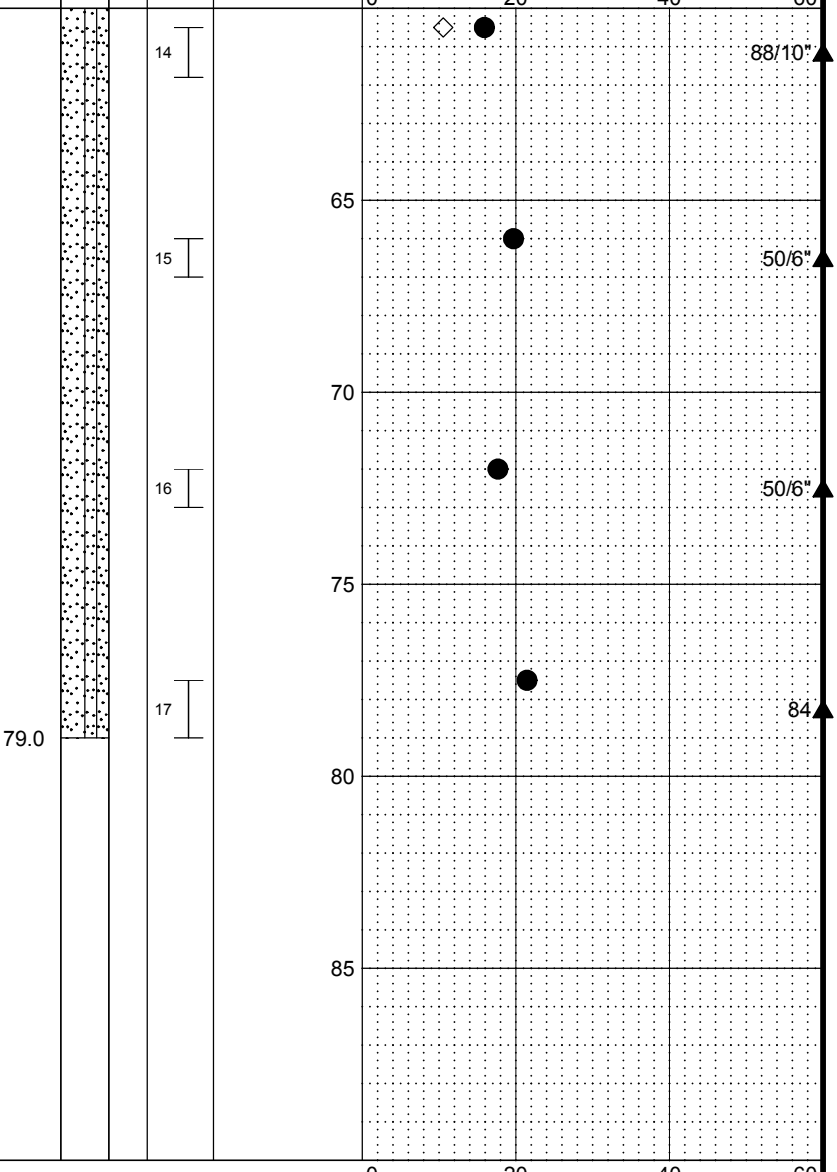
- Small trace of red andesite at about 72 feet.

- 1/2-inch layer of silty, fine sand at about 78 feet.

79.0

BOTTOM OF BORING
COMPLETED 10/23/2013

NOTE: Boring was drilled with mud rotary methods and 5" casing, encountering refusal in gravel at 47 feet on 10/22/2013. On 10/23/2013, boring was redrilled at the same location with mud-filled 4-1/4" ID hollow stem auger to the bottom of boring. Boring was backfilled with bentonite grout to the mudline.



LEGEND

* Sample Not Recovered
E Environmental Sample Obtained
2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-3

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-4
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*47.5 ft.*	Northing:	*~ 225,560 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -44 ft.*	Easting:	*~ 1,267,519 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very soft, black to gray, slightly fine sandy, silty CLAY; wet; scattered shell and wood fragments, sulfur odor; (He/Hf) CH.

3.0

Very loose to loose, gray, slightly silty SAND; wet; trace to abundant shell fragments; (Hb/Hf) SP-SM.

9.0

Medium dense, gray, slightly silty SAND; wet; trace of shell fragments; (Hb) SP-SM.

12.0

Medium dense to dense, gray, slightly silty, sandy GRAVEL to slightly silty, slightly gravelly SAND; wet; (Hb) GP-GM/SP-SM.
- Blow counts may be artificially high due to the presence of gravel.

16.5

Dense, gray, slightly silty to silty, gravelly, fine to medium SAND; wet; (Qvro) SM/SP-SM.

28.0

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water Depth, ft.

PID, ppm: 0, 0, 0, 0

Samples: 1, 2, 3, 4, 5, 6, 7, 8, 9

Ground Water Depth, ft.: 0/18" (WOR)

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60

WC=72

5 10 15 20 25

50/6"

0 20 40 60

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

⊥ 2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-4

March 2018 21-1-21504-432

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FIG. A.1-5
Sheet 1 of 2

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*47.5 ft.*	Northing:	*~ 225,560 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -44 ft.*	Easting:	*~ 1,267,519 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

Very dense, blue-gray, silty, sandy GRAVEL; wet; rounded to angular gravel, possible slough; (Qvri/Qvat) GM.

33.0

Very dense, gray, slightly sandy GRAVEL, trace of silt; wet; possible slough; (Qvri?) GP.

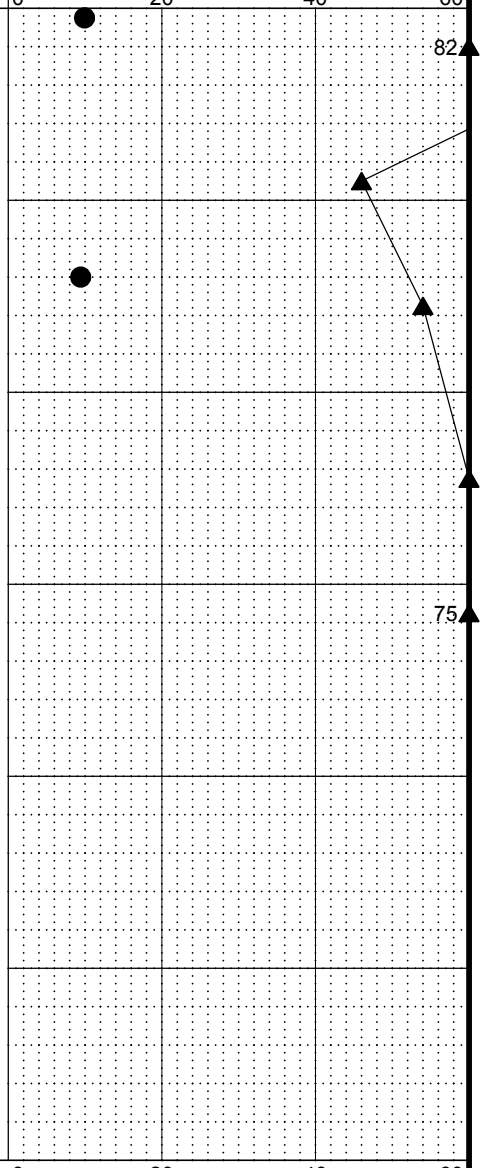
36.0

Very dense, gray, silty, clayey, sandy GRAVEL to sandy GRAVEL, trace of silt; wet; diamict texture to about 40 feet, fractured gravel and possible slough mixed with samples; (Qpgm?) GC/GP.

47.5

BOTTOM OF BORING
COMPLETED 10/11/2013

NOTE: Boring was drilled with mud rotary methods and 5" casing, reaching refusal in caving gravel at 47.5 feet on 10/11/2013; unable to drive casing through gravel. All cuttings and drill mud were lost into this gravel layer. Boring was backfilled with bentonite grout to the mudline.



LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-4

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FIG. A.1-5
Sheet 2 of 2

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 *Log: MJW Rev: WTL/JKF Typ: PVH*

Total Depth:	*71.8 ft.*	Northing:	*~ 225,558 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -24 ft.*	Easting:	*~ 1,267,703 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

No sampling.

4.0

Very loose, black, sandy SILT, trace of gravel; wet; scattered shell and abundant wood fragments, slight sheen, wood preservative odor; (He/Hf) ML.

12.0

Medium dense to very dense, gray to gray-brown, sandy GRAVEL, trace of silt; wet; trace of shell and wood fragments, wood preservative odor; (Hb/Hf) GP.
- Blow counts may be artificially high due to the presence of gravel.

20.0

Very dense, yellow-brown, slightly clayey, fine gravelly, fine sandy SILT; wet; weathered; (Qvrl/Qvro) ML.

21.0

Medium dense to dense, gray, sandy GRAVEL, trace of silt; wet; rounded to subangular gravel, possible slough; (Qvro) GP.

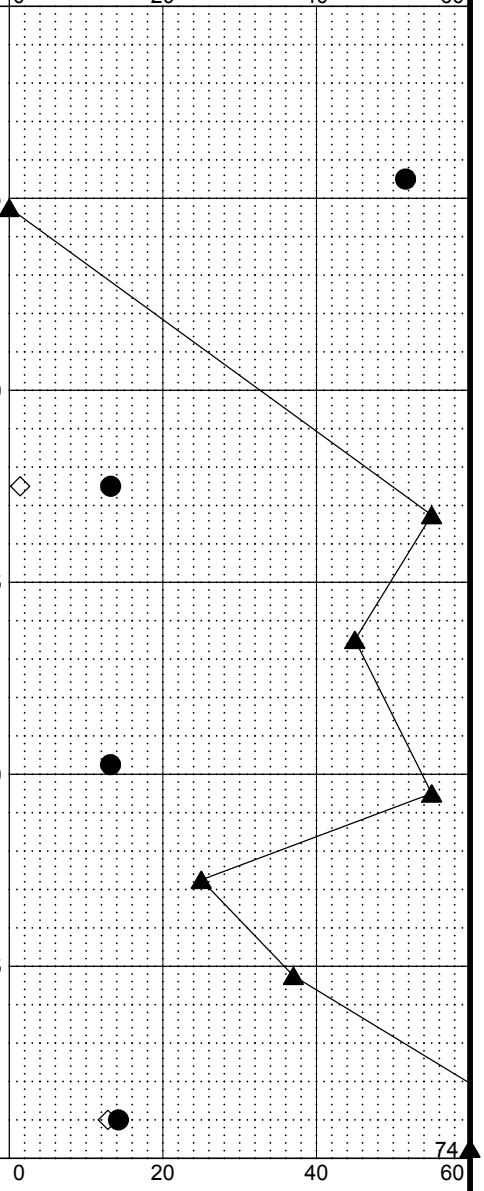
29.0

CONTINUED NEXT SHEET

Depth, ft.	Symbol	PID, ppm	Samples	Ground Water Depth, ft.
4.0		0	1	0/18" (WOH)
12.0		0	2	
		0	3	
20.0		0	4	
21.0			5	
			6	
29.0			7	

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-5

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-6
Sheet 1 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*71.8 ft.*	Northing:	*~ 225,558 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -24 ft.*	Easting:	*~ 1,267,703 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very dense, yellow-brown, silty, fine gravelly SAND; wet; weathered; (Qpgo) SM.

33.0

Very dense, yellow-brown, silty, fine SAND; wet; micaceous, weathered, iron oxide-stained; (Qpgo/Qpgl) SM.

37.0

Very dense, gray-brown to greenish brown, silty, fine to medium SAND; wet; micaceous; (Qpgo) SM.
- Sample S-10 was driven within zone disturbed by sample S-9.

43.0

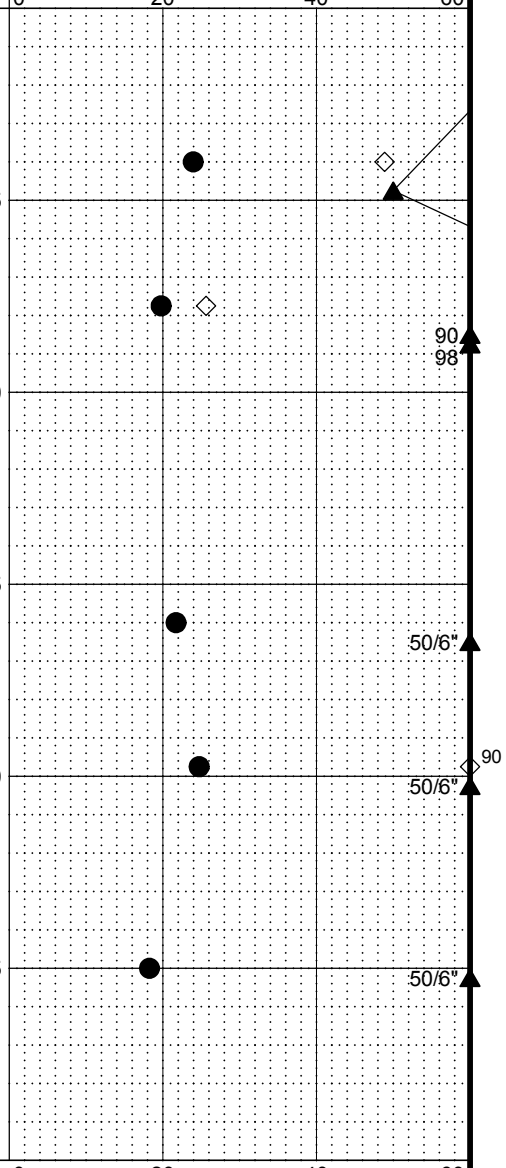
Very dense, green-gray, slightly fine sandy to fine sandy SILT, trace of clay; wet; silty, fine sand layers, yellow-brown above about 50 feet; (Qpgl) ML.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

Samples: 8, 9, 10, 11, 12, 13

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



◇ % Fines (<0.075mm)

● % Water Content

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-5

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-6
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*71.8 ft.*	Northing:	*~ 225,558 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -24 ft.*	Easting:	*~ 1,267,703 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	*~*	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	*~*	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60

60.0 — Very dense, green-gray, slightly silty to silty, gravelly SAND; wet; (Qpgo) SW-SM/SM.

14 — 50/5"

15 — 84

16 — 87

65 70 75 80 85

71.8 — BOTTOM OF BORING COMPLETED 10/9/2013

NOTES:

(a) Boring was drilled with mud rotary methods and 5" casing. Shallow cuttings and drill mud were lost into gravel layers from about 18 to 19 feet and below 21 feet.

(b) Boring was backfilled with bentonite grout to the mudline.

0 20 40 60

◇ % Fines (<0.075mm)

● % Water Content

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

⌶ 2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-5

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-6
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 *Log: MJW Rev: WTL/JKF Typ: PVH*

Total Depth:	*79.9 ft.*	Northing:	*~ 224,985 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -26 ft.*	Easting:	*~ 1,268,265 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very soft, black to gray, trace to slightly sandy, slightly clayey, organic SILT; wet; trace to scattered shell fragments, trace to abundant wood fragments, strong sulfur odor; (He/Hf) OL.

10.0

Loose to medium dense, mottled brown and black, silty, fine to medium SAND, trace of fine gravel, and WOOD; wet; strong wood preservative odor (drilled through a log); (Hb/Hf) SM.
- Blow counts may be artificially high due to the presence of wood.

12.0

Medium dense to very dense, gray, trace of fine gravel to fine gravelly, slightly silty SAND; wet; abundant shells, scattered wood fragments, and strong wood preservative odor above 15 feet, trace of shell fragments and faint wood preservative odor below 15 feet; (Hb) SP-SM/SW-SM.
- Wood fibers in cuttings at about 24 feet.
- Lost drilling fluid circulation at about 20 feet.
- Blow counts may be artificially high due to the presence of gravel and wood.

25.0

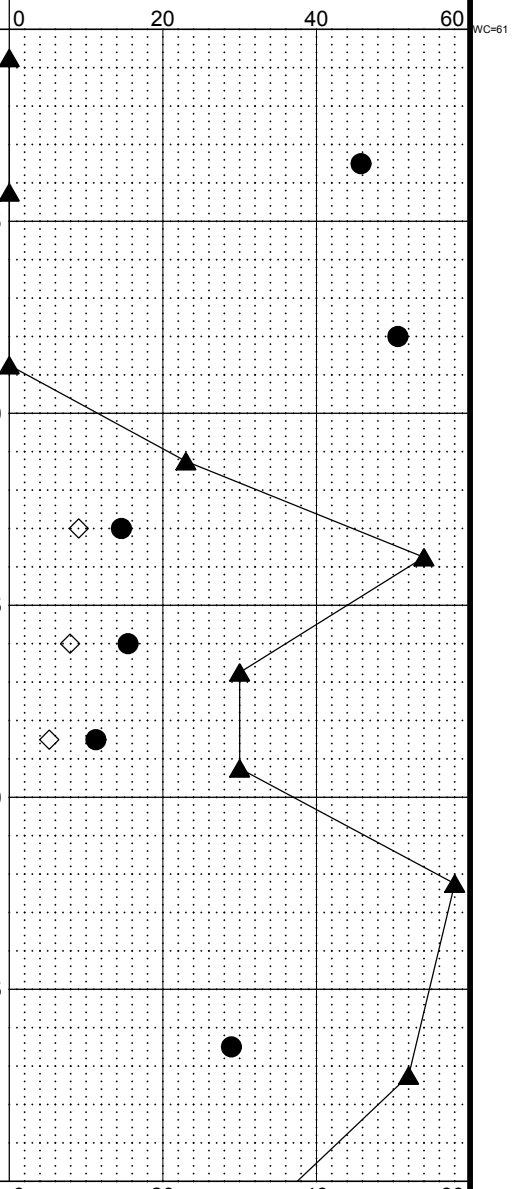
Hard, gray, slightly gravelly, slightly sandy, silty CLAY; moist; weathered clasts, seams of fine to medium sand and gravel; (Hls?/Qpgl?) CH.

CONTINUED NEXT SHEET

Depth, ft.	Symbol	PID, ppm	Samples	Ground Water Depth, ft.
		0	1	0/18" (WOR)
		0	2	0/18" (WOR)
		0	3	0/18" (WOR)
		0	4	
		0	5	
		0	6	
		0	7	
			8 *	
			9	

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

⊥ 2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-6

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-7
Sheet 1 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	79.9 ft.	Northing:	~ 224,985 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ -26 ft.	Easting:	~ 1,268,265 ft.	Drilling Company:	Holt Services	Rod Diam.:	2-5/8" NWJ
Vert. Datum:	NAVD 88	Station:	~	Drill Rig Equipment:	CME 85 Truck	Hammer Type:	Automatic
Horiz. Datum:	NAD 83/91	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

- Inconclusive evidence for Hls.
- 5-inch diameter casing was advanced to 27.0 feet prior to collecting sample S-9.
- Sample S-9 was disturbed during sampling by gravel in the split spoon shoe.

32.0

Very stiff, gray, slightly gravelly, sandy, silty CLAY; wet; trace of wood fibers and shell fragments, distorted texture - possibly due to sampling process; (Hls?/Qpgl?) CH.
- Inconclusive evidence for Hls.

36.0

Hard, gray, gravelly, sandy, silty CLAY; moist; diamict, weathered clasts; (Qpgm) CH.

44.0

Very dense, gray, clayey, sandy GRAVEL and slightly silty, sandy GRAVEL; moist; diamict, weathered clasts; (Qpgm) GC/GP-GM.

- Interbedded below 49.3 feet with fine to medium sand, trace of silt and fine gravel; SP.

52.5

Very dense, gray, clayey, silty, gravelly SAND; wet; (Qpgm) SC.
- Layer description is based on poor sample recovery.

59.0

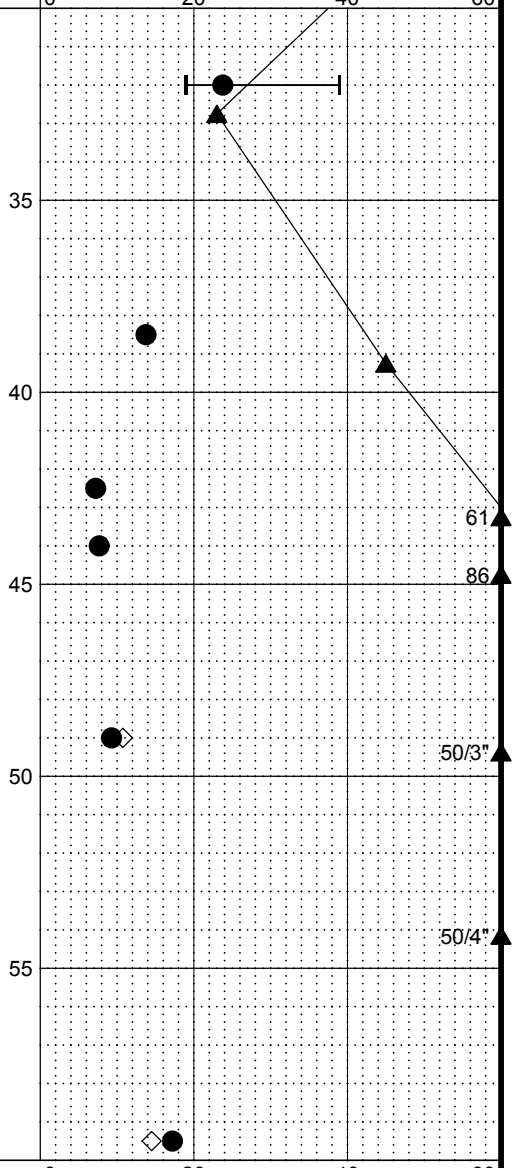
CONTINUED NEXT SHEET

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

Samples: 10, 11, 12, 13, 14, 15

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

⊥ 2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-6

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-7
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	79.9 ft.	Northing:	~ 224,985 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ -26 ft.	Easting:	~ 1,268,265 ft.	Drilling Company:	Holt Services	Rod Diam.:	2-5/8" NWJ
Vert. Datum:	NAVD 88	Station:	~	Drill Rig Equipment:	CME 85 Truck	Hammer Type:	Automatic
Horiz. Datum:	NAD 83/91	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very dense, gray-green, slightly gravelly, silty, fine to medium SAND; wet; micaceous; (Qpgo) SM.

64.0

Very dense, gray-green, sandy GRAVEL, trace of silt; wet; (Qpgo) GP.
- Layer description is based on poor sample recovery.

68.0

Very dense, light gray-green SILT, trace of clay and fine sand; wet; rapid dilatancy; (Qpgl) ML.

78.0

Very dense, gray-green, fine to medium SAND, trace of silt; wet; interbedded with fine gravelly, silty, fine sand, diamict; (Qpgo) SP.

79.9

BOTTOM OF BORING
COMPLETED 10/25/2013

NOTE: Boring was drilled with mud rotary methods and 5" casing. Boring was backfilled with bentonite slurry to the mudline.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

16 | 17 | 18 | 19 | 20

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

0 20 40 60

65 70 75 80 85

96/9" | 50/6" | 50/6" | 50/5" | 50/5"

0 20 40 60

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-6

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-7
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*101.9 ft.*	Northing:	*~ 224,849 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -38 ft.*	Easting:	*~ 1,268,259 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very loose, dark gray and gray, trace to slightly fine gravelly, silty SAND; wet; fine organics, trace of shell fragments and cinders, strong sulfur odor; (He/Hf) SM.

12.0

Very loose, gray, slightly fine gravelly SAND, trace of silt; wet; trace of shell and wood fragments, scattered pockets of silty, fine sand with abundant shells, sulfur odor; (Hb/Hf) SP.

- Sample S-4 was collected to obtain additional soil volume and overlapped with sample S-3.

16.0

Medium dense to very dense, gray, slightly silty, sandy GRAVEL; wet; trace of shell fragments, subrounded to rounded gravel; (Hb) GP-GM.

- Blow counts may be artificially high due the presence of gravel.

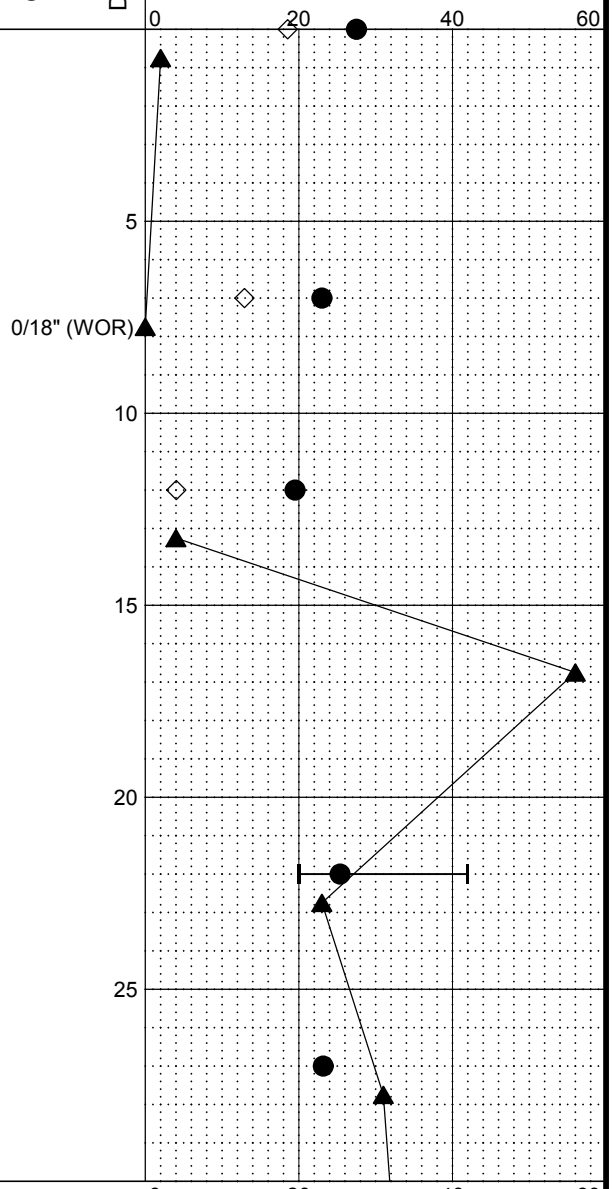
20.0

Very stiff to hard, gray, silty CLAY, trace of sand and fine gravel; moist; trace of shell fragments above 25 feet; (Qpgl) CL.

Depth, ft.	Symbol	PID, ppm	Samples	Ground Water Depth, ft.
		0	1	
		0	2	
12.0		0	4	
		0	3	
16.0		0	5	
20.0			6	
			7	

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
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4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-7

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-8
Sheet 1 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*101.9 ft.*	Northing:	*~ 224,849 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -38 ft.*	Easting:	*~ 1,268,259 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

32.0

Very stiff to hard, gray, silty CLAY, trace of fine sand and fine gravel; moist; sand partings and layers of clayey sand, diamict; (Qpgl/Qpgm) CH.

46.0

Hard, gray, silty CLAY, trace of sand and fine gravel; moist to wet; (Qpgm/Qpgl) CH.

57.0

Hard, gray, gravelly, sandy, silty CLAY; moist to wet; (Qpgm) CH.

8 9 10 11 12 13

0 20 40 60

35 40 45 50 55

74

0 20 40 60

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
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Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-7

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-8
Sheet 2 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*101.9 ft.*	Northing:	*~ 224,849 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -38 ft.*	Easting:	*~ 1,268,259 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

63.0

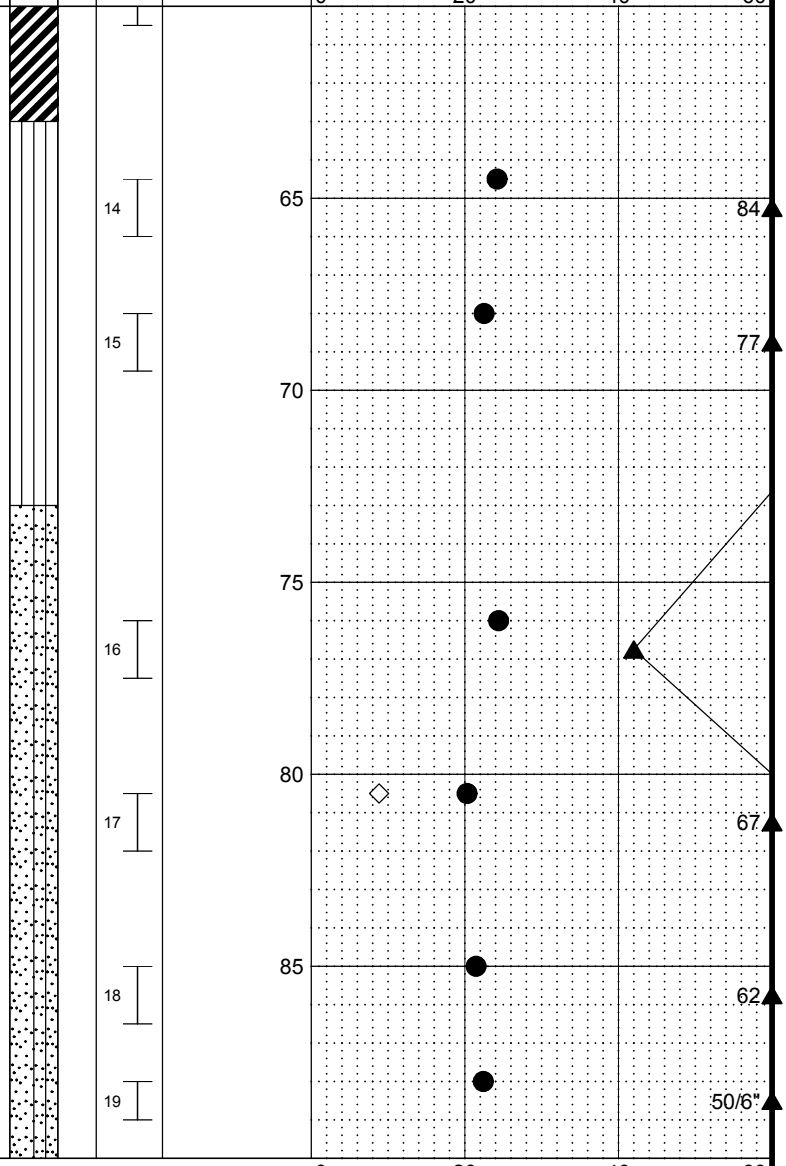
Very dense, gray-green, trace to slightly fine sandy SILT, trace of clay; wet; layers and seams of fine to medium sand; (Qpgl) ML.

73.0

Dense, gray-green to gray, slightly silty, fine to medium SAND, trace of fine gravel; wet; micaceous; (Qpgo) SP-SM.

- 1-inch-thick, gray-green gravelly layer with mica and trace of organics at 85 feet.

- 2-inch thick layer of gray-green, slightly silty sand at 88 feet.



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-7

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FIG. A.1-8
Sheet 3 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*101.9 ft.*	Northing:	*~ 224,849 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -38 ft.*	Easting:	*~ 1,268,259 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
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Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60

95 100 105 110 115

20 21

50/5" 50/5"

101.9

BOTTOM OF BORING
COMPLETED 10/29/2013

NOTE: Boring was drilled with mud rotary methods and 5" casing. Boring was backfilled with bentonite grout to the mudline.

0 20 40 60

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
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Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-7

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-8
Sheet 4 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Appendix B
Sampling and Quality Assurance Project Plan

April 2023
Pier 63 Removal Project

ANCHOR QEA

Sampling and Quality Assurance Project Plan

Prepared for City of Seattle

April 2023
Pier 63 Removal Project

Sampling and Quality Assurance Project Plan

Prepared for
City of Seattle Department of Transportation
Seattle Municipal Tower
700 5th Avenue
Suite 3800
Seattle, Washington 98104

Prepared by
Anchor QEA, LLC
1201 3rd Avenue, Suite 2600
Seattle, Washington 98101

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ABBREVIATIONS

City	City of Seattle
cm	centimeters
COC	chain-of-custody
DGPS	differential global positioning system
DQO	data quality objective
Ecology	Washington State Department of Ecology
HDPE	high-density polyethylene
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Cleanup Act
NAD 83	North American Datum of 1983
NAD88	North American Datum of 1988
OPR	ongoing precision and recovery samples
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Project	Pier 63 RemovalProject
PTFE	polytetrafluoroethylene
QA	quality assurance
QC	quality control
SAR	sampling and analysis report
Site	The area where Pier 63 was once located
SQAPP	Sampling and Quality Assurance Project Plan
SVOC	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons

1 Introduction

From the fall of 2022 through January 2023, the City of Seattle (City) removed Pier 63 from the Seattle waterfront as part of the Pier 63 Removal Project (Project). See Figure 1 for a vicinity map. The pier will not be rebuilt. The City originally intended to replace Pier 63 with a smaller concrete-decked pier. However, the City determined that complete removal of the pier would result in the best habitat outcome while still meeting the City's park and recreational objectives with Waterfront Park (Pier 58), which is being replaced to the south of where Pier 63 was. The Project removed approximately 900 in-water creosote-treated timber piles, 8 in-water steel piles, and the entire 35,108-square-foot overwater deck structure of the pier. Other debris present under the pier was also removed.

This Sampling and Quality Assurance Project Plan (SQAPP) is being provided to support sediment sampling activities required for a Washington State Department of Ecology (Ecology) Model Toxics Cleanup Act (MTCA) grant awarded to the City for the Project. Sediment sampling activities will include collecting five surface sediment grab samples in and around the area where Pier 63 was located (Site). The samples will be analyzed for the following analytes and parameters:

- Metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc)
- Polyaromatic hydrocarbons (PAHs)
- Semivolatile organic compounds (SVOCs)
- Polychlorinated biphenyls (PCBs)
- Pesticides/DDT
- Dioxins/furans
- Total organic carbon
- Grain size
- Percent solids
- Ammonia
- Sulfides

1.1 Site Background

The Site was formerly Pier 10, known as the Virginia Street Dock. It was constructed in 1906 as a pier and shed. The shed was used for newsprint storage and eventually as at least one residential apartment. The Site was joined with Pier 62 in the 1980s, and the City acquired the piers in 1990 (Sheridan 2017; Hudson et al. 2013). They were used for events during the 1990s but since have been unused due to their deteriorated condition. Pier 62 was recently rebuilt and opened to the public in 2020. Prior to demolition of the Site, the pier did not meet current seismic code requirements and had been closed to the public due to safety concerns.

1.2 Existing Data Summary

Anchor QEA, LLC, reviewed available sediment data collected in the vicinity of the Waterfront Park and the Site as part of the Project (Appendix A). Historical data dating back to 2004 were obtained from the City's *Waterfront Seattle Program Geotechnical and Environmental Data Report* (Shannon & Wilson 2018) and Ecology's Environmental Information Management Database. The existing data indicated that elevated concentrations of mercury, PAHs, and PCBs are present in sediment in the area surrounding the Site (Section 2.1.1).

1.3 Document Organization

The remainder of this document is organized as follows:

- **Section 2—Sediment Sampling:** This section summarizes the sampling and processing methods and sample handling requirements for sediment sampling.
- **Section 3—Laboratory Analytical Methods:** This section summarizes the methods used for chemical analyses by a state-accredited laboratory.
- **Section 4—Quality Assurance and Quality Control:** This section summarizes chemical analysis, quality control procedures, and data validation tasks.
- **Section 5—Data Validation and Usability:** This section summarizes the procedures used to assess the usability of collected data.
- **Section 6—Reporting:** This section summarizes reporting requirements for data collected during sediment sampling.

Appendices to this SQAPP include:

- **Appendix A:** Existing Sediment Data Review
- **Appendix B:** Field Forms
- **Appendix C:** Health and Safety Plan

2 Sediment Sampling

2.1 Sediment Sample Collection Methods

The rationale for the sampling design and assumptions for locating and selecting samples, as well as methods and procedures for the collection of field samples, are provided in this section. Sampling will be conducted following standard procedures documented in this SQAPP.

2.1.1 Sampling Design

Sediment samples will be collected to characterize the sediment in the area surrounding the Site and to comply with sampling requirements set forth in the Ecology MTCA grant. Table 1 summarizes sample location identifications and coordinates. Figure 2 shows the sample locations. Sampling locations were selected to, in conjunction with previously collected data, characterize conditions in surface sediments near the Site. In particular, three of the five sampling locations were selected to coincide with historical sediment sampling locations P66CAPBH13, WS-1, and WS-2.

Historical surface sediment sample (0 to 10 centimeters [cm]) was collected from location P66CAPBH13 in 2004. Results indicated elevated concentrations of PAHs, mercury, and total PCBs. Sample collection at location P63-SS-03 will target this location.

Historical samples WS-1 and WS-2 were collected in 2013 by Shannon & Wilson to support the City of Seattle's Waterfront Seattle Program (Shannon & Wilson 2018). Environmental sediment samples were collected using hollow-stem auger and mud rotary drilling methods. Each sample represents a composite of select intervals within a subsurface boring. The samples do not provide discreet data at specific sediment elevations (such as the bioactive zone [upper 10 cm]). Additionally, because the samples were not pulled from a consecutive interval, they do not represent the entire depth range provided in the data report. The seven samples represent subsurface composites over large, deep intervals (up to 18.6 feet below mudline). Results indicated elevated levels of PAHs at WS-1 and detected concentrations of PAHs at location WS-2. Sampling locations P63-SS-01 and P63-SS-02 will target historical locations WS-02 and WS-01, respectively.

The remaining two sample locations are at points underlying the former Pier 63.

To support the Ecology MTCA grant awarded to the City for the Site, sediment samples will be analyzed for the following parameters:

- Ammonia
- Metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc)
- Sulfides
- PAHs

- SVOCs
- PCBs
- Pesticides
- Dioxins/furans
- Total organic carbon
- Grain size
- Percent solids

2.1.2 Surface Sediment Collection

Each surface sediment grab sample will be collected from the top10 cm of sediment using a Van Veen or similar clamshell-type power grab sampler. Samples will be collected in the following manner:

- The vessel will maneuver to the proposed location.
- The grab sampler will be decontaminated.
- A depth to the mudline measurement will be taken with a lead line or depth sounder and recorded along with the time on the field collection form.
- The grab sampler will be deployed.
- The winch cable to the grab sampler will be drawn taut and vertical.
- Location coordinates of the cable hoist will be recorded.
- The sample will be retrieved for processing onboard the vessel.

2.1.3 Sample Acceptance Criteria

Upon retrieval, the sediment sample will be evaluated against the following acceptability criteria:

- The grab sampler is not overfilled (i.e., sediment surface is not against the top of the sampler).
- Sediment surface is relatively flat, indicating minimal disturbance or winnowing during retrieval.
- Overlying water is present, indicating minimal leakage.
- Overlying water has low turbidity, indicating minimal sample disturbance.
- A target penetration depth of at least 10 cm is achieved.

2.1.4 Contingency Plan for Field Condition Impediments to Surface Sediment Sample Collection

The following contingency framework will be followed if encountered field conditions preclude the collection of acceptable surface samples at planned locations:

- If inconsistent or poor recovery is encountered due to hard sediment or debris, up to three attempts will occur at the location and will be retained. If the composite average is 10 cm (0.3 foot), the sample will be retained for analysis.

- Sample locations may be adjusted based on unexpected field conditions (e.g., presence of riprap, large debris, or other obstructions). If no material is recovered after three attempts due to bedrock, riprap, or other obstructions, the location will be offset within a 50-foot (15.2-meter) radius, and another three attempts will be made. If the required adjustment results in more than a 50-foot (15.2-meter) offset from the original location, an Anchor QEA project manager will be contacted to discuss the potential for an alternate location.

2.1.5 Sediment Grab Sample Processing

Surface sediment grab samples that meet project acceptance criteria will be processed as follows:

- Overlying water will be siphoned off.
- Prior to sampling, color photographs will be taken, and a description of each grab sample will be recorded on a sediment sampling form; this will include observations of texture, odor, presence of vegetation or biota, anthropogenic debris, sheen or other visual evidence of contamination, and any other distinguishing characteristics.
- Using a clean, stainless-steel spoon, sample material will be placed into a clean, stainless-steel bowl. To avoid cross-contamination, only sediment that has not contacted the sides or bottom of the grab sampler will be removed and processed.
- The sample will be homogenized until a uniform color and consistency are achieved.
- Using a clean, stainless-steel spoon, all appropriate sample containers will be filled with the homogenized material; the sample jars should be pre-labeled (with sample ID, date and time, and analysis) prior to filling.
- The screw cap will be placed on the sample containers, and the lids will be tightened.
- All sample containers will be double-checked for proper identification and secure lid closure.
- Each container will be packed carefully to prevent breakage and placed inside a cooler with ice for proper storage (at 4° ± 2°C).

2.2 Station and Sample Identifiers

Each sample will be assigned a unique alphanumeric identifier. The identifier will have the format of "Project Identifier-Media Code-Station ID-Sample Interval-Date." Samples will be identified according to the following procedure:

- The project designator will be "P63" to denote Pier 63.
- The media code will be "SS" for surface sediment.
- The station identification will correspond to the station location (Figure 2).
- The date of collection will be presented in the form of MMDDYY.
- As an example, a sediment sample collected on March 20, 2023, from Station 04 will have a sample identification number of P63-SS-04-032023.

- A field duplicate collected from a sample will be identified by the addition of 100 to the sample station number. A duplicate sample collected from the sediment sample Station 04 on March 20, 2023 would be P63-SS-104-032023.

Each sample will have an adhesive plastic or waterproof paper label affixed to the container and will be labeled at the time of collection. The following information will be recorded on the container label at the time of collection:

- Project name
- Sample identifier
- Date and time of sample collection
- Analysis to be performed

2.3 Station Positioning

Station locations are listed in Table 1 and shown in Figure 2. Horizontal positioning will be determined in the field by differential global positioning system (DGPS) based on target coordinates. Target coordinates are provided in Table 1. The horizontal datum will be Washington State Plane North American Datum of 1983 (NAD83), U.S. feet. Measured geographical coordinates for station positions will be recorded and reported to the nearest 0.01 second. In addition, state plane coordinates will be reported to the nearest foot. The DGPS accuracy is less than 1 meter and generally less than 30 cm, depending on the satellite coverage and the number of data points collected.

The vertical elevation of each sediment station will be measured using a fathometer or lead line and converted to mean lower low water elevation. Tidal elevations will be determined based on published tide predictions from National Oceanic and Atmospheric Administration's Tides and Currents and confirmed using measured data from the National Oceanic and Atmospheric Administration's automated tide gauge station No. 9449424, located at Cherry Point, Washington. Vertical elevations of sampling stations will be converted to elevations in North American Vertical Datum of 1988 (NAD88), and a conversion table will be presented in the report memorandum.

2.4 Sample Handling Requirements

Sample container requirements, holding times, and preservation requirements are provided in Table 2. Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sample material must meet high standards of cleanliness. All equipment and instruments that will be used and are in direct contact with various media collected for chemical analyses must be made of glass, stainless steel, high-density polyethylene (HDPE), or polytetrafluoroethylene (PTFE) and will be cleaned prior to each day's use and between sampling or compositing events.

2.4.1 Decontamination Procedures

Sample containers, instruments, working surfaces, and other items that may come into contact with sample material must meet high standards of cleanliness. All equipment and instruments used that will be in direct contact with samples collected for analysis must be made of glass, stainless steel, or HDPE. All reusable sampling equipment will be cleaned prior to sample collection at each station and prior to sample collection of each interval.

The decontamination procedure is as follows:

- Rinse with site water and wash with scrub brush until free of sediment.
- Wash with a solution of tap water and biodegradable phosphate-free detergent (e.g., Alconox).
- Visually inspect the equipment and repeat the scrub and rinse step, if necessary.
- Rinse with tap water.
- Rinse three times with distilled water.
- Use immediately or cover all decontaminated items with aluminum foil.

All water and excess sediments resulting from the decontamination process will be returned to the inlet near the site of sample collection upon completion of the decontamination procedures.

2.4.2 Investigation-Derived Waste

All disposable sampling materials and personal protective equipment used in sample collection and processing (e.g., disposable gloves and paper towels) will be placed in heavy-duty garbage bags for disposal as nonhazardous solid waste. No hazardous materials requiring disposal will be used during field work for this effort.

Sediment recovered in samples not retained for chemical analyses will be returned to the target sampling location.

2.4.3 Sample Handling Requirements

2.4.3.1 Sample Custody and Shipping Requirements

Samples are considered to be in custody if they are in the custodian's possession or view, in a secured location (under lock) with restricted access, or in a container that is secured with official seals such that the sample cannot be reached without breaking the seals.

Chain-of-custody (COC) procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the COC form. Each sample ID will be listed on an electronic or handwritten COC form the day it is collected. All data entries will be made using indelible ink pen. Corrections will be made by

drawing a single line through the error, writing in the correct information, and then dating and initialing the change. Blank lines and spaces on the COC form will be lined out, dated, and initialed by the individual maintaining custody.

A COC form will accompany each shipment of samples to the analytical laboratories. Each person who has custody of the samples will ensure that the samples are not left unattended unless properly secured. Copies of all COC forms will be retained in the project files. All samples will be shipped or hand-delivered to the analytical laboratory no later than the day after collection. Samples collected on Friday may be held until the following Monday for shipment, provided that this does not jeopardize any hold time requirements. Specific sample shipping procedures are as follows:

- Each cooler or container holding the samples for analysis will be hand-delivered the day of sample collection, couriered, or shipped via overnight delivery to the appropriate analytical laboratory. In the event that Saturday delivery is required, the field lead will contact the analytical laboratories before 3:00 p.m. on Friday to ensure that the laboratory is aware of the number of containers shipped and the airbill tracking numbers for those containers.
- Ice will be sealed in separate plastic bags and placed in the shipping containers.
- Individual samples will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- Glass jars will be separated in the shipping container by shock-absorbent material (e.g., bubble wrap) to prevent breakage.
- If the samples are transferred using a commercial shipping company, the following procedures will be followed:
  - The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to enable positive identification.
  - COC forms will be enclosed in a plastic bag and placed inside the cooler.
  - Two signed and dated COC seals will be placed on adjacent sides of each cooler prior to shipping.
  - Each cooler will be wrapped securely with strapping tape, labeled "Glass – Fragile" and "This End Up," and clearly labeled with the laboratory's shipping address and the consultant's return address.

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the COC form. Upon receipt of the sample at the laboratory, the person receiving the sample will sign the COC form.

2.4.3.2 Sample Receipt

All samples received at the laboratory will be checked for label identification and complete, accurate COC documentation. The condition of the samples will be checked, and the temperature blank will

be measured and recorded (with a calibrated digital thermometer) immediately after the cooler is opened. These results, along with any questions or comments regarding sample integrity, will be recorded on the COC form (or the appropriate laboratory cooler receipt form). The laboratory will contact Anchor QEA immediately if discrepancies between the samples and COC records are found upon receipt. If it is necessary for the receiving laboratory to ship samples to other laboratories, a COC form will be completed and will accompany the samples. A copy of the COC form (and cooler receipt form) will be emailed to Anchor QEA within 2 days of sample receipt and included in the final analytical data report.

Once received at the laboratory, the samples will be maintained at 4° ± 2°C, unless it is required that the samples be held at a lower temperature (-10 ± 10°C) to extend the holding time.

If a sample container is received broken, a sample is received in an inappropriate container, or a sample has not been preserved by appropriate means, the laboratory will notify Anchor QEA as soon as possible on the day of sample receipt. The laboratory sample custodian will be responsible for logging the samples in, assigning a unique laboratory identification number to each sample, labeling each sample bottle with its laboratory identification number, and moving the samples to appropriate storage locations to await analysis. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in the laboratory tracking system. Relevant custody documentation will be placed in the project file.

3 Laboratory Analytical Methods

Chemical analyses will be conducted at a laboratory accredited through Ecology's Laboratory Accreditation Program. All samples will be maintained according to the appropriate holding times and temperatures for each analysis (Table 2). Analytes, analytical methods, and target detection limits for chemical testing are presented in Table 3. The analytical laboratory will prepare a detailed report.

4 Quality Assurance and Quality Control

This section describes the laboratory and field quality assurance (QA)/quality control (QC) procedures to be followed to ensure that data are of known and acceptable precision and accuracy, so project objectives are achieved. These procedures include analytical and field QA/QC requirements.

4.1 Field Quality Control

Anchor QEA personnel will identify and label samples in a consistent manner to ensure that field samples are traceable. Labels will be used in conjunction with the COC and this SQAPP to provide all information necessary for the laboratory to conduct required analyses properly. QA samples will be collected in the field to ensure project data quality objectives (DQOs) are met. Samples will be placed in appropriate containers and preserved for shipment to the laboratory in accordance with the requirements presented in Table 2.

4.2 Laboratory Quality Control

Internal laboratory QC checks will be used to monitor data integrity. These checks will include method blanks, matrix spikes (MSs) (and matrix spike duplicates [MSDs]), laboratory control samples (LCSs) (and laboratory control sample duplicates [LCSDs]), internal standards, surrogate standards, calibration standards, and reference material standards. Project-required control limits will be used to evaluate MS/MSD and LCS/LCSD percent recoveries and relative percent difference values. Surrogate recoveries will be evaluated using laboratory control limits. Laboratory control charts will be used to determine long-term instrument trends.

Results of QC samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine whether control limits have been exceeded. If control limits are grossly exceeded in the sample group, the project QA manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing of the affected samples) will be initiated prior to processing a subsequent group of samples.

All primary chemical standards and standard solutions used in this project will be traceable to the National Institute of Standards and Technology, Environmental Resource Associates, National Research Council of Canada, or other documented, reliable, commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities found in a standard will be documented.

4.2.1 Method Blanks

Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. The method blank for all analyses must be less than the method reporting limit of any single target analyte/compound. If a laboratory method blank exceeds this criterion for any analyte/compound, and the concentration of the analyte/compound in any of the samples is less than 5 times the concentration found in the blank (10 times for common contaminants), analyses must stop and the source of contamination must be eliminated or reduced.

4.2.2 Laboratory Control and Ongoing Precision and Recovery Samples

LCSs and ongoing precision and recovery samples (OPRs) are prepared and analyzed to assess possible laboratory bias at all stages of sample preparation and analysis. The LCS is a matrix-dependent spiked sample prepared at the time of sample preparation along with the preparation of samples, method blanks, and MSs. The LCS and OPR will provide information on the accuracy of the analytical process and, when analyzed in duplicate, will provide precision information as well.

4.2.3 Matrix Spike/Matrix Spike Duplicate

MSs/MSDs will be performed on project-specific samples either at a frequency of 5% or once per analytical batch, whichever is more frequent. Analysis of MS samples provides information on the preparation and/or analytical efficiency of the method for the sample matrix. By performing duplicate MS analyses, information on the precision of the method is also provided. MS/laboratory duplicates can be performed in place of MSs/MSDs for precision information. MS/MSD samples are not performed for dioxin/furan analyses.

4.2.4 Surrogate Spikes

Surrogates are compounds that are unlikely to occur under natural conditions and have properties similar to the analytes of interest. Surrogates are added to the samples prior to purging or extraction and are primarily used for organic samples analyzed by gas chromatography/mass spectrometry and gas chromatography methods. The surrogate spike provides broader insight into the proficiency and efficiency of an analytical method on a sample-specific basis. This control reflects analytical conditions that may not be attributable to the sample matrix. All project samples and associated sample QC to be analyzed by organic methods will be spiked with appropriate surrogate compounds as defined in the analytical methods.

4.2.5 Laboratory Duplicates

For inorganic and high-resolution mass spectrometry analyses, laboratory duplicates will be analyzed to assess laboratory precision. A laboratory duplicate is defined as a separate aliquot of a sample

that is analyzed as a separate sample. An MSD, OPR duplicate, or LCSD may be analyzed in lieu of a laboratory duplicate.

4.2.6 Instrument Performance Checks

Instrument performance checks are analyzed on mass spectrometer instruments to ensure ion ratios and abundances are adequate to proceed with subsequent analyses.

4.2.7 Calibration Standards

Initial calibration standards are analyzed prior to sample analyses and establish the response to concentration ratios to quantify the sample concentrations. Initial calibrations are established prior to any other analyses except instrument performance checks. Calibration check standards analyzed within a particular analytical series provide information regarding instrument stability and validity of the instrument calibration. The analytical frequency of calibration check standards is specified by the analytical method.

4.2.8 Standard Reference Materials

Standard reference materials are substances of the same or similar matrix to the project samples and contain a known concentration of target analytes. These materials are prepared and analyzed in the same manner as routine samples and in the same preparation and analytical batch. The recovery of the target analytes provides information on interferences caused by the sample matrix. A standard reference material may be used in lieu of an LCS.

4.3 Data Management

Field data sheets will be checked for completeness and accuracy by the field coordinator prior to delivery to the data manager. Data generated in the field will be documented on electronic or hard copy and provided to the data manager, who is responsible for the data entry into the database. All manually entered data will be verified by a second party. Field documentation will be filed in the main project folder after data entry and verification are complete.

Laboratory data will be provided to the data manager in electronic format. Laboratory data that is electronically provided and loaded into the database will undergo a check against the laboratory hard copy data. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. The accuracy of all manually entered data will be verified. Data tables and reports will be exported from EQuIS to Microsoft Excel tables, and data will be exported in the Environmental Information Management Database format to provide to Ecology.

5 Data Validation and Usability

This section describes the processes that will be used to review project data quality.

5.1 Data Review, Validation, and Verification

During the validation process, analytical data will be evaluated for project, method, and laboratory QC compliance, and their validity and applicability for program purposes will be determined. Based on the findings of the validation process, data validation qualifiers may be assigned. The validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed.

5.2 Validation and Verification Methods

Data validation includes signed entries by the field and laboratory technicians on field data sheets and laboratory datasheets, respectively; review for completeness and accuracy by the field coordinator and laboratory manager; review by the QA/QC manager for outliers and omissions; and the use of QC criteria to accept or reject specific data. All data will be entered into the EQuIS database, and a raw data file printed or exported. A second data manager or designee will perform a cursory verification of the database raw data file. If errors are found, further verification will be performed to ensure that all data are accurate. Any errors found will be corrected in the database, and the laboratory will be notified of the errors.

All laboratory data will be reviewed and verified to determine whether DQOs have been met and that appropriate corrective actions have been taken, when necessary. The project QA/QC manager or designee will be responsible for the final review of data generated from analyses of samples.

The first level of review will take place in the laboratory as the data are generated. The laboratory manager or designee will be responsible for ensuring that the data generated meet minimum QA/QC requirements and that the instruments were operating under acceptable conditions during generation of data. DQOs will also be assessed at this point by comparing the results of QC measurements with pre-established criteria as a measure of data acceptability.

The analysts or laboratory manager will prepare a preliminary QC checklist for each parameter and for each sample delivery group as soon as analysis of a sample delivery group has been completed. Any deviations from the DQOs listed on the checklist will be brought to the attention of the laboratory manager to determine whether corrective action is needed and to determine the impact on the reporting schedule.

Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. Stage 2B validations (EPA 2009) will be conducted on all data, with the exceptions of total solids and grain size, which will be validated

using Stage 1 validations. Data validation will be conducted by a third-party reviewer using current National Functional Guidelines data validation requirements (EPA 2017a, 2017b), the analytical methods, and professional judgment by considering the following information, as applicable:

- COC documentation and sample receipt condition
- Holding times
- Instrument performance checks
- Initial calibrations
- Continuing calibrations
- Method blanks
- Surrogate recoveries
- Internal standard recoveries
- Detection limits
- Reporting limits
- Laboratory control samples
- MS/MSD samples
- Field and laboratory duplicates
- Standard reference material results

The data will be validated in accordance with the project-specific DQOs described above, analytical method criteria, and the laboratory's internal performance standards based on their standard operating procedures.

5.3 Reconciliation with User Requirements

The QA/QC manager will review data after each survey to determine if DQOs have been met. If data do not meet the project's specifications, the QA/QC manager will review the errors and determine if the problem is due to calibration, maintenance, sampling techniques, or other factors and will suggest corrective action. Retraining, revision of techniques, or replacement of supplies/equipment should correct the problem; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA/QC manager will recommend appropriate modifications.

6 Reporting

All sampling data will be summarized in a sampling and analysis report (SAR) to be prepared and submitted to the City. The SAR will include a Sediment Management Standards evaluation, which will be composed of summary tables with comparison to the Sediment Quality Standard (Ecology 2019).

The SAR will include the following sections:

- Site background and context
- Sampling objectives and methods
- Method deviations in sampling or analysis from this SQAPP
- Data quality review
- Results of sampling, including some or all the following:
  - A table of sample coordinates, collection equipment and protocol used for each sample, water depth at each location, and the time of sample collection
  - A figure showing actual sampling locations
  - Sample recovery data
  - Results of chemical testing analyses and comparison to regulatory standards; table of analyzed concentrations for all contaminants of concern, lab qualifiers, method reporting limits and method detection limits
  - Laboratory data reports, including the case narrative and COC forms, included as a report appendix
  - Data validation report
  - Field logs (i.e., daily and grab collection logs) included as a report appendix

7 References

Ecology (Washington State Department of Ecology), 2019. Sediment Cleanup User's Manual II. Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC. Publication No. 12-09-057. May 2019 Revised Draft for 60 Day Review and Comment. Available at: https://fortress.wa.gov/ecy/publications/SummaryPages/1209057.html.

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EPA, 2017a. National Functional Guidelines for Organic Superfund Methods Data Review. OSRTI. EPA 540-R-2017-002. January 2017.

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Shannon & Wilson, 2018. *Waterfront Seattle Program, Geotechnical and Environmental Data Report*. Prepared for Seattle Department of Transportation. March 2018.

Sheridan, M., 2017. *Pier 62/63 Cultural Resources Assessment*. Report on file at the Washington State Department of Archaeology and Historic Preservation.

Tables

Table 1
Target Sample Locations

Location ID	Station Coordinates		Collection Method	Sample ID
P63-SS-01	47.60881406	-122.3461755	Grab	P63-SS-01-MMDDYY
P63-SS-02	47.60897444	-122.345875	Grab	P63-SS-02-MMDDYY
P63-SS-03	47.60897786	-122.3456176	Grab	P63-SS-03-MMDDYY
P63-SS-04	47.60873343	-122.3449645	Grab	P63-SS-04-MMDDYY
P63-SS-05	47.60873518	-122.3456821	Grab	P63-SS-05-MMDDYY

Table 2
Holding Times, Preservation, and Sample Containers

Parameter	Required Analytical Method	Sample Size	Container Size and Type	Holding Time	Sample Preservation Technique
Total solids	SM 2540 G	50 g	8-oz glass	14 days	Cool/4°C
				6 months	Freeze/-18°C
Ammonia	SM 4500-NH3-H	50 g		7 days	Cool/4°C
Sulfide	SM 4500-S2-D	50 g	2-oz glass[2]	7 days	Cool/4°C, ZnAc
TOC	USEPA 9060A	30 g	4-oz glass	28 days	Cool/4°C
Grain size	ASTM D422	100 g	16-oz glass	No hold time	Cool/4°C or ambient temperature
Metals	USEPA 6020B (metals)	10 g	4-oz glass	6 months	Cool/4°C
				1 year[1]	Freeze/-18°C
	USEPA 7471B (mercury)	10 g	4-oz glass	6 months	Cool/4°C
				1 year[1]	Freeze/-18°C
PAH/SVOCs/PCBs/Dioxins/Furans, pesticides	USEPA 8270E SIM, USEPA 8270E, USEPA 8082A, USEPA 1613B, USEPA 8081B	150 g	16-oz glass	14 days until extraction	Cool/4°C
				1 year until extraction	Freeze/-18°C
				40 days after extraction	Cool/4°C

Notes:

1. Samples must be analyzed within 14 days of collection or thawing.
2. Jar should be filled without headspace and preserved with ZnAc provided by the laboratory.

g: gram
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
SVOC: semivolatile organic compound
oz: ounce
TOC: total organic carbon
znAc: zinc acetate

Table 3
Conventional and Chemical Parameters, Required Analytical Methods, and Target Method Detection and Reporting Limits for Sediment Samples

Parameter	Required Analytical Method	Units	Target Method Detection Limit[1]	Target Reporting Limit[1]
Physical and Conventional Parameters				
Total solids	SM 2540 G	% wet weight	0.04	0.04
TOC	USEPA 9060A	%	0.02	0.02
Grain size	ASTM D422	%	0.1	0.1
Sulfide	SM 4500-S2-D	mg/kg	1	1
Ammonia	SM 4500-NH3-H	mg/kg	0.4	0.4
Metals				
Arsenic	USEPA 6020B	mg/kg	0.038	0.2
Barium	USEPA 6020B	mg/kg	0.114	0.5
Cadmium	USEPA 6020B	mg/kg	0.04	0.1
Chromium	USEPA 6020B	mg/kg	0.26	0.5
Copper	USEPA 6020B	mg/kg	0.35	0.5
Lead	USEPA 6020B	mg/kg	0.052	0.1
Mercury	USEPA 7471B	mg/kg	0.00525	0.025
Nickel	USEPA 6020B	mg/kg	0.22	0.5
Selenium	USEPA 6020B	mg/kg	0.18	0.5
Silver	USEPA 6020B	mg/kg	0.022	0.2
Zinc	USEPA 6020B	mg/kg	2.92	6
PAHs				
1-Methylnaphthalene	USEPA 8270E SIM	µg/kg	0.106	0.5
2-Methylnaphthalene	USEPA 8270E SIM	µg/kg	0.128	0.5

Parameter	Required Analytical Method	Units	Target Method Detection Limit[1]	Target Reporting Limit[1]
Acenaphthene	USEPA 8270E SIM	µg/kg	0.089	0.5
Acenaphthylene	USEPA 8270E SIM	µg/kg	0.064	0.5
Anthracene	USEPA 8270E SIM	µg/kg	0.074	0.5
Benzo(a)anthracene	USEPA 8270E SIM	µg/kg	0.072	0.5
Benzo(a)pyrene	USEPA 8270E SIM	µg/kg	0.087	0.5
Benzo(b)fluoranthene	USEPA 8270E SIM	µg/kg	0.066	0.5
Benzo(g,h,i)perylene	USEPA 8270E SIM	µg/kg	0.085	0.5
Benzo(j)fluoranthene	USEPA 8270E SIM	µg/kg	0.097	0.5
Benzo(k)fluoranthene	USEPA 8270E SIM	µg/kg	0.101	0.5
Chrysene	USEPA 8270E SIM	µg/kg	0.07	0.5
Dibenz(a,h)anthracene	USEPA 8270E SIM	µg/kg	0.105	0.5
Dibenzofuran	USEPA 8270E SIM	µg/kg	0.126	0.5
Fluoranthene	USEPA 8270E SIM	µg/kg	0.081	0.5
Fluorene	USEPA 8270E SIM	µg/kg	0.068	0.5
Indeno(1,2,3-cd)pyrene	USEPA 8270E SIM	µg/kg	0.088	0.5
Naphthalene	USEPA 8270E SIM	µg/kg	0.439	0.6
Phenanthrene	USEPA 8270E SIM	µg/kg	0.114	0.5
Pyrene	USEPA 8270E SIM	µg/kg	0.089	0.5
SVOCs				
Phenol	USEPA 8270E	µg/kg	4.39	20
bis(2-chloroethyl) ether	USEPA 8270E	µg/kg	19.3	50
2-Chlorophenol	USEPA 8270E	µg/kg	13.8	20
1,3-Dichlorobenzene	USEPA 8270E	µg/kg	3.13	20
1,4-Dichlorobenzene	USEPA 8270E	µg/kg	3.14	20

Parameter	Required Analytical Method	Units	Target Method Detection Limit[1]	Target Reporting Limit[1]
Benzyl Alcohol	USEPA 8270E	µg/kg	2.37	20
1,2-Dichlorobenzene	USEPA 8270E	µg/kg	16.3	20
2-Methylphenol	USEPA 8270E	µg/kg	3.37	20
2,2'-Oxybis(1-chloropropane)	USEPA 8270E	µg/kg	6.66	20
4-Methylphenol	USEPA 8270E	µg/kg	3.45	20
N-Nitroso-di-n-Propylamine	USEPA 8270E	µg/kg	7.45	20
Hexachloroethane	USEPA 8270E	µg/kg	7.39	20
Nitrobenzene	USEPA 8270E	µg/kg	7.24	20
Isophorone	USEPA 8270E	µg/kg	3.93	20
2-Nitrophenol	USEPA 8270E	µg/kg	4.86	20
2,4-Dimethylphenol	USEPA 8270E	µg/kg	3.78	100
Bis(2-Chloroethoxy)methane	USEPA 8270E	µg/kg	4.31	20
Benzoic acid	USEPA 8270E	µg/kg	39	200
2,4-Dichlorophenol	USEPA 8270E	µg/kg	15.3	100
1,2,4-Trichlorobenzene	USEPA 8270E	µg/kg	3.57	20
Naphthalene	USEPA 8270E	µg/kg	4.24	20
4-Chloroaniline	USEPA 8270E	µg/kg	8.38	100
Hexachlorobutadiene	USEPA 8270E	µg/kg	4.81	20
4-Chloro-3-Methylphenol	USEPA 8270E	µg/kg	12.4	100
2-Methylnaphthalene	USEPA 8270E	µg/kg	4.51	20
Hexachlorocyclopentadiene	USEPA 8270E	µg/kg	24.5	100
2,4,6-Trichlorophenol	USEPA 8270E	µg/kg	8.98	100
2,4,5-Trichlorophenol	USEPA 8270E	µg/kg	25.8	100
2-Chloronaphthalene	USEPA 8270E	µg/kg	7.96	20

Parameter	Required Analytical Method	Units	Target Method Detection Limit[1]	Target Reporting Limit[1]
2-Nitroaniline	USEPA 8270E	µg/kg	16.4	100
Dimethylphthalate	USEPA 8270E	µg/kg	4.39	20
Acenaphthylene	USEPA 8270E	µg/kg	6.24	20
2,6-Dinitrotoluene	USEPA 8270E	µg/kg	20.5	100
3-Nitroaniline	USEPA 8270E	µg/kg	22.3	20
Acenaphthene	USEPA 8270E	µg/kg	5.22	100
2,4-Dinitrophenol	USEPA 8270E	µg/kg	33.8	200
Dibenzofuran	USEPA 8270E	µg/kg	14.1	20
4-Nitrophenol	USEPA 8270E	µg/kg	32.6	100
2,4-Dinitrotoluene	USEPA 8270E	µg/kg	16.2	100
Fluorene	USEPA 8270E	µg/kg	14.6	20
Diethyl phthalate	USEPA 8270E	µg/kg	19.7	50
4-Chlorophenylphenyl ether	USEPA 8270E	µg/kg	19.2	50
4-Nitroaniline	USEPA 8270E	µg/kg	29.4	100
4,6-Dinitro-2-methylphenol	USEPA 8270E	µg/kg	38	200
N-Nitrosodiphenylamine	USEPA 8270E	µg/kg	5.32	20
4-Bromophenyl phenyl ether	USEPA 8270E	µg/kg	17	20
Hexachlorobenzene	USEPA 8270E	µg/kg	13.5	20
Pentachlorophenol	USEPA 8270E	µg/kg	31.2	100
Phenanthrene	USEPA 8270E	µg/kg	8.72	20
Anthracene	USEPA 8270E	µg/kg	7.19	20
Carbazole	USEPA 8270E	µg/kg	4.29	20
Di-n-Butylphthalate	USEPA 8270E	µg/kg	5.61	20
Fluoranthene	USEPA 8270E	µg/kg	6.09	20

Parameter	Required Analytical Method	Units	Target Method Detection Limit[1]	Target Reporting Limit[1]
Pyrene	USEPA 8270E	µg/kg	5.68	20
Butylbenzylphthalate	USEPA 8270E	µg/kg	9.41	20
Benzo(a)anthracene	USEPA 8270E	µg/kg	5.96	20
3 ,3 '-Dichlorobenzidine	USEPA 8270E	µg/kg	7.09	100
Chrysene	USEPA 8270E	µg/kg	6.06	20
bis(2-Ethylhexyl)phthalate	USEPA 8270E	µg/kg	5.46	50
Di-n-Octylphthalate	USEPA 8270E	µg/kg	4.39	20
Benzo(a)pyrene	USEPA 8270E	µg/kg	4.23	20
Indeno(l ,2,3-cd)pyrene	USEPA 8270E	µg/kg	14.6	20
Dibenzo(a,h)anthracene	USEPA 8270E	µg/kg	17.2	20
Benzo(g,h,i)perylene	USEPA 8270E	µg/kg	13.6	20
Benzofluoranthenes, Total	USEPA 8270E	µg/kg	10	40
1-Methylnaphthalene	USEPA 8270E	µg/kg	5.26	20
PCB Aroclors				
Aroclor 1016	USEPA 8082A	µg/kg	0.78	2
Aroclor 1221	USEPA 8082A	µg/kg	0.78	2
Aroclor 1232	USEPA 8082A	µg/kg	0.78	2
Aroclor 1242	USEPA 8082A	µg/kg	0.78	2
Aroclor 1248	USEPA 8082A	µg/kg	0.78	2
Aroclor 1254	USEPA 8082A	µg/kg	0.78	2
Aroclor 1260	USEPA 8082A	µg/kg	0.295	2
Aroclor 1262	USEPA 8082A	µg/kg	0.295	2
Aroclor 1268	USEPA 8082A	µg/kg	0.295	2
Dioxin and Furan				

Parameter	Required Analytical Method	Units	Target Method Detection Limit[1]	Target Reporting Limit[1]
2,3,7,8-TCDD	USEPA 1613B	ng/kg	0.15	1
2,3,7,8-TCDF	USEPA 1613B	ng/kg	0.058	1
1,2,3,7,8-PeCDD	USEPA 1613B	ng/kg	0.17	1
1,2,3,7,8-PeCDF	USEPA 1613B	ng/kg	0.24	1
2,3,4,7,8-PeCDF	USEPA 1613B	ng/kg	0.22	1
1,2,3,4,7,8-HxCDD	USEPA 1613B	ng/kg	0.17	1
1,2,3,6,7,8-HxCDD	USEPA 1613B	ng/kg	0.18	1
1,2,3,7,8,9-HxCDD	USEPA 1613B	ng/kg	0.22	1
1,2,3,4,7,8-HxCDF	USEPA 1613B	ng/kg	0.28	1
1,2,3,6,7,8-HxCDF	USEPA 1613B	ng/kg	0.2	1
1,2,3,7,8,9-HxCDF	USEPA 1613B	ng/kg	0.19	1
2,3,4,6,7,8-HxCDF	USEPA 1613B	ng/kg	0.17	1
1,2,3,4,6,7,8-HpCDD	USEPA 1613B	ng/kg	0.56	2.5
1,2,3,4,6,7,8-HpCDF	USEPA 1613B	ng/kg	0.21	1
1,2,3,4,7,8,9-HpCDF	USEPA 1613B	ng/kg	0.24	1
OCDD	USEPA 1613B	ng/kg	4.6	10
OCDF	USEPA 1613B	ng/kg	1.1	2.5
Pesticides				
4,4-DDD	USEPA 8081B	µg/kg	0.575	3.3
4,4-DDE	USEPA 8081B	µg/kg	0.568	3.3
4,4-DDT	USEPA 8081B	µg/kg	0.572	3.3
Aldrin	USEPA 8081B	µg/kg	0.218	1.7
alpha-BHC	USEPA 8081B	µg/kg	0.17	1.7
alpha-Chlordane (cis-Chlordane)	USEPA 8081B	µg/kg	0.282	1.7

Parameter	Required Analytical Method	Units	Target Method Detection Limit[1]	Target Reporting Limit[1]
beta-BHC	USEPA 8081B	µg/kg	0.318	1.7
beta-Chlordane (trans-Chlordane)	USEPA 8081B	µg/kg	0.264	1.7
cis-Nonachlor	USEPA 8081B	µg/kg	0.85	1.7
delta-BHC	USEPA 8081B	µg/kg	0.3	1.7
Dieldrin	USEPA 8081B	µg/kg	0.563	3.3
Endosulfan I	USEPA 8081B	µg/kg	0.273	1.7
Endosulfan II	USEPA 8081B	µg/kg	0.561	3.3
Endosulfan Sulfate	USEPA 8081B	µg/kg	0.844	3.3
Endrin	USEPA 8081B	µg/kg	0.518	3.3
Endrin Aldehyde	USEPA 8081B	µg/kg	0.963	3.3
Endrin Ketone	USEPA 8081B	µg/kg	0.663	3.3
gamma-BHC (Lindane)	USEPA 8081B	µg/kg	0.175	1.7
Heptachlor	USEPA 8081B	µg/kg	0.218	1.7
Heptachlor Epoxide	USEPA 8081B	µg/kg	0.286	1.7
Hexachlorobutadiene	USEPA 8081B	µg/kg	0.815	3.3
Hexachlorobenzene	USEPA 8081B	µg/kg	0.61	3.3
Methoxychlor	USEPA 8081B	µg/kg	3.52	17
Oxychlordane	USEPA 8081B	µg/kg	1.7	3.3
trans-Nonachlor	USEPA 8081B	µg/kg	1.7	3.3

Notes:

1. Target method detection limits and reporting limits are listed in wet weight. Individual limits may vary based on dry weight correction, dilution, sample size or matrix interference.

µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram

Figures

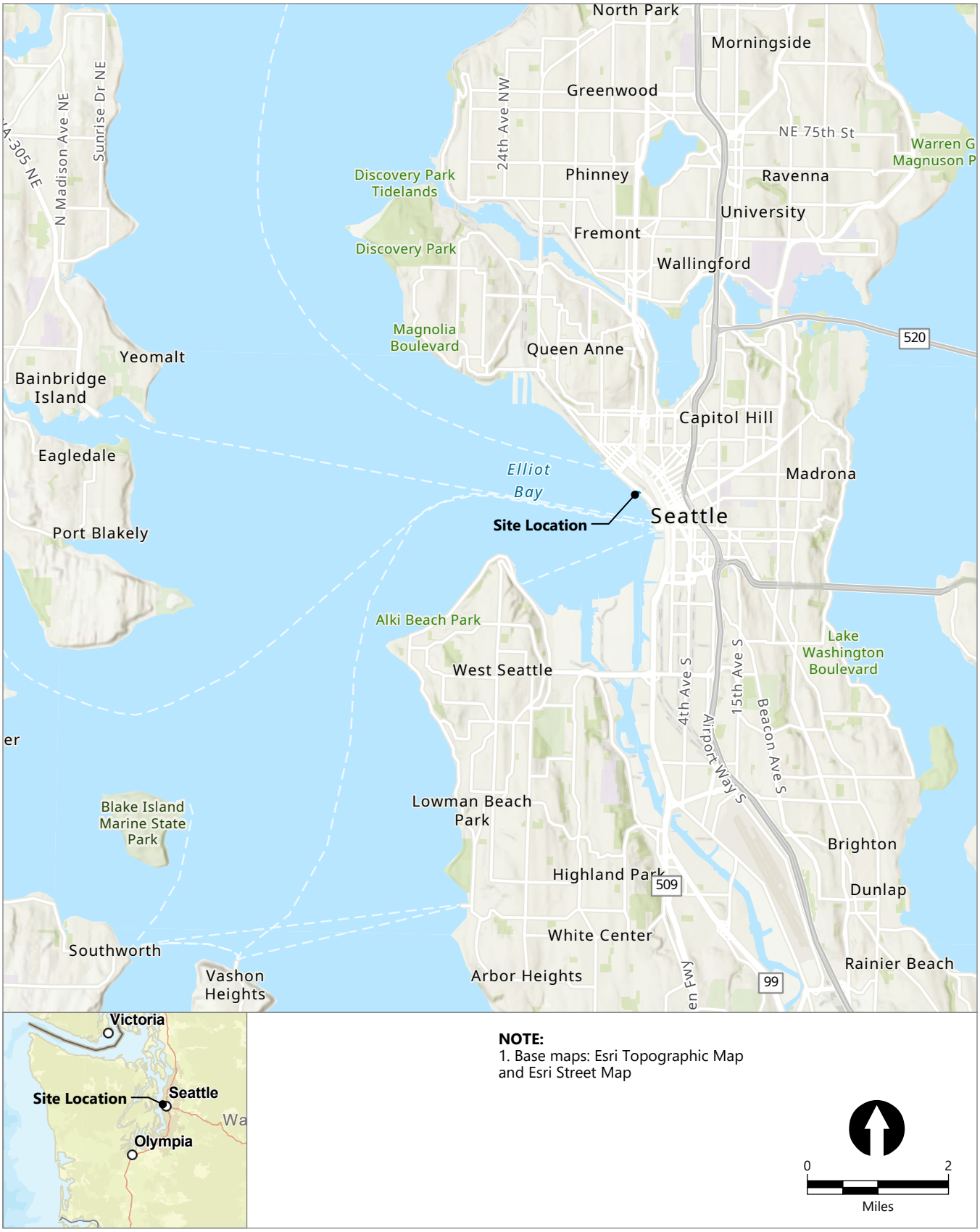

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Figure 1
Vicinity Map
Pier 63 Removal Project
Sampling Quality Assurance Project Plan

LEGEND:

- Proposed Sampling Location
- Former Pier 63 Location

NOTES:

1. Aerial image: King County (2021)
2. Pier 63 removed from Fall 2022 through January 2023

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Figure 2
Sediment Sampling Locations
Pier 63 Removal Project
Sampling Quality Assurance Project Plan

Appendix A
Existing Sediment Data Review

1201 3rd Avenue, Suite 2600
Seattle, Washington 98101
206.287.9130

ANCHOR QEA

Memorandum

November 8, 2019

To: Kit Loo and Jill Macik, Seattle Department of Transportation
David Graves, City of Seattle Parks and Recreation

From: Joy Dunay and Cindy Fields, Anchor QEA, LLC

cc: Sasha Visconty, Axis Environmental
Josh Jensen and Heather Page, Anchor QEA, LLC

Re: Piers 58 and 63 Existing Sediment Data Review

Introduction

This memorandum provides a summary of available data evaluated in the vicinity of the proposed Piers 58 and 63 Replacement Project. Historical data between 2004 and the present were obtained from the City of Seattle's *Waterfront Seattle Program Geotechnical and Environmental Data Report* (Shannon & Wilson 2018) and the Washington State Department of Ecology's (Ecology's) Environmental Information Management (EIM) Database. The following provides a summary of these available data, including a screening of the data against state standards for sediment quality to evaluate the potential ecological and human health risks associated with site sediments.

Data Sources

The following provides a summary of the available data from the *Waterfront Seattle Program Geotechnical and Environmental Data Report* and Ecology's EIM Database.

Waterfront Seattle Program Geotechnical and Environmental Data Report

Environmental data were collected by Shannon & Wilson in 2013 and 2014 in the vicinity of the Pier 58 and 63 site boundaries to support the City of Seattle's Waterfront Seattle Program (Shannon & Wilson 2018). The objective of the sampling was to characterize existing fill and shallow native soils that would be excavated and disposed of as investigative derived waste and to support disposal options. The sediment was not evaluated consistent with any remedial program or state cleanup standards. To support the evaluation, two sediment samples (WS-6 and WS-7) were collected at Pier 58, and five sediment samples (WS-1 through WS-5) were collected adjacent to Pier 63 (Figures 1 and 2).

Environmental sediment samples were collected using hollow-stem auger and/or mud rotary drilling methods. Each sample represents a composite of select intervals within a subsurface boring, as specified in the soil boring log (Appendix A); the samples do not provide discreet data at specific sediment elevations (such as the bioactive zone [upper 10 centimeters]). Additionally, because the samples were not pulled from a consecutive interval, they do not represent the entire depth range provided in the data report. The seven samples represent subsurface composites over large, deep

intervals (up to 20.2 feet below mudline). Samples were analyzed for all or a subset of the following tests: diesel range organics, lube oil range organics, Resource Conservation and Recovery Act (RCRA) metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyl (PCB) Aroclors.

Ecology's EIM Database

The Ecology EIM Database is a publicly available repository of environmental data collected in Washington state by both private and public entities. The database was reviewed for existing data within the vicinity of Piers 58 and 63 and reviewed for acceptability using several factors, as described below:

- Data within 10 years are generally accepted by regulatory agencies as being representative of current sediment quality conditions.
- Data completeness is required to understand the validity of the data; specifically, sampling depths and collection methods are required to know what the chemical data represents.
- Relevancy to the study was used to determine which data points were included. For example, specialized chemical compounds (i.e., polybrominated diphenyl ethers) that were collected for specific purposes, but do not have regulatory screening levels to assess them, were omitted.

Table 1 provides the sediment and tissue data available from EIM and the data acceptability of each sample.

Two sediment samples (from one location) and two tissue samples (from one location) were deemed acceptable near Pier 58 (Figure 1). Surface sediment samples were collected from the same location in 2007 and 2013. Samples were collected from the upper 2 centimeters (cm; dioxins/furans only) and upper 3 cm (all other results) and analyzed for total organic carbon (TOC), metals, semivolatile organic compounds (SVOCs), PAHs, pesticides, PCB Aroclors, and dioxins/furans. Mussel tissue was sampled in 2013 and 2018. Caged mussels were deployed and retrieved from the intertidal area of the Seattle Aquarium. Tissue samples were analyzed for metals, hexachlorobenzene, PAHs, pesticides, and PCB congeners. The 2007 data were included, even though they were older than 10 years, because they were the only dioxin/furan data found in the vicinity of the site.

Seven sediment samples (five from one location) were deemed acceptable near Pier 63 (Figure 2). Surface sediment from location 303D_LTDF01 was sampled in 2007, 2009, 2011, 2013, and 2015 as part of the King County Routine Marine Ambient Monitoring Study. Samples were collected from the upper 2 cm and tested for sulfide, total solids, TOC, metals, SVOCs, PAHs, PCB Aroclors, and pesticides. Two surface sediment samples were collected in 2004 from the upper 10 cm and analyzed for mercury, bis(2-ehtylhexyl)phthalate, PAHs, and PCB Aroclors. Three data points are older than 10 years, but were included due to the limited recent data available in the vicinity of the site.

Sediment Quality Assessment

Table 2 shows the existing sediment data compared to Washington State Sediment Management Standards (SMS) marine benthic screening levels provided in the Sediment Cleanup User Manual (SCUM II; Ecology 2017). These screening criteria are used to determine if there are potential effects to the benthic community relative to Sediment Cleanup Objective (SCO). Concentrations below the SCO are anticipated to have no effect; concentrations between SCO and Cleanup Screening Level (CSL) are anticipated to have minor adverse effects; and concentrations above the CSL are likely to have adverse effects to the benthic community.

For sediment in marine environments, there are benthic numeric criteria for 47 chemicals and narrative criteria for others (i.e., natural or regional background or risk-based thresholds). Some of the marine chemical criteria are based on dry weight, such as metals, while others are normalized with the organic carbon (OC) content of the sediment. Per SCUM II guidance, OC-normalized results are only applicable to samples with TOC content within 0.5% to 3.5%. If the TOC concentration in the sample is outside of 0.5% to 3.5%, dry weight apparent effects threshold (AET) criteria are used. The SMS marine benthic criteria are used in lieu of site-specific criteria, which are typically established for cleanup sites. No site-specific criteria have been established for Pier 58 or 63. Additional screening was applied using the preliminary Elliott Bay Regional Background Concentrations (Anchor QEA 2016). These screening levels were included because they provide realistic potential criteria for nearshore areas within Elliott Bay.

The chemical profile of samples collected from areas adjacent to Piers 58 and 63 are similar so are evaluated together. The following chemicals exceed one or more regulatory screening levels and may be considered contaminants of potential concern (COPCs):

- **Mercury** is elevated above the CSL at several locations. Surface concentrations are generally higher than the subsurface composites, but exceedances are present at both depths.
- **Copper** is elevated above the CSL at one surface location near Pier 58. Copper was not collected at any other surface sample locations, so the extent of elevated concentrations of this metal is unknown. There was no copper exceedance in subsurface samples.
- **PAHs** are elevated well above the CSL at several locations. Concentrations are elevated in both the surface and subsurface samples. Additionally, carcinogenic PAHs (cPAHs) are above the preliminary regional background concentration (Anchor QEA 2016).
- **PCBs** are elevated above the SCO at several surface locations.
- **Dioxins/furans** were above the preliminary regional background concentration in the one surface sample collected in 2007. These compounds are common urban COPCs and are elevated in other areas of Elliott Bay.

Tissue Quality Assessment

Table 3 provides available tissue data collected near Piers 58 and 63. Tissue data are useful to understand the bioavailability and human health risks of COPCs. Tissue criteria are site-specific, risk-based concentrations, which have not been established for Elliott Bay. In lieu of site-specific criteria, SCUM II (Ecology 2017), Suquamish Tribe-designated, adult-human health risk-based tissue concentrations are used as screening levels.

Recent mussel tissue data, collected from the same area in 2013 and 2018, were available from the underpier intertidal area by Pier 59 (Seattle Aquarium). In each event, caged mussels were deployed for approximately 2 months and then retrieved, shucked, and composited into a single tissue sample. Data indicate that risk-based tissue concentrations may be exceeded for several compounds, including arsenic, cadmium, cPAHs, and DDTs. Other sediment COPCs do not have SCUM II criteria for comparison (mercury, copper, PCBs, dioxins/furans) and are therefore unavailable for use in this assessment.

Conclusions

The existing data indicate that elevated concentrations of mercury, copper, PAHs, PCBs, and dioxins/furans are present in surface and/or subsurface sediments near Piers 58 and 63. Although only limited tissue data are available, they indicate that the sediment contaminants are bioavailable and could potentially pose ecological and/or human health risks.

References

Anchor QEA (Anchor QEA, LLC), 2016. *Elliott Bay Preliminary Regional Background Evaluation*, Sediment Cleanup Action Plan, Seattle Multimodal Terminal at Colman Dock. Prepared for Washington State Department of Transportation. November 2016.

Ecology (Washington State Department of Ecology), 2017. *Sediment Cleanup User's Manual II (SCUM II).* Publication No. 12-09-057. December 2017 Revision.

Shannon & Wilson, 2018. *Waterfront Seattle Program, Geotechnical and Environmental Data Report*. Prepared for Seattle Department of Transportation, City of Seattle, Washington. March 2018.

Figures

LEGEND:

◯ Historical Sample (Approximate Location)

NOTE:
1. Aerial imagery sourced from King County, WA (2017)

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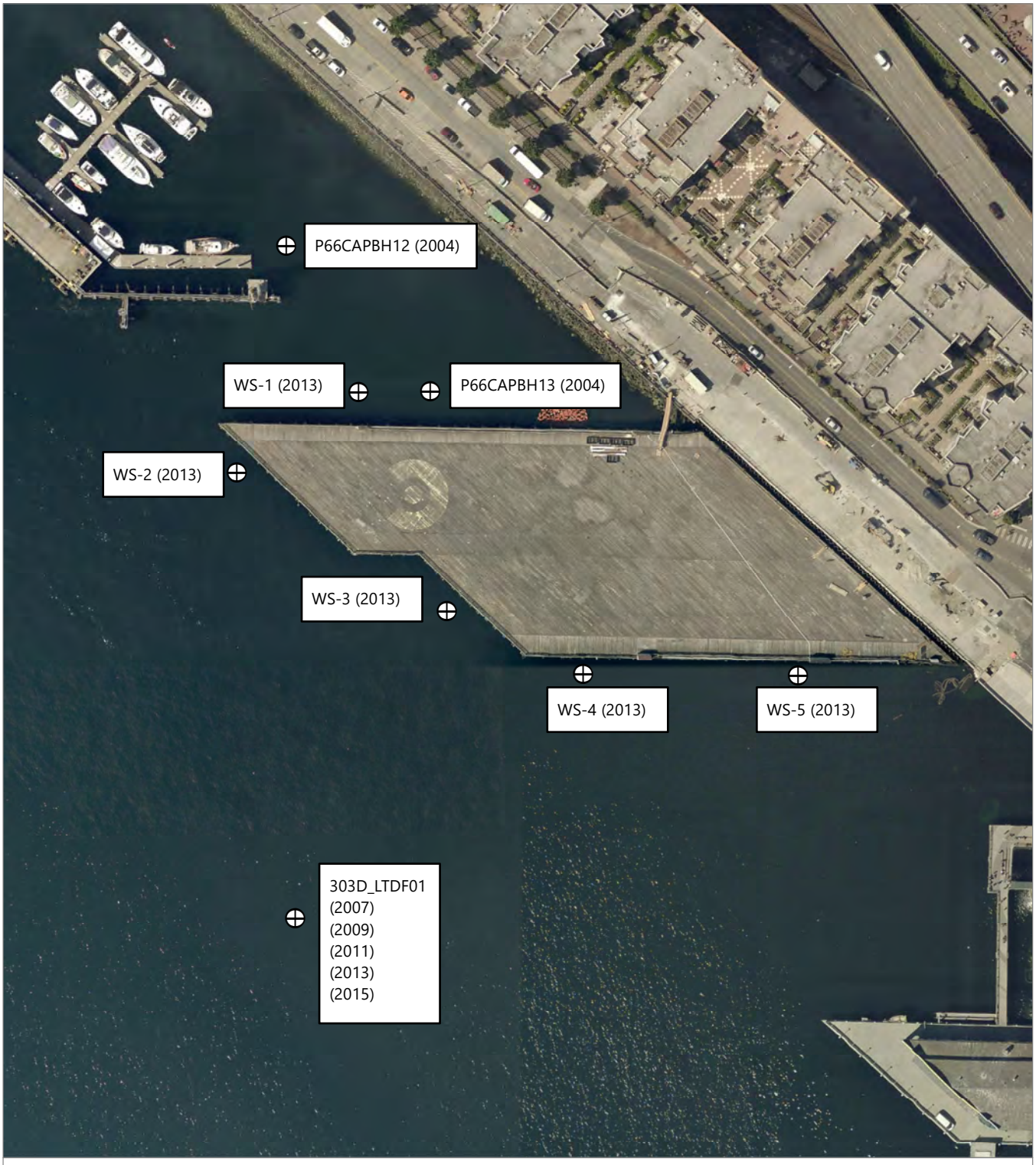
Figure 1
Pier 58 Historical Sample Locations
Pier 58 and 63 Existing Sediment Data Review Memorandum
Piers 58 and 63 Replacement Project



LEGEND:

◯ Historical Sample (Approximate Location)

NOTE:
1. Aerial imagery sourced from King County, WA (2017)
2. WS-1 is the mid-point of borings WS-1/1A and WS-1B

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Figure 2
Pier 63 Historical Sample Locations
Pier 58 and 63 Existing Sediment Data Review Memorandum
Piers 58 and 63 Replacement Project

Tables

Table 1
Environmental Information Management System Results

Pier	Location ID	Location Name	Study Name	Matrix	Sampling Date	Depth	Collection Method	Data Acceptability Status and Rationale[1]
58	EBCHEMSS-07	1985 Elliott Bay sediment survey	1985 Elliott Bay sediment survey	Sediment	1985	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
58	ELLTBAY	ELLTBAY	PSAMP - fish sampled for tissue and bioaccumuation analysis	Tissue	1989-1996	Not recorded in EIM	Not recorded in EIM	No: no chemistry, recency criteria not met
58	UWI-EB-188	Elliott Bay-188	Surface Sediment and Fish Tissue Chemistry in Greater Elliott Bay (Seattle) - Urban Waters Initiative	Sediment	2007	0-2 cm	Van Veen Grab Sampler	Yes: only D/F data available at Pier 58
58	UWI-EB-188	Elliott Bay-188	Urban Waters Initiative	Sediment	2013	0-3 cm	Van Veen Grab Sampler	Yes: recency criteria met
58	EB_P59	Elliott Bay, Seattle Aqrm, Pier 59	WDFW Mussel Watch Pilot Expansion project - toxic contaminants in Puget Sound nearshore biota: a large-scale synoptic survey using transplanted mussels (*Mytilus trossulus*)	Tissue	2013	Surface	Handpick	Yes: recency criteria met
58	EB_P59	Elliott Bay, Seattle Aqrm, Pier 59	Stormwater Action Monitoring Program Puget Nearshore Mussels	Tissue	2018	Surface	Handpick	Yes: recency criteria met
63	TPPSS0065	TPPS	TPPS Preliminary survey	Sediment	1982	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	EBCHEMSS-08	1985 Elliott Bay sediment survey	1985 Elliott Bay sediment survey	Sediment	1985	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	P53MON89LTDG02	P53MON89	Pier 53/55 Metro's Monitoring Report, 1989	Sediment	1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	HSSEAT88LTDF06	HSSEAT88	Metro's Hot Spot Invest. Waterfront, 1988	Sediment	1988-1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	HSSEAT88LTDG03	HSSEAT88	Metro's Hot Spot Invest. Waterfront, 1988	Sediment	1988-1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	HSSEAT88LTDG05	HSSEAT88	Metro's Hot Spot Invest. Waterfront, 1988	Sediment	1988-1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	HSSEAT88LTDG06	HSSEAT88	Metro's Hot Spot Invest. Waterfront, 1988	Sediment	1988-1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	HSSEAT89LTDG02	HSSEAT89	Metro's Hot Spot Invest. Waterfront, 1988	Sediment	1988-1989	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	PIER6465HC-SS03	PIER6465	Pier 64/65 Sediment Quality Assessment	Sediment	1990	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	METPSA92LTDF01	METPSA92	Metro's Puget Sound Ambient Monitoring, 1992	Sediment	1992	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	ELLIOTB1	Elliot Bay Sediment Trap Station EB-1	Elliot Bay Waterfront Recontamination Study	Sediment	1993-1994	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	CPSD9497LTDF01	CPSD9497	Ambient Subtidal Monitoring 1994-1997	Sediment	1995-1996	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	EVS95-WF-01	WF-01	Elliott Bay Duwamish River Fish Tissue & Bioaccumulation Investigation	Tissue	1995	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	EVS95-WF-02	WF-02		Tissue	1995	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	EVS95-WF-03	WF-03		Tissue	1995	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	PIER6465HC-B02	PIER6465	Pier 64/65 Sediment Quality Assessment	Sediment	1990	Not recorded in EIM	Not recorded in EIM	No: data incomplete; recency criteria not met
63	P66CAPBH12	P66CAP	Pier 66 Sediment Cap/Central Waterfront	Sediment	2004	0-10 cm	Not recorded in EIM	Yes: limited data available, so included
63	P66CAPBH13	P66CAP	Pier 66 Sediment Cap/Central Waterfront	Sediment	2004	0-10 cm	Not recorded in EIM	Yes: limited data available, so included
63	303D_LTDF01	LTDF01	King County Routine Marine Ambient Monitoring	Sediment	2007-2015	0-2 cm	Not recorded in EIM	Yes: recency criteria met; 2007 data part of temporal trend

Notes:

1. Data acceptability was based on a number of factors, including data recency (<10 years), data completeness, and relevancy to project.

cm: centimeter
D/F: dioxins/furans
EIM: Environmental Information Management System
PSAMP: Puget Sound Ambient Monitoring Program
TPPS: Metro Toxicant Protreatment Planning Study
WDFW: Washington Department of Fish and Wildlife

Table 2
Existing Sediment Data Near Piers 63 and 58

							King County Routine Marine Ambient Monitoring Study					Pier 66 Cap	
						Study	LTDF01	LTDF01	LTDF01	LTDF01	LTDF01	P66CAPBH13	P66CAPBH12
						Location ID							
						Sample Date	06/26/07	06/29/09	06/13/11	06/03/13	06/23/15	03/26/04	03/26/04
						Depth	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-10 cm	0-10 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background							
Conventional Parameters (mg/kg)													
Sulfide	SM4500S2D	--	--	--	--	--	1.086U	1.1U	**23.2**	**5.8**	**2.9J**	**3600**	**3900**
Conventional Parameters (%)													
Total organic carbon	Plumb 1981	--	--	--	--	--	**0.57%**	**3.01%**	**2.22%**	**3.56%**	**2.26%**	**4.9**	**5.9**
Total Solids	SM2540G	--	--	--	--	--	**54.3**	**44.2**	**53.5**	**45.5**	**54.4**	**43**	**45**
Petroleum Hydrocarbons (mg/kg)													
Diesel Range Organics	NWTPH-Dx	--	--	--	--	--	--	--	--	--	--	--	--
Lube Oil Range Organics	NWTPH-Dx	--	--	--	--	--	--	--	--	--	--	--	--
Metals (mg/kg)													
Antimony	SW6020A	--	--	--	--	--	2.0UJ	1.7UJ	1.4UJ	--	--	--	--
Arsenic	SW6020A	57	93	57	93	13	**2.5J**	**11J**	**9.7J**	**11J**	**11J**	--	--
Cadmium	SW6020A	5.1	6.7	5.1	6.7	--	**0.05J**	**0.41J**	**0.34J**	**0.24J**	**0.33**	--	--
Chromium	SW6020A	260	270	260	270	--	**9.2**	**39**	**34**	**38**	**33**	--	--
Copper	SW6020A	390	390	390	390	--	**12**	**52**	**46**	**65**	**44**	--	--
Lead	SW6020A	450	530	450	530	--	**19**	**59**	**56**	**61**	**55**	--	--
Mercury	SW7471B	0.41	0.59	0.41	0.59	0.38	**0.09**	**0.40**	**0.40**	**0.46**	**0.49**	**1.9J**	**1.2J**
Selenium	SW6020A	--	--	--	--	--	--	2.9U	--	--	--	--	--
Silver	SW6020A	6.1	6.1	6.1	6.1	--	**0.26J**	**0.93J**	**0.52J**	**0.51J**	**0.825J**	--	--
Zinc	SW6020A	410	960	410	960	--	**19**	**93**	**75**	**88**	**76**	--	--
Semivolatile Organics (µg/kg)													
1,2,4-Trichlorobenzene	SW8270D	31	51	--	--	--	0.11U	0.23U	0.82U	1.2U	0.97U	--	--
1,2-Dichlorobenzene	SW8270D	35	50	--	--	--	0.22U	0.45U	8.3U	11.7U	9.8U	--	--
1,4-Dichlorobenzene	SW8270D	110	110	--	--	--	**0.56**	0.45U	12.5U	17.6U	14.7U	--	--
2,4-Dimethylphenol	SW8270D	29	29	29	29	--	1.09U	2.3U	8.2U	12U	9.7U	--	--
2-Methylphenol (o-Cresol)	SW8270D	63	63	63	63	--	2.17U	4.5U	8.2U	12U	9.7U	--	--
4-Methylphenol (p-Cresol)	SW8270D	670	670	670	670	--	4.34U	9U	41U	59U	50U	--	--
Benzoic acid	SW8270D	650	650	650	650	--	**29**	**405**	**140J**	**325**	197U	--	--
Benzyl alcohol	SW8270D	57	73	57	73	--	2.2U	4.5U	20.7U	29.2U	24.4U	--	--
bis(2-Ethylhexyl)phthalate	SW8270D	1300	3100	--	--	--	**149**	89.4UJ	**114**	**86.4**	**53.9**	**260**	**420**
Butylbenzyl phthalate	SW8270D	63	900	--	--	--	**14.2**	**17.2**	**14.3J**	17.6U	14.7U	--	--
Diethyl phthalate	SW8270D	200	1200	--	--	--	4.34U	9U	17U	**131**	20U	--	--
Dimethyl phthalate	SW8270D	71	160	--	--	--	4.34U	9U	16.6U	23.5U	19.7U	--	--
Di-n-butyl phthalate	SW8270D	1400	1400	--	--	--	**5.5**	**15J**	**22J**	24U	**22J**	--	--
Di-n-octyl phthalate	SW8270D	6200	6200	--	--	--	4.34U	9U	16.6U	23.5U	19.7U	--	--
Hexachlorobenzene	SW8270D	22	70	--	--	--	0.11U	0.23U	0.82U	1.2U	0.97U	--	--
Hexachlorobutadiene	SW8270D	11	120	--	--	--	0.54U	1.1U	4.1U	5.9U	5U	--	--
n-Nitrosodiphenylamine	SW8270D	28	40	--	--	--	4.34U	9U	20.7U	29.2U	24.4U	--	--
Pentachlorophenol	SW8270D	360	690	360	690	--	10.9U	23U	125U	176U	147U	--	--
Phenol	SW8270D	420	1200	420	1200	--	4.34U	9U	41U	59U	50U	--	--
Semivolatile Organics (mg/kg-OC)													
1,2,4-Trichlorobenzene	SW8270D	--	--	0.81	1.8	--	0.0191U	0.008U	0.04U	0.03U	0.04U	--	--
1,2-Dichlorobenzene	SW8270D	--	--	2.3	2.3	--	0.038U	0.015U	0.38U	0.33U	0.43U	--	--
1,4-Dichlorobenzene	SW8270D	--	--	3.1	9	--	**0.097**	0.015U	0.56U	0.49U	0.65U	--	--
bis(2-Ethylhexyl)phthalate	SW8270D	--	--	47	78	--	**26.2**	2.97UJ	**5.14**	**2.43**	**2.38**	--	--
Butylbenzyl phthalate	SW8270D	--	--	4.9	64	--	**2.49**	**0.571**	0.64J	0.49U	0.65U	--	--
Diethyl phthalate	SW8270D	--	--	61	110	--	0.762U	0.299U	0.77U	**3.68**	0.88U	--	--
Dimethyl phthalate	SW8270D	--	--	53	53	--	0.762U	0.299U	0.75U	0.66U	0.87U	--	--
Di-n-butyl phthalate	SW8270D	--	--	220	1,700	--	**0.962**	**0.498J**	0.99J	0.67U	**0.97J**	--	--
Di-n-octyl phthalate	SW8270D	--	--	58	4500	--	0.762U	0.299U	0.75U	0.66U	0.87U	--	--
Hexachlorobenzene	SW8270D	--	--	0.38	2.3	--	0.019U	0.008U	0.04U	0.03U	0.04U	--	--
Hexachlorobutadiene	SW8270D	--	--	3.9	6.2	--	0.095U	0.037U	0.18U	0.17U	0.22U	--	--
n-Nitrosodiphenylamine	SW8270D	--	--	11	11	--	0.762U	0.299U	0.93U	0.82U	1.08U	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)													
1-Methylnaphthalene	SW8270DSIM	--	--	--	--	--	--	--	--	--	**12J**	--	--
2-Methylnaphthalene	SW8270DSIM	670	670	--	--	--	**3.4**	**19.4**	**11J**	**81.1**	**13J**	120U	**400**
Acenaphthene	SW8270DSIM	500	500	--	--	--	**15.4**	**32.6**	**30.1**	**147**	**26.5**	**290**	**140**
Acenaphthylene	SW8270DSIM	1300	1300	--	--	--	**8.9**	**35.7**	**36.4**	**90.8**	**35.3**	**230**	**470**
Anthracene	SW8270DSIM	960	960	--	--	--	**61**	**221**	**181**	**495**	**151**	**1100**	**1600**

Table 2
Existing Sediment Data Near Piers 63 and 58

						Study	King County Routine Marine Ambient Monitoring Study					Pier 66 Cap	
						Location ID	LTDF01	LTDF01	LTDF01	LTDF01	LTDF01	P66CAPBH13	P66CAPBH12
						Sample Date	06/26/07	06/29/09	06/13/11	06/03/13	06/23/15	03/26/04	03/26/04
						Depth	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-10 cm	0-10 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background							
Benzo(a)anthracene	SW8270DSIM	1300	1600	--	--	--	**146**	**511**	**327**	**813**	**307**	**1500**	**2900**
Benzo(a)pyrene	SW8270DSIM	1600	1600	--	--	--	**197**	**550**	**523**	**1030**	**403**	**2500**	**3000**
Benzo(b,j,k)fluoranthenes	SW8270DSIM	3,200	3,600	--	--	--	**333**	**1120**	**897**	**2080**	**871**	**5400**	**7200**
Benzo(g,h,i)perylene	SW8270DSIM	670	720	--	--	--	**74**	**269**	**258**	**301**	**169**	**660**	**1100**
Chrysene	SW8270DSIM	1,400	2800	--	--	--	**200**	**597**	**469**	**1400**	**460**	**2200**	**4100**
Dibenzo(a,h)anthracene	SW8270DSIM	230	230	--	--	--	**37**	**126**	**119J**	**115**	**56.1**	**270**	**490**
Dibenzofuran	SW8270DSIM	540	540	--	--	--	**6.6**	**22.9**	**22.2**	**83.7**	**23**	**150**	**400**
Fluoranthene	SW8270DSIM	1700	2500	--	--	--	**206**	**640**	**574**	**2100**	**465**	**2400**	**2800**
Fluorene	SW8270DSIM	540	540	--	--	--	**18**	**50.7**	**55**	**158**	**41**	**300**	**490**
Indeno(1,2,3-cd)pyrene	SW8270DSIM	600	690	--	--	--	**90**	**271**	**232**	**431**	**193**	**720**	**1100**
Naphthalene	SW8270DSIM	2100	2100	--	--	--	**6.2**	**21.4**	**25.8**	**132**	**28.9**	**180**	**130**
Phenanthrene	SW8270DSIM	1500	1,500	--	--	--	**113**	**419**	**351**	**1250**	**272**	**1900**	**2000**
Pyrene	SW8270DSIM	2600	3300	--	--	--	**241**	**799**	**703**	**2370**	**603**	**5200**	**12000**
Total cPAH TEQ (U = 0)	Calculated	--	--	--	--	380	**259**	**758**	**685**	**1388**	**550**	**3300**	**4200**
Total HPAH (U = 0)	Calculated	12000	17000	--	--	--	**1190**	**3763**	**4102J**	**10640**	**3527**	**15500**	**27500**
Total LPAH (U = 0)	Calculated	5200	5200	--	--	--	**223**	**780.4**	**679.3**	**2273**	**555**	**4000**	**5230**
Polycyclic Aromatic Hydrocarbons (mg/kg-OC)													
1-Methylnaphthalene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	SW8270DSIM	--	--	38	64	--	**0.60**	**0.64**	**0.50J**	**2.28**	**0.58J**	--	--
Acenaphthene	SW8270DSIM	--	--	16	57	--	**2.71**	**1.08**	**1.36**	**4.13**	**1.17**	--	--
Acenaphthylene	SW8270DSIM	--	--	66	66	--	**1.56**	**1.19**	**1.64**	**2.55**	**1.56**	--	--
Anthracene	SW8270DSIM	--	--	220	1200	--	**10.8**	**7.34**	**8.15**	**13.9**	**6.68**	--	--
Benzo(a)anthracene	SW8270DSIM	--	--	110	270	--	**25.5**	**17.0**	**14.7**	**22.8**	**13.60**	--	--
Benzo(a)pyrene	SW8270DSIM	--	--	99	210	--	**34.5**	**18.3**	**23.6**	**28.9**	**17.80**	--	--
Benzo(b)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(j,k)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b,j,k)fluoranthenes	SW8270DSIM	--	--	230	450	--	**58**	**37**	**40.4**	**58.4**	**38.50**	--	--
Benzo(g,h,i)perylene	SW8270DSIM	--	--	31	78	--	**13.05**	**8.94**	**11.6**	**8.46**	**7.50**	--	--
Chrysene	SW8270DSIM	--	--	110	460	--	**35.15**	**19.8**	**21.1**	**39.3**	**20.40**	--	--
Dibenzo(a,h)anthracene	SW8270DSIM	--	--	12	33	--	**6.51**	**4.19**	**5.4J**	**3.23**	**2.48**	--	--
Dibenzofuran	SW8270DSIM	--	--	--	--	--	**1.15**	**0.76**	**1.0**	**2.35**	**1.02**	--	--
Fluoranthene	SW8270DSIM	--	--	160	1200	--	**36.1**	**21.3**	**25.9**	**59**	**20.60**	--	--
Fluorene	SW8270DSIM	--	--	23	79	--	**3.12**	**1.68**	**2.48**	**4.44**	**1.81**	--	--
Indeno(1,2,3-c,d)pyrene	SW8270DSIM	--	--	34	88	--	**15.7**	**9.0**	**10.5**	**12.1**	**8.54**	--	--
Naphthalene	SW8270DSIM	--	--	99	170	--	**1.09**	**0.71**	**1.16**	**3.71**	**1.28**	--	--
Phenanthrene	SW8270DSIM	--	--	100	480	--	**19.8**	**13.9**	**15.8**	**35.1**	**12.00**	--	--
Pyrene	SW8270DSIM	--	--	1000	1400	--	**42.2**	**26.5**	**31.7**	**66.6**	**26.70**	--	--
Total HPAH (DMMP) (U = 0)	Calculated	--	--	960	5300	--	**267**	**162**	**185J**	**299**	**156**	--	--
Total LPAH (DMMP) (U = 0)	Calculated	--	--	370	780	--	**39.1**	**25.9**	**30.6**	**63.8**	**24.5**	--	--
Pesticides (µg/kg)													
4,4'-DDD	SW8081B	--	--	--	--	--	**1.08**	1.5U	**3.07**	**6.62**	**3.09**	--	--
4,4'-DDE	SW8081B	--	--	--	--	--	**1.21**	1.5U	1.5U	0.95J	1.5U	--	--
4,4'-DDT	SW8081B	--	--	--	--	--	**7.49**	1.5U	1.5U	0.88U	2U	--	--
Aldrin	SW8081B	--	--	--	--	--	0.72U	1.5U	1.5U	--	--	--	--
cis-Chlordane	SW8081B	--	--	--	--	--	0.36U	0.75U	0.75U	--	--	--	--

Table 2
Existing Sediment Data Near Piers 63 and 58

						Study	King County Routine Marine Ambient Monitoring Study					Pier 66 Cap	
						Location ID	LTDF01	LTDF01	LTDF01	LTDF01	LTDF01	P66CAPBH13	P66CAPBH12
						Sample Date	06/26/07	06/29/09	06/13/11	06/03/13	06/23/15	03/26/04	03/26/04
						Depth	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-2 cm	0-10 cm	0-10 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background							
trans-Chlordane	SW8081B	--	--	--	--	--	0.36U	0.75U	0.75U	--	--	--	--
Dieldrin	SW8081B	--	--	--	--	--	0.72U	1.5U	1.5U	--	--	--	--
Heptachlor	SW8081B	--	--	--	--	--	0.36U	0.75U	0.75U	--	--	--	--
cis-Nonachlor	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--
trans-Nonachlor	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--
Oxychlordane	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--
Sum 4,4 DDT, DDE, DDD (U = 0)	Calculated	--	--	--	--	--	**9.78**	1.5U	**3.07**	**6.62**	**3.09**	--	--
Sum of cis-Chlordane and trans-Chlordane (U = 0)	Calculated	--	--	--	--	--	0.36U	0.75U	0.75U	--	--	--	--
Dioxin Furans (ng/kg)													
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Tetrachlorodibenzofuran (TCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	Calculated	--	--	--	--	--	--	--	--	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	Calculated	--	--	--	--	14	--	--	--	--	--	--	--
PCB Aroclors (µg/kg)													
Aroclor 1016	SW8082A	--	--	--	--	--	2.86U	4.5U	3.7U	4.4U	7.4U	39U	79U
Aroclor 1221	SW8082A	--	--	--	--	--	1.81U	3.8U	7.5U	13U	22U	39U	79U
Aroclor 1232	SW8082A	--	--	--	--	--	1.81U	3.8U	7.5U	13U	22U	39U	79U
Aroclor 1242	SW8082A	--	--	--	--	--	0.91U	1.9U	**8.07**	**11J**	**8.6J**	39U	79U
Aroclor 1248	SW8082A	--	--	--	--	--	**5.92**	**12.2**	3.7U	4.4U	7.4U	39U	**180J**
Aroclor 1254	SW8082A	--	--	--	--	--	**25.58**	**39.4**	**48.6**	**65.9**	53.7	**220J**	**400**
Aroclor 1260	SW8082A	--	--	--	--	--	**14.44**	**40.7**	**36.6**	**59.3**	**59**	**88**	**230**
Aroclor 1262	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1268	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (U = 0)	Calculated	130	1,000	--	--	95	**45.9**	**92.3**	**93.3**	**136.2J**	**121.3J**	**300J**	**810J**
PCB Aroclors (mg/kg-OC)													
Aroclor 1016	SW8082A	--	--	--	--	--	0.50U	0.15U	0.17U	0.12U	0.33U	--	--
Aroclor 1221	SW8082A	--	--	--	--	--	0.32U	0.13U	0.34U	0.37U	0.97U	--	--
Aroclor 1232	SW8082A	--	--	--	--	--	0.32U	0.13U	0.34U	0.37U	0.97U	--	--
Aroclor 1242	SW8082A	--	--	--	--	--	0.16U	0.06U	**0.36**	**0.31J**	**0.38J**	--	--
Aroclor 1248	SW8082A	--	--	--	--	--	**1.04**	**0.41**	0.17U	0.12U	0.33U	--	--
Aroclor 1254	SW8082A	--	--	--	--	--	**4.49**	**1.3**	**2.19**	**1.85**	**2.38**	--	--
Aroclor 1260	SW8082A	--	--	--	--	--	**2.53**	**1.4**	**1.65**	**1.67**	**2.61**	--	--
Aroclor 1262	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1268	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (U = 0)	Calculated	--	--	12	65	--	**8.06**	**3.07**	**4.2**	**3.83J**	**5.37J**	--	--

Table 2
Existing Sediment Data Near Piers 63 and 58

						Study	Shannon & Wilson Waterfront Geotechnical and Environmental Study					Shannon & Wilson		PSAMP and NOAA	
						Location ID	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7	UWI-EB-188	UWI-EB-188
						Sample Date	10/14/13	10/17/13	10/21/13	10/10/13	10/08/13	10/24/13	10/28/13	06/19/07	06/05/13
						Depth	0-16.2 feet	4-18.6 feet	0-14.2 feet	0.5-13.8 feet	4.5-20.2 feet	0-20 feet	0-13.5 feet	0-2 cm	0-3 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 58	Pier 58	Pier 58	Pier 58
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background									
Conventional Parameters (mg/kg)															
Sulfide	SM4500S2D	--	--	--	--	--	--	--	**--**	--	--	--	--	--	--
Conventional Parameters (%)															
Total organic carbon	Plumb 1981	--	--	--	--	--	--	--	**--**	--	--	--	--	--	**3.13**
Total Solids	SM2540G	--	--	--	--	--	--	--	**--**	--	--	--	--	--	--
Petroleum Hydrocarbons (mg/kg)															
Diesel Range Organics	NWTPH-Dx	--	--	--	--	--	**168**	25.5U	20U	20.4U	**216**	**1130**	--	--	--
Lube Oil Range Organics	NWTPH-Dx	--	--	--	--	--	**657**	63.8U	51U	**74**	**130**	**579**	--	--	--
Metals (mg/kg)															
Antimony	SW6020A	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	SW6020A	57	93	57	93	13	**7.62**	**7.7**	**4.42**	**4.54**	**4.35**	**10.5**	**4**	--	**10.5**
Cadmium	SW6020A	5.1	6.7	5.1	6.7	--	**0.42**	0.21U	0.19U	0.21U	**0.20**	**1.33**	0.18U	--	**0.41**
Chromium	SW6020A	260	270	260	270	--	**22.0**	**19.0**	**18.1**	**30.2**	**20.5**	**32.4**	**18.5**	--	**53.7**
Copper	SW6020A	390	390	390	390	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	**480**
Lead	SW6020A	450	530	450	530	--	**37.6**	**2.18**	**8.54**	**19.3**	**18.7**	**150**	**7.58**	--	**62.2**
Mercury	SW7471B	0.41	0.59	0.41	0.59	0.38	**0.28**	0.31U	0.29U	0.32U	0.26U	**1.37**	**0.53**	--	**0.988**
Selenium	SW6020A	--	--	--	--	--	0.38U	0.51U	0.49U	0.51U	**0.49**	**0.8**	0.46U	--	**0.654**
Silver	SW6020A	6.1	6.1	6.1	6.1	--	**0.49**	0.10U	0.10U	0.10U	**0.15**	**2.74**	0.09U	--	**1.14**
Zinc	SW6020A	410	960	410	960	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	**124**
Semivolatile Organics (µg/kg)															
1,2,4-Trichlorobenzene	SW8270D	31	51	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	14U
1,2-Dichlorobenzene	SW8270D	35	50	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	14U
1,4-Dichlorobenzene	SW8270D	110	110	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	**13J**
2,4-Dimethylphenol	SW8270D	29	29	29	29	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	--
2-Methylphenol (o-Cresol)	SW8270D	63	63	63	63	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	140U
4-Methylphenol (p-Cresol)	SW8270D	670	670	670	670	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	140U
Benzoic acid	SW8270D	650	650	650	650	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	720UJ
Benzyl alcohol	SW8270D	57	73	57	73	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	--
bis(2-Ethylhexyl)phthalate	SW8270D	1300	3100	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	**410J**
Butylbenzyl phthalate	SW8270D	63	900	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	--
Diethyl phthalate	SW8270D	200	1200	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	--	140U
Dimethyl phthalate	SW8270D	71	160	--	--	--	--	--	--	--	--	--	--	--	27U
Di-n-butyl phthalate	SW8270D	1400	1400	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	SW8270D	6200	6200	--	--	--	--	--	--	--	--	--	--	--	140UJ
Hexachlorobenzene	SW8270D	22	70	--	--	--	--	--	--	--	--	--	--	--	14U
Hexachlorobutadiene	SW8270D	11	120	--	--	--	--	--	--	--	--	--	--	--	14U
n-Nitrosodiphenylamine	SW8270D	28	40	--	--	--	--	--	--	--	--	--	--	--	14UJ
Pentachlorophenol	SW8270D	360	690	360	690	--	--	--	--	--	--	--	--	--	140U
Phenol	SW8270D	420	1200	420	1200	--	--	--	--	--	--	--	--	--	270U
Semivolatile Organics (mg/kg-OC)															
1,2,4-Trichlorobenzene	SW8270D	--	--	0.81	1.8	--	--	--	--	--	--	--	--	--	0.45U
1,2-Dichlorobenzene	SW8270D	--	--	2.3	2.3	--	--	--	--	--	--	--	--	--	0.45U
1,4-Dichlorobenzene	SW8270D	--	--	3.1	9	--	--	--	--	--	--	--	--	--	**0.42J**
bis(2-Ethylhexyl)phthalate	SW8270D	--	--	47	78	--	--	--	--	--	--	--	--	--	**13J**
Butylbenzyl phthalate	SW8270D	--	--	4.9	64	--	--	--	--	--	--	--	--	--	
Diethyl phthalate	SW8270D	--	--	61	110	--	--	--	--	--	--	--	--	--	4.5U
Dimethyl phthalate	SW8270D	--	--	53	53	--	--	--	--	--	--	--	--	--	0.9U
Di-n-butyl phthalate	SW8270D	--	--	220	1,700	--	--	--	--	--	--	--	--	--	
Di-n-octyl phthalate	SW8270D	--	--	58	4500	--	--	--	--	--	--	--	--	--	4.5UJ
Hexachlorobenzene	SW8270D	--	--	0.38	2.3	--	--	--	--	--	--	--	--	--	0.5U
Hexachlorobutadiene	SW8270D	--	--	3.9	6.2	--	--	--	--	--	--	--	--	--	0.5U
n-Nitrosodiphenylamine	SW8270D	--	--	11	11	--	--	--	--	--	--	--	--	--	0.5U
Polycyclic Aromatic Hydrocarbons (µg/kg)															
1-Methylnaphthalene	SW8270DSIM	--	--	--	--	--	**176**	59U	123	55U	1560	592	196	--	**177**
2-Methylnaphthalene	SW8270DSIM	670	670	--	--	--	**226**	59U	**145**	55U	**2640**	**819**	**271**	--	**290**
Acenaphthene	SW8270DSIM	500	500	--	--	--	**619**	59U	**82**	55U	**3080**	**3560**	**271**	--	**213**
Acenaphthylene	SW8270DSIM	1300	1300	--	--	--	**112**	59U	58U	55U	**166**	**245**	57U	--	**193**
Anthracene	SW8270DSIM	960	960	--	--	--	**626**	59U	58U	55U	**1250**	**5750**	**344**	--	**747**

Table 2
Existing Sediment Data Near Piers 63 and 58

						Study	Shannon & Wilson Waterfront Geotechnical and Environmental Study					Shannon & Wilson		PSAMP and NOAA	
						Location ID	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7	UWI-EB-188	UWI-EB-188
						Sample Date	10/14/13	10/17/13	10/21/13	10/10/13	10/08/13	10/24/13	10/28/13	06/19/07	06/05/13
						Depth	0-16.2 feet	4-18.6 feet	0-14.2 feet	0.5-13.8 feet	4.5-20.2 feet	0-20 feet	0-13.5 feet	0-2 cm	0-3 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 58	Pier 58	Pier 58	Pier 58
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background									
Benzo(a)anthracene	SW8270DSIM	1300	1600	--	--	--	**726**	59U	58U	55U	**1260**	**3760**	**203**	--	**692**
Benzo(a)pyrene	SW8270DSIM	1600	1600	--	--	--	**1110**	59U	58U	55U	**1210**	**1560**	**89**	--	**1400**
Benzo(b,j,k)fluoranthenes	SW8270DSIM	3,200	3,600	--	--	--	**2030**	59U	58U	**59**	**2476**	**3076**	**210**	--	**2490**
Benzo(g,h,i)perylene	SW8270DSIM	670	720	--	--	--	**547**	59U	58U	55U	**470**	**775**	57U	--	**853**
Chrysene	SW8270DSIM	1,400	2800	--	--	--	**1100**	59U	58U	55U	**1620**	**4620**	**260**	--	**1310**
Dibenzo(a,h)anthracene	SW8270DSIM	230	230	--	--	--	**87**	59U	58U	55U	**94**	**129**	57U	--	**250**
Dibenzofuran	SW8270DSIM	540	540	--	--	--	**--**	**--**	**--**	**--**	--	--	--	--	**282**
Fluoranthene	SW8270DSIM	1700	2500	--	--	--	**1670**	**200**	58U	**99**	**5530**	**19900**	**809**	--	**1590**
Fluorene	SW8270DSIM	540	540	--	--	--	**563**	59U	58U	55U	**2750**	**2580**	**306**	--	**274**
Indeno(1,2,3-cd)pyrene	SW8270DSIM	600	690	--	--	--	**473**	59U	58U	55U	**432**	**629**	57U	--	**735**
Naphthalene	SW8270DSIM	2100	2100	--	--	--	**246**	59U	**941**	**62**	**5380**	**1670**	**535**	--	**850**
Phenanthrene	SW8270DSIM	1500	1,500	--	--	--	**1820**	**109**	58U	**69**	**8590**	**4780**	**669**	--	**1250**
Pyrene	SW8270DSIM	2600	3300	--	--	--	**3810**	**152**	58U	**202**	**4990**	**13200**	**736**	--	**2120**
Total cPAH TEQ (U = 0)	Calculated	--	--	--	--	380	**1450**	59U	58U	**40**	**1650**	**2370**	**140**	--	**1830**
Total HPAH (U = 0)	Calculated	12000	17000	--	--	--	**9523**	**352**	**58U**	**301**	**15606**	**44573**	**2097**	--	**11440**
Total LPAH (U = 0)	Calculated	5200	5200	--	--	--	**4212**	**109**	**1168**	**131**	**23856**	**19404**	**2396**	--	**3527**
Polycyclic Aromatic Hydrocarbons (mg/kg-OC)															
1-Methylnaphthalene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--	--	**5.7**
2-Methylnaphthalene	SW8270DSIM	--	--	38	64	--	--	--	--	--	--	--	--	--	**9.3**
Acenaphthene	SW8270DSIM	--	--	16	57	--	--	--	--	--	--	--	--	--	**6.8**
Acenaphthylene	SW8270DSIM	--	--	66	66	--	--	--	--	--	--	--	--	--	**6.2**
Anthracene	SW8270DSIM	--	--	220	1200	--	--	--	--	--	--	--	--	--	**24**
Benzo(a)anthracene	SW8270DSIM	--	--	110	270	--	--	--	--	--	--	--	--	--	**22**
Benzo(a)pyrene	SW8270DSIM	--	--	99	210	--	--	--	--	--	--	--	--	--	**45**
Benzo(b)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--	--	**38**
Benzo(k)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--	--	**42**
Benzo(j,k)fluoranthene	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b,j,k)fluoranthenes	SW8270DSIM	--	--	230	450	--	--	--	--	--	--	--	--	--	**80**
Benzo(g,h,i)perylene	SW8270DSIM	--	--	31	78	--	--	--	--	--	--	--	--	--	**27**
Chrysene	SW8270DSIM	--	--	110	460	--	--	--	--	--	--	--	--	--	**42**
Dibenzo(a,h)anthracene	SW8270DSIM	--	--	12	33	--	--	--	--	--	--	--	--	--	**8**
Dibenzofuran	SW8270DSIM	--	--	--	--	--	--	--	--	--	--	--	--	--	**9**
Fluoranthene	SW8270DSIM	--	--	160	1200	--	--	--	--	--	--	--	--	--	**21**
Fluorene	SW8270DSIM	--	--	23	79	--	--	--	--	--	--	--	--	--	**8.8**
Indeno(1,2,3-c,d)pyrene	SW8270DSIM	--	--	34	88	--	--	--	--	--	--	--	--	--	**23**
Naphthalene	SW8270DSIM	--	--	99	170	--	--	--	--	--	--	--	--	--	**27**
Phenanthrene	SW8270DSIM	--	--	100	480	--	--	--	--	--	--	--	--	--	**40**
Pyrene	SW8270DSIM	--	--	1000	1400	--	--	--	--	--	--	--	--	--	**68**
Total HPAH (DMMP) (U = 0)	Calculated	--	--	960	5300	--	--	--	--	--	--	--	--	--	**365**
Total LPAH (DMMP) (U = 0)	Calculated	--	--	370	780	--	--	--	--	--	--	--	--	--	**113**
Pesticides (µg/kg)															
4,4'-DDD	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**5.7**
4,4'-DDE	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**1.5**
4,4'-DDT	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**18**
Aldrin	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.51**
cis-Chlordane	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**1**

Table 2
Existing Sediment Data Near Piers 63 and 58

						Study	Shannon & Wilson Waterfront Geotechnical and Environmental Study					Shannon & Wilson		PSAMP and NOAA	
						Location ID	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7	UWI-EB-188	UWI-EB-188
						Sample Date	10/14/13	10/17/13	10/21/13	10/10/13	10/08/13	10/24/13	10/28/13	06/19/07	06/05/13
						Depth	0-16.2 feet	4-18.6 feet	0-14.2 feet	0.5-13.8 feet	4.5-20.2 feet	0-20 feet	0-13.5 feet	0-2 cm	0-3 cm
						Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
						Location	Pier 63	Pier 63	Pier 63	Pier 63	Pier 63	Pier 58	Pier 58	Pier 58	Pier 58
		AET Marine SQS SCUM II	AET Marine CSL SCUM II	SMS Marine SCO SCUM II	SMS Marine CSL SCUM II	Preliminary Regional Background									
trans-Chlordane	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**1.2**
Dieldrin	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**1**
Heptachlor	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**1**
cis-Nonachlor	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Nonachlor	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Oxychlordane	SW8081B	--	--	--	--	--	--	--	--	--	--	--	--	--	**2**
Sum 4,4 DDT, DDE, DDD (U = 0)	Calculated	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sum of cis-Chlordane and trans-Chlordane (U = 0)	Calculated	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)															
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**0.416**	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**3.09**	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**4.23**	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**19.5**	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**7.49**	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**630**	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**6510**	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**2.22**	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**2.09**	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**2.25**	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**13.3**	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**3.67**	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**2.02**	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**5.13**	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**129**	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**8.32**	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	**434**	--
Total Tetrachlorodibenzofuran (TCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Pentachlorodibenzofuran (PeCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Hexachlorodibenzofuran (HxCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Heptachlorodibenzofuran (HpCDF)	E1613B	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	Calculated	--	--	--	--	--	--	--	--	--	--	--	--	**20**	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	Calculated	--	--	--	--	14	--	--	--	--	--	--	--	**20**	--
PCB Aroclors (µg/kg)															
Aroclor 1016	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	5.1U
Aroclor 1221	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	10U
Aroclor 1232	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	10U
Aroclor 1242	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	**12J**
Aroclor 1248	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	30UJ
Aroclor 1254	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	**71J**
Aroclor 1260	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	**66J**
Aroclor 1262	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	57UJ
Aroclor 1268	SW8082A	--	--	--	--	--	0.12U	--	--	--	0.09U	0.15U	--	--	5.1U
Total PCBs (U = 0)	Calculated	130	1,000	--	--	95	0.12U	--	--	--	0.09U	0.15U	--	--	**149**
PCB Aroclors (mg/kg-OC)															
Aroclor 1016	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.16U
Aroclor 1221	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.32U
Aroclor 1232	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.32U
Aroclor 1242	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.38J
Aroclor 1248	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.96UJ
Aroclor 1254	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	**2.3J**
Aroclor 1260	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	**2.1J**
Aroclor 1262	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	1.8UJ
Aroclor 1268	SW8082A	--	--	--	--	--	--	--	--	--	--	--	--	--	0.16U
Total PCBs (U = 0)	Calculated	--	--	12	65	--	--	--	--	--	--	--	--	--	**4.76J**

Table 3
Existing Tissue Data Near Pier 58

		Study	Elliott Bay, Seattle Aqrm Pier 59	
		Location ID	EB_P59	EB_P59
		Sample Date	01/09/13	02/27/18
		Depth	--	--
		Matrix	Tissue	Tissue
		Location	Pier 58	Pier 58
		Suquamish Tribal Adult - Human Health Risk-Based Tissue Concentrations		
Metals (mg/kg)				
Arsenic	SW6020A	0.00012	**0.80**	--
Cadmium	SW6020A	0.16	**0.30**	--
Copper	SW6020A	--	**0.80**	--
Lead	SW6020A	--	**0.06**	--
Mercury	SW7471B	--	**0.006**	--
Zinc	SW6020A	--	**12.1**	--
Semivolatile Organics (µg/kg)				
Hexachlorobenzene	SW8270D	--	0.35U	0.14U
Polycyclic Aromatic Hydrocarbons (µg/kg)				
Acenaphthene	SW8270DSIM	--	**2.7**	**17**
Acenaphthylene	SW8270DSIM	--	0.34U	**0.99**
Anthracene	SW8270DSIM	--	**13**	**37**
Benzo(a)anthracene	SW8270DSIM	--	**23J**	**160**
Benzo(a)pyrene	SW8270DSIM	--	**9.8**	**50**
Benzo(b,j,k)fluoranthenes	SW8270DSIM	--	**39**	**198**
Benzo(g,h,i)perylene	SW8270DSIM	--	**4**	**8.2**
Chrysene	SW8270DSIM	--	**24J**	**150**
Dibenzo(a,h)anthracene	SW8270DSIM	--	**1.6**	**4.9**
Fluoranthene	SW8270DSIM	--	**70J**	**570**
Fluorene	SW8270DSIM	--	**4.3**	**30**
Indeno(1,2,3-cd)pyrene	SW8270DSIM	--	**4.6**	**12**
Naphthalene	SW8270DSIM	--	**1.4J**	**3.2**
Phenanthrene	SW8270DSIM	--	**29J**	**270**
Pyrene	SW8270DSIM	--	**38J**	**410**
Total cPAH TEQ (U = 0)	Calculated	0.024	**17J**	**89**
Total HPAH (U = 0)	Calculated	--	**144J**	**1563**
Total LPAH (U = 0)	Calculated	--	**50J**	**358**
Pesticides (µg/kg)				
4,4'-DDD	SW8081B	--	0.34U	0.14U
4,4'-DDE	SW8081B	--	**0.53**	**0.93**
4,4'-DDT	SW8081B	--	0.35U	0.14U
Aldrin	SW8081B	--	0.35U	0.14U
cis-Chlordane	SW8081B	--	0.35U	0.14U
trans-Chlordane	SW8081B	--	0.34U	0.14U
Dieldrin	SW8081B	--	0.34U	**0.17**
Heptachlor	SW8081B	--	0.35U	0.44U
cis-Nonachlor	SW8081B	--	0.34U	0.14U
trans-Nonachlor	SW8081B	--	0.35U	0.14U
Oxychlordane	SW8081B	--	0.35U	0.14U
Sum 4,4 DDT, DDE, DDD (U = 0)	Calculated	0.52	**0.53**	**1.21**
PCBs (µg/kg)				
Total PCB Congeners (U = 0)	Calculated	--	**7.05**	**20.41**

Table 3
Existing Tissue Data Near Pier 58

Notes:
Bold = Detected result
Detected concentration exceeds at least one screening level
Detected concentration exceeds two or more screening levels
-- Data are not available.
Analytical method versions may vary slightly between studies.
Totals are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum.
Total LPAH consists of the sum of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.
Total HPAH consists of the sum of fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(b,j,k)fluoranthenes, benzo(a)pyrene, indeno(1,2,3,-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.
Total cPAH TEQ (7 minimum CAEPA 2005) calculation includes benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene.
Total DDT consists of the sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT.
µg/kg: microgram per kilogram
HPAH: high-molecular-weight polycyclic aromatic hydrocarbon
J: Estimated value
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
mg/kg: milligram per kilogram
PCB: polychlorinated biphenyl
U: compound analyzed, but not detected above detection limit
UJ: compound analyzed, but not detected above estimated detection limit

Appendix A
Soil Boring Log

Total Depth:	*26 ft.*	Northing:	*~ 225,806 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -39 ft.*	Easting:	*~ 1,267,339 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very loose, dark gray to gray, slightly silty, slightly fine gravelly SAND; wet; scattered wood, abundant fine organics, angular gravel, strong organic odor; (He/Hf) SW-SM.

7.5

Very loose, gray, silty, fine to medium SAND; wet; trace of wood and shell fragments, sulfur odor; (Hb/Hf) SM.

9.0

Loose to medium dense, gray, trace of silt to slightly silty, fine to medium SAND; wet; trace of wood and shell fragments, slight sulfur odor; (Hb) SP/SP-SM.

13.5

Loose to medium dense, gray, slightly silty, fine to medium SAND; wet; trace of red andesite; (Hb) SP-SM.

18.0

Medium dense to dense, gray, sandy GRAVEL, trace of silt; wet; subrounded to angular gravel; (Hb) GP.

- Samples S-8 and S-9 were collected in WS-1A. Blow counts may be artificially high due to the presence of gravel.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

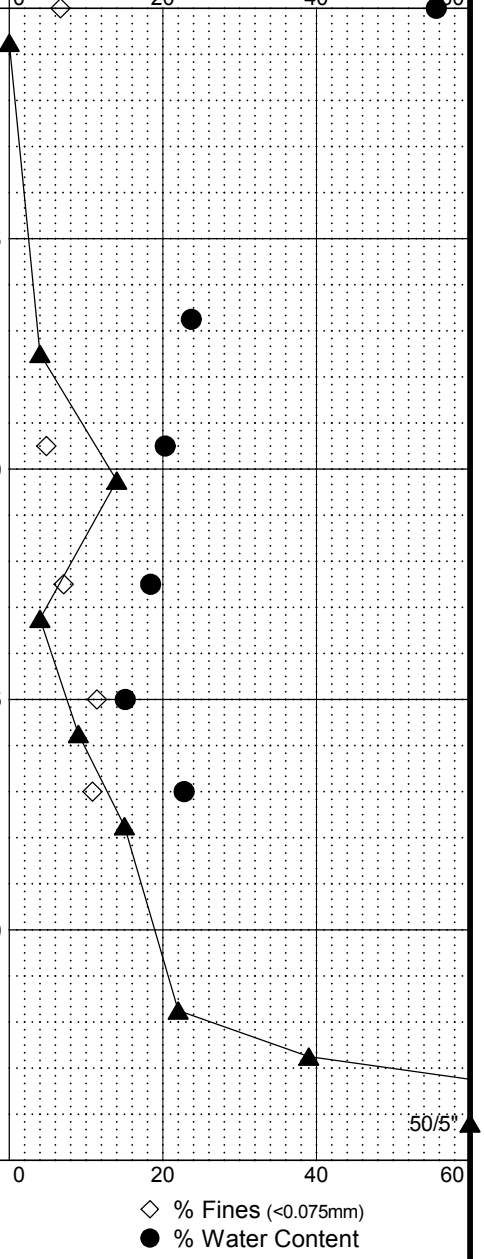
PID, ppm: 0 | 0 | 0 | 0 | 0

Samples: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9*

Ground Water: 0/18" (WOR)

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-1/1A

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-1
Sheet 1 of 2

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*26 ft.*	Northing:	*~ 225,806 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -39 ft.*	Easting:	*~ 1,267,339 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

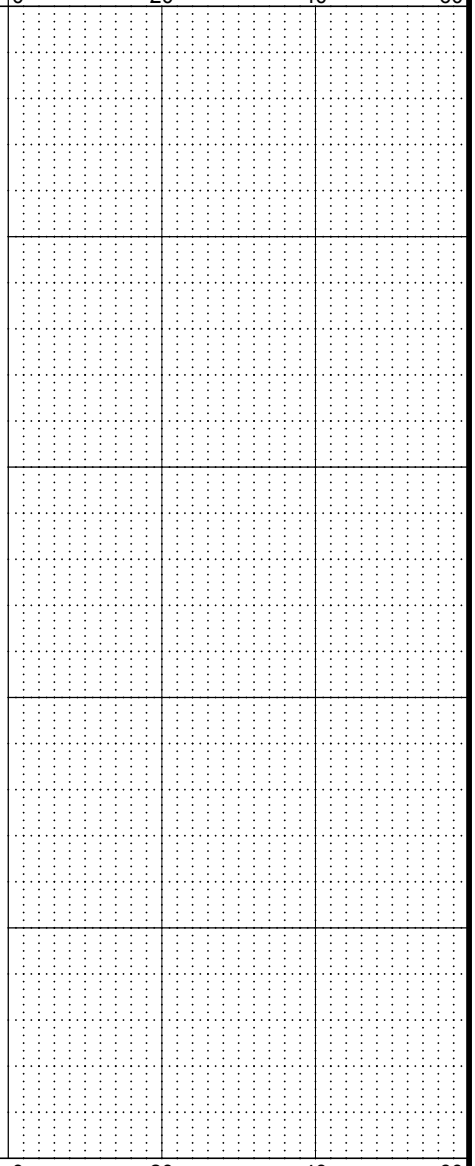
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

- Cobbles below 25 feet based on drill action.

26.0

BOTTOM OF BORING
COMPLETED 10/15/2013

NOTE: On 10/14/2013 boring WS-1 was drilled with mud rotary methods and 5" casing, reaching refusal in gravel at 25 feet. All cuttings and drill mud were lost into this gravel layer. On 10/15/2013, the boring was moved about 5 feet west to WS-1A. Boring WS-1A was drilled with mud rotary methods using HWT casing advancer and 4.5" casing, reaching refusal in gravel at 26 feet. WS-1 and WS-1A were backfilled with bentonite grout to the mudline.



◇ % Fines (<0.075mm)
● % Water Content

LEGEND

* Sample Not Recovered
E Environmental Sample Obtained
2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-1/1A

March 2018 | 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-1
Sheet 2 of 2

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*70.4 ft.*	Northing:	*~ 225,806 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -41 ft.*	Easting:	*~ 1,267,312 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60

See log of WS-1/WS-1A, located approximately 26 and 21 feet east, respectively, for soil descriptions.

17.0

- No sampling. Gravelly below 17 feet based on drill action

- Cobbles and gravel below 25 feet based on drill action.

28.0

Dense to very dense, gray-green, silty, fine to medium SAND; wet; interbedded with sandy

5 10 15 20 25

CONTINUED NEXT SHEET

0 20 40 60

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

LEGEND

* Sample Not Recovered

⌶ 2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-1B

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-2
Sheet 1 of 3

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

REV 3 - Approved for Submittal

Total Depth:	*70.4 ft.*	Northing:	*~ 225,806 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -41 ft.*	Easting:	*~ 1,267,312 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

silt; (Qpgo) SM.

- Gravelly from about 38 to 40 feet based on drill action.
- Fine to medium sandy silt layer at 40 feet.
- Harder drilling below 47 feet.

50.3

Hard, gray-green, trace to slightly fine sandy, slightly clayey SILT; moist; (Qpgl) ML.

- Fine to coarse sand lamination at about 55.3 feet.

58.0

Very dense, gray-green, slightly silty, gravelly, fine to coarse SAND; wet; (Qpgo) SW-SM.

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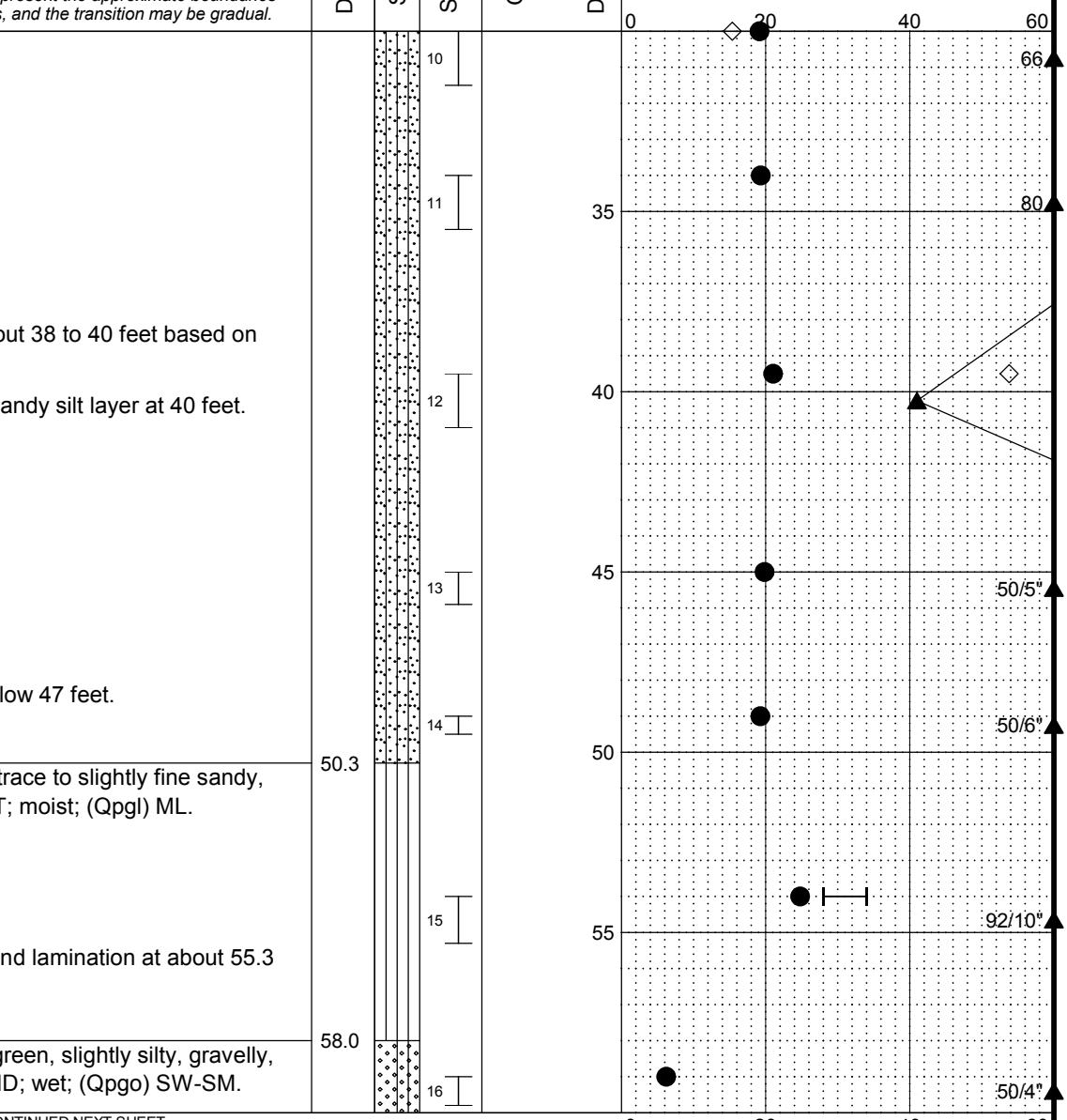

LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-1B

March 2018 | 21-1-21504-432

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FIG. A.1-2
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*70.4 ft.*	Northing:	*~ 225,806 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -41 ft.*	Easting:	*~ 1,267,312 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60

65.3

Very dense, blue-gray to gray-green, slightly fine gravelly, slightly silty SAND; wet; trace of red andesite; (Qpgo) SP-SM.

17

82/11"

18

88/11"

70.4

BOTTOM OF BORING
COMPLETED 10/15/2013

NOTE: On 10/16/2013, boring WS-1B was drilled about 21 feet west of WS-1A and was completed using mud-filled 4-1/4" ID hollow-stem auger. Auger was filled with bentonite slurry during drilling operations. WS-1B was backfilled with bentonite grout to the mudline.

65 70 75 80 85

0 20 40 60

LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-1B

March 2018 21-1-21504-432

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FIG. A.1-2
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*80.5 ft.*	Northing:	*~ 225,733 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -63 ft.*	Easting:	*~ 1,267,221 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very loose, brown, slightly clayey, slightly fine sandy, organic SILT; wet; (He/Hf) OL/OH.

4.7

Medium dense, gray, silty, fine to medium SAND; wet; scattered wood and shell fragments, faint wood preservative odor; (Hb/Hf) SM.

10.0

Loose to medium dense, olive green, trace to slightly silty, fine to medium SAND; wet; trace of wood fragments; (Hb) SP-SM/SP.
- Sample S-4 was driven partially within zone disturbed by sample S-3.

17.0

Medium dense, dark gray, silty, fine to medium SAND; wet; trace of red andesite grains; (Hb) SM.

21.0

Dense, gray, slightly silty, slightly fine gravelly SAND; wet; trace of shell fragments and organics; (Hb) SW-SM.

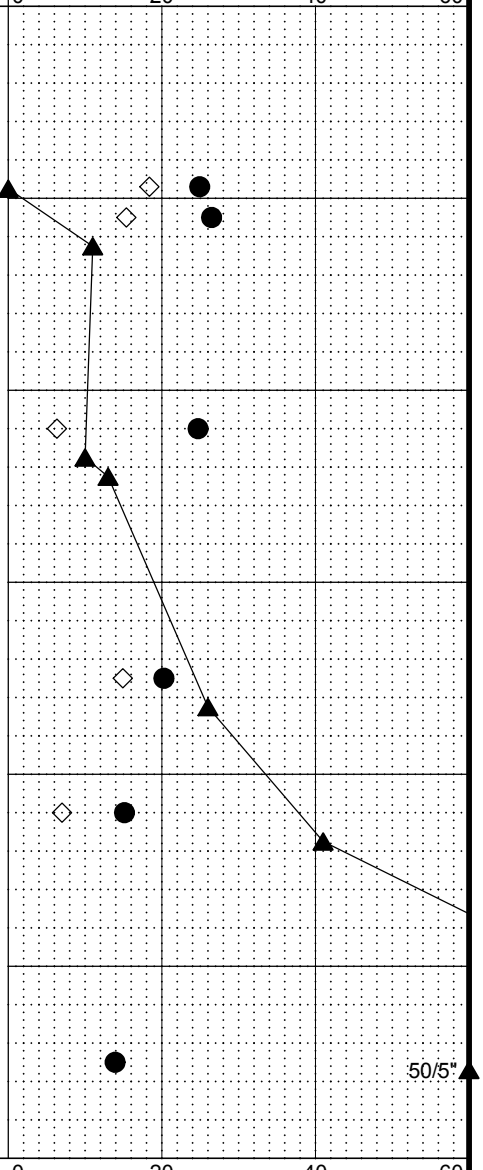
23.0

Medium dense to very dense, gray, slightly silty, sandy GRAVEL; wet; interbedded with gravelly, fine to medium sand, trace of shell fragments, subangular to angular gravel; (Hb) GP.
- Blow counts may be artificially high due to the presence of gravel.

Depth, ft.	Symbol	PID, ppm	Samples	Ground Water Depth, ft.
		0	1	0/18" (WOR)
		0	2	
		0	3	
		0	4	
			5	
			6	
			7	50/5"

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-2

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-3
Sheet 1 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*80.5 ft.*	Northing:	*~ 225,733 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -63 ft.*	Easting:	*~ 1,267,221 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very dense, gray, slightly silty, sandy GRAVEL; wet; layer description is based on poor sample recovery; (Qpgo/Qpgd) GP-GM.

30.0

Very dense, gray, slightly silty to silty, fine to medium SAND, trace of gravel; wet; (Qpgo) SP-SM/SM.

37.0

39.0

Very dense, gray-green, slightly gravelly, silty SAND to slightly gravelly, slightly silty SAND; wet; (Qpgo/Qpgd) SM/SP-SM.

- Small pocket of light green, clayey silt at about 42.5 feet.

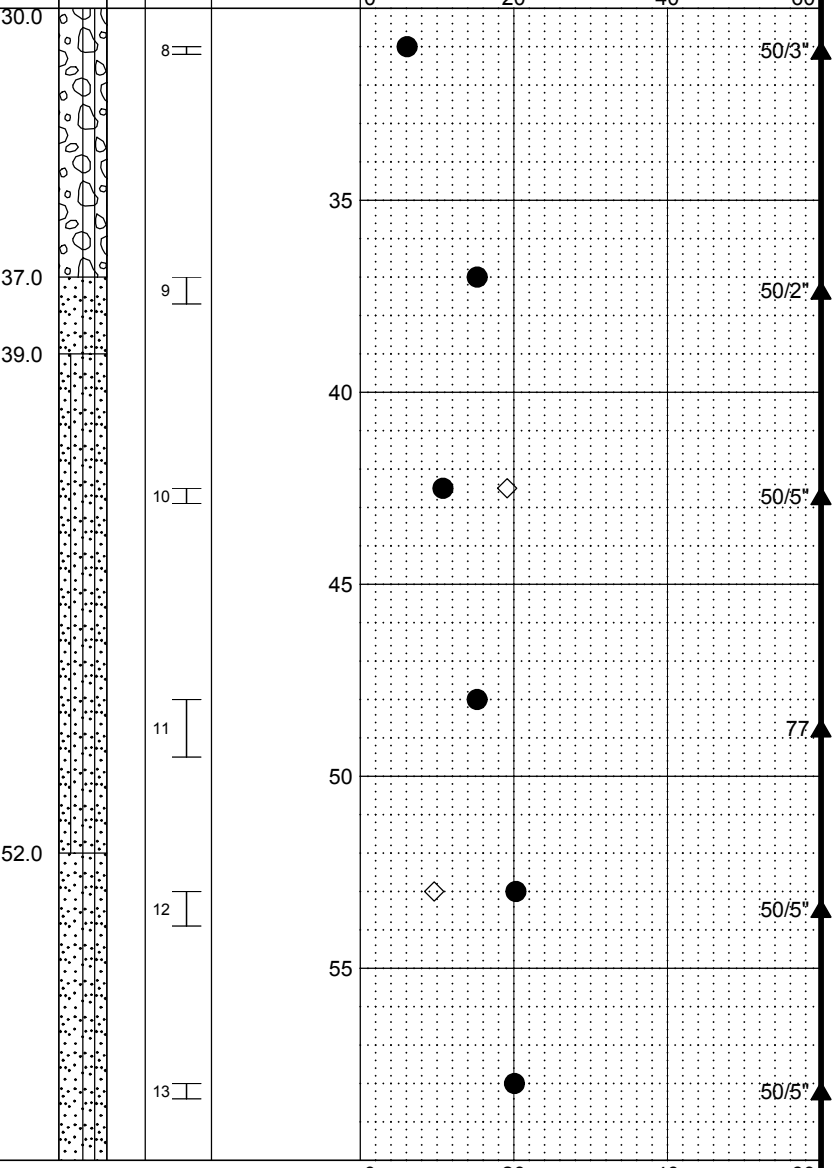
- 2-inch layer of silty, fine sand, trace of gravel, diamict texture, at about 48 feet.

52.0

Very dense, gray-green, slightly silty, fine to medium SAND; wet; (Qpgo) SP-SM

- 1/4-inch seam of sandy silt at about 53 feet.

- 2-inch dark green layer with trace of gravel at about 58 feet.



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-2

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-3
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*80.5 ft.*	Northing:	*~ 225,733 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -63 ft.*	Easting:	*~ 1,267,221 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

- Blue-gray below about 60 feet.

- Layers of silty sand at about 66.5 feet.

BOTTOM OF BORING
COMPLETED 10/18/2013

NOTE: On 10/17/2013, boring was drilled with mud rotary methods and 5" casing, reaching refusal in gravel at 23 feet. All shallow cuttings and drill mud were lost into this gravel layer. On 10/18/2013, boring was redrilled at the same location with a mud-filled 4-1/4" ID hollow stem auger to 80.5 feet. Boring was backfilled with bentonite grout to the mudline.

Depth, ft.: 80.5

Symbol

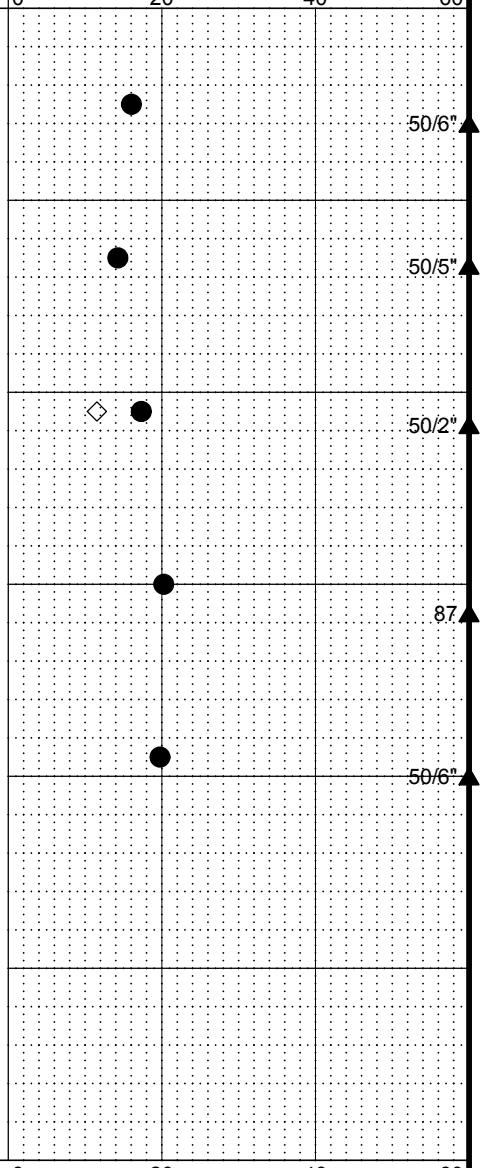
PID, ppm

Samples: 14, 15, 16, 17, 18

Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-2

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-3
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	79 ft.	Northing:	~ 225,611 ft.	Drilling Method:	HSA and Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ -53 ft.	Easting:	~ 1,267,400 ft.	Drilling Company:	Holt Services	Rod Diam.:	2-5/8" NWJ
Vert. Datum:	NAVD 88	Station:	~	Drill Rig Equipment:	CME 85 Truck	Hammer Type:	Automatic
Horiz. Datum:	NAD 83/91	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very soft, black grading to gray, fine sandy, silty CLAY; wet; scattered shells, trace of wood, strong wood preservative odor; (He/Hf) CL.

4.0

Dense, gray, slightly gravelly, silty, fine to medium SAND; wet; scattered wood fragments, wood preservative odor; (Hb/Hf) SM.

7.0

Medium dense, dark gray, slightly silty SAND; wet; trace of shell and wood fragments, slight sulfur or wood preservative odor; (Hb) SW-SM.

12.0

Dense, olive-gray, slightly fine gravelly, slightly silty SAND; wet; scattered shell fragments; (Hb) SP-SM.

15.0

Dense, gray SAND, trace of silt and gravel; wet; abundant shell fragments, scattered wood fragments, gravel in sampler shoe; (Hb) SW.

17.0

Medium dense to dense, gray-brown to yellow-brown, silty, sandy GRAVEL; wet; rounded to subangular gravel; (Hb/Qvro) GM.

24.0

Dense, gray-brown, silty, fine to medium SAND; wet; micaceous; (Qvro) SM.

Depth, ft.

Symbol

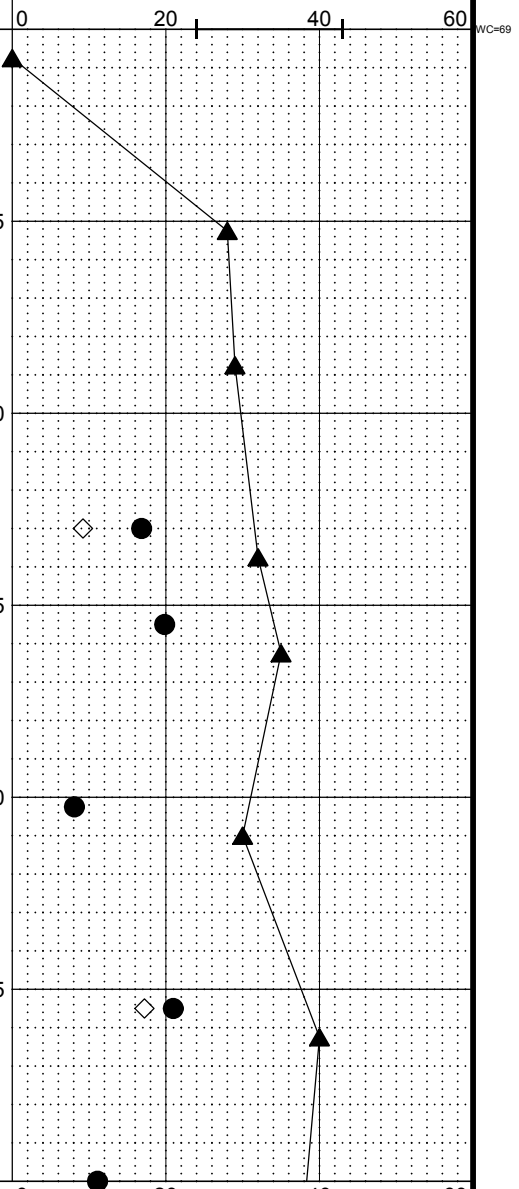
PID, ppm: 0, 0, 0, 0

Samples: 1, 2, 3, 4, 5, 6, 7

Ground Water Depth, ft.: 0/18" (WOR)

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-3

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-4
Sheet 1 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	79 ft.	Northing:	~ 225,611 ft.	Drilling Method:	HSA and Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ -53 ft.	Easting:	~ 1,267,400 ft.	Drilling Company:	Holt Services	Rod Diam.:	2-5/8" NWJ
Vert. Datum:	NAVD 88	Station:	~	Drill Rig Equipment:	CME 85 Truck	Hammer Type:	Automatic
Horiz. Datum:	NAD 83/91	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

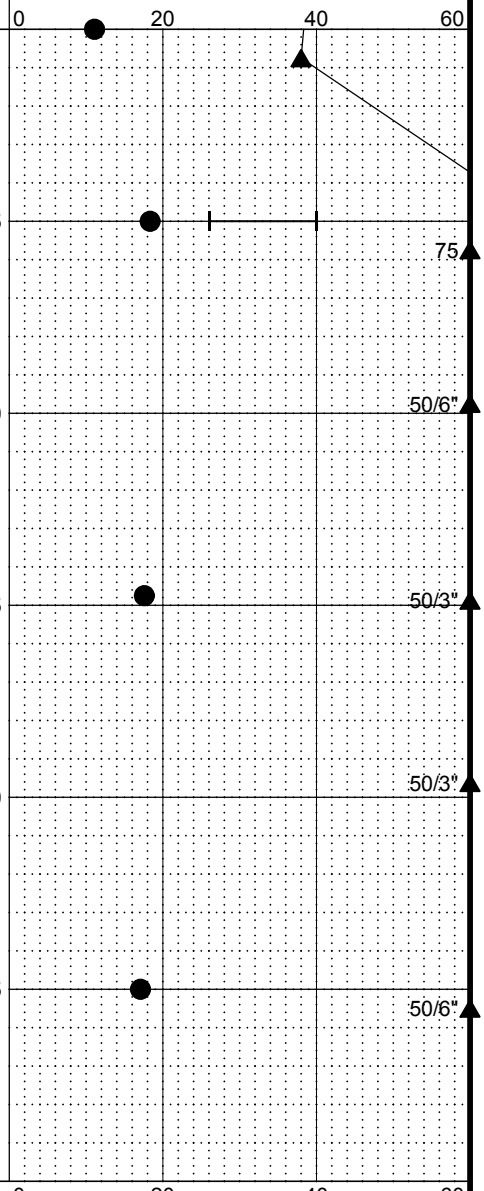
Depth, ft.	Soil Description
30.0	Dense, olive-green, silty, sandy, clayey GRAVEL; moist; diamict texture; (Qvri) GC.
33.0	Hard, light green, clayey SILT, trace of sand and gravel; moist; iron oxide staining; (Qpgl) ML.
38.0	Very dense, yellow-brown, slightly silty, sandy GRAVEL; wet; layer description is based on poor sample recovery; (Qpgo) GP-GM.
43.0	Hard, mottled olive-green and light green, slightly clayey SILT, trace of sand and gravel; moist to wet; weathered; (Qpgm) ML.
47.5	Very dense, blue-green, silty, clayey, sandy, fine GRAVEL; moist; diamict; (Qpgm) GC.
53.0	Very dense, blue-green, silty, fine to medium SAND, trace of gravel; wet; 2-inch layer of gravelly, sandy clay, diamict; (Qpgd) SM.
58.0	

Symbol | PID, ppm | Samples | Ground Water Depth, ft.

Sample	Depth, ft.
8	
9	
10	
11	
12	
13	

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-3

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-4
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

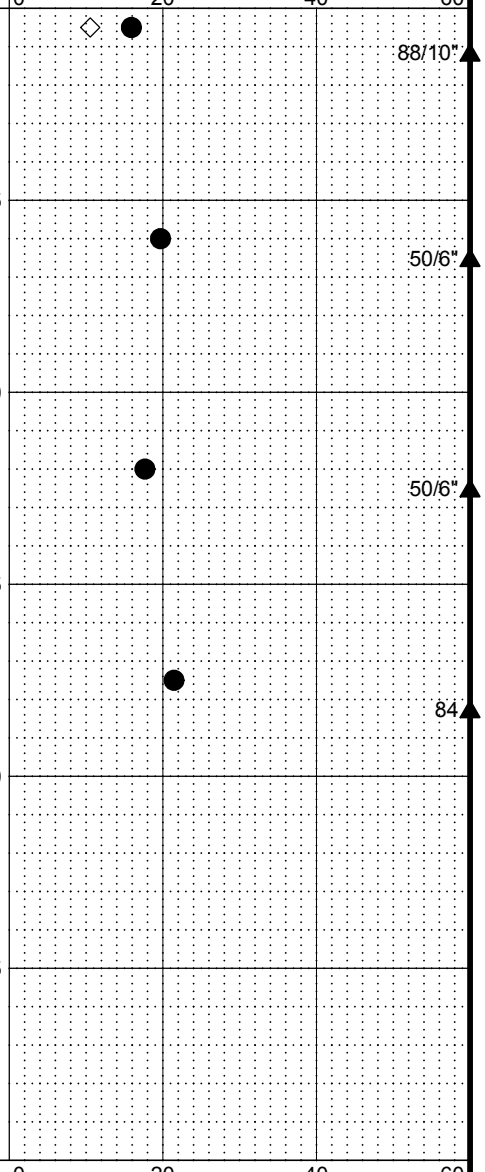
Total Depth:	*79 ft.*	Northing:	*~ 225,611 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -53 ft.*	Easting:	*~ 1,267,400 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION	Depth, ft.	Symbol	PID, ppm	Samples	Ground Water Depth, ft.
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.					
Very dense, gray-green, slightly silty SAND, trace of gravel; wet; micaceous; (Qpgo) SP-SM.				14	
				15	
- Small trace of red andesite at about 72 feet.				16	
- 1/2-inch layer of silty, fine sand at about 78 feet.				17	
BOTTOM OF BORING COMPLETED 10/23/2013	79.0				

NOTE: Boring was drilled with mud rotary methods and 5" casing, encountering refusal in gravel at 47 feet on 10/22/2013. On 10/23/2013, boring was redrilled at the same location with mud-filled 4-1/4" ID hollow stem auger to the bottom of boring. Boring was backfilled with bentonite grout to the mudline.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-3

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-4
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 *Log: MJW Rev: WTL/JKF Typ: PVH*

Total Depth:	*47.5 ft.*	Northing:	*~ 225,560 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -44 ft.*	Easting:	*~ 1,267,519 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very soft, black to gray, slightly fine sandy, silty CLAY; wet; scattered shell and wood fragments, sulfur odor; (He/Hf) CH.

3.0

Very loose to loose, gray, slightly silty SAND; wet; trace to abundant shell fragments; (Hb/Hf) SP-SM.

9.0

Medium dense, gray, slightly silty SAND; wet; trace of shell fragments; (Hb) SP-SM.

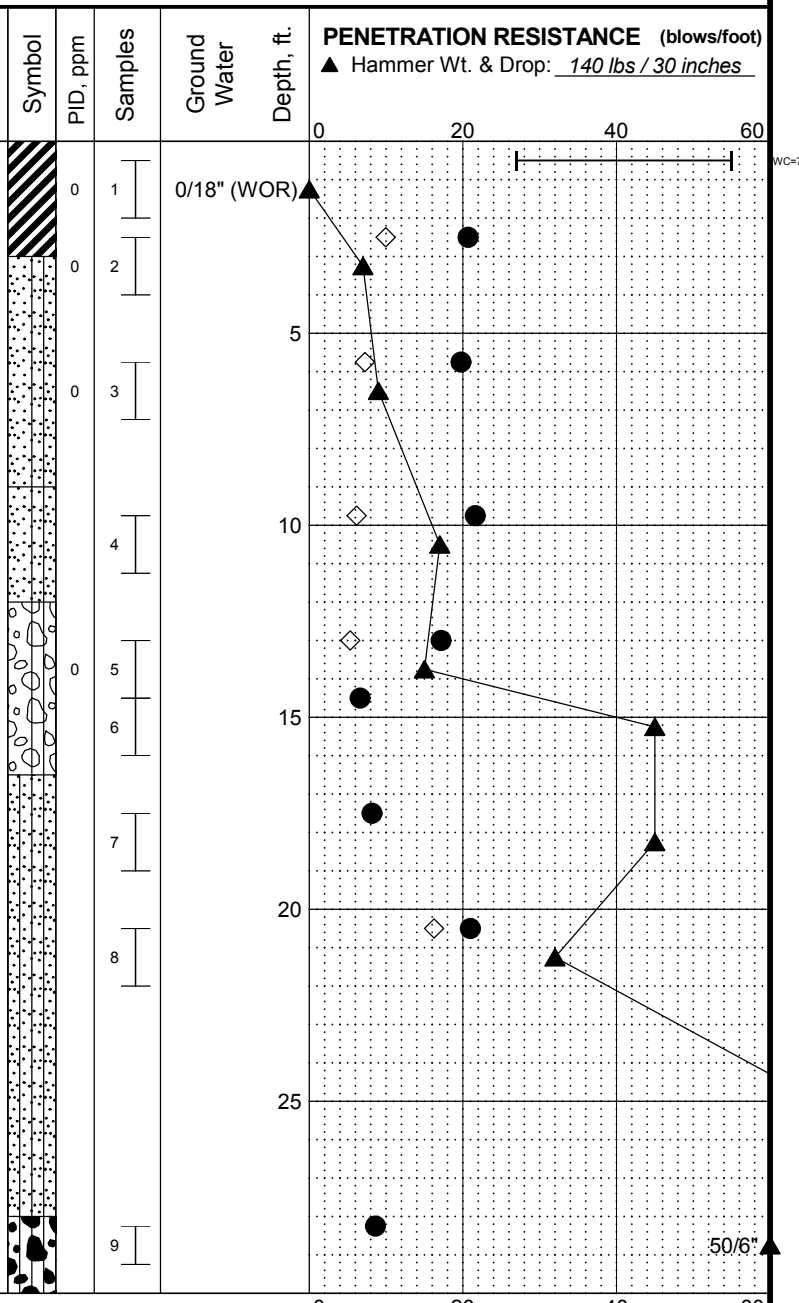
12.0

Medium dense to dense, gray, slightly silty, sandy GRAVEL to slightly silty, slightly gravelly SAND; wet; (Hb) GP-GM/SP-SM.
- Blow counts may be artificially high due to the presence of gravel.

16.5

Dense, gray, slightly silty to silty, gravelly, fine to medium SAND; wet; (Qvro) SM/SP-SM.

28.0



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-4

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-5
Sheet 1 of 2

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*47.5 ft.*	Northing:	*~ 225,560 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -44 ft.*	Easting:	*~ 1,267,519 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very dense, blue-gray, silty, sandy GRAVEL; wet; rounded to angular gravel, possible slough; (Qvri/Qvat) GM.

33.0

Very dense, gray, slightly sandy GRAVEL, trace of silt; wet; possible slough; (Qvri?) GP.

36.0

Very dense, gray, silty, clayey, sandy GRAVEL to sandy GRAVEL, trace of silt; wet; diamict texture to about 40 feet, fractured gravel and possible slough mixed with samples; (Qpgm?) GC/GP.

47.5

BOTTOM OF BORING
COMPLETED 10/11/2013

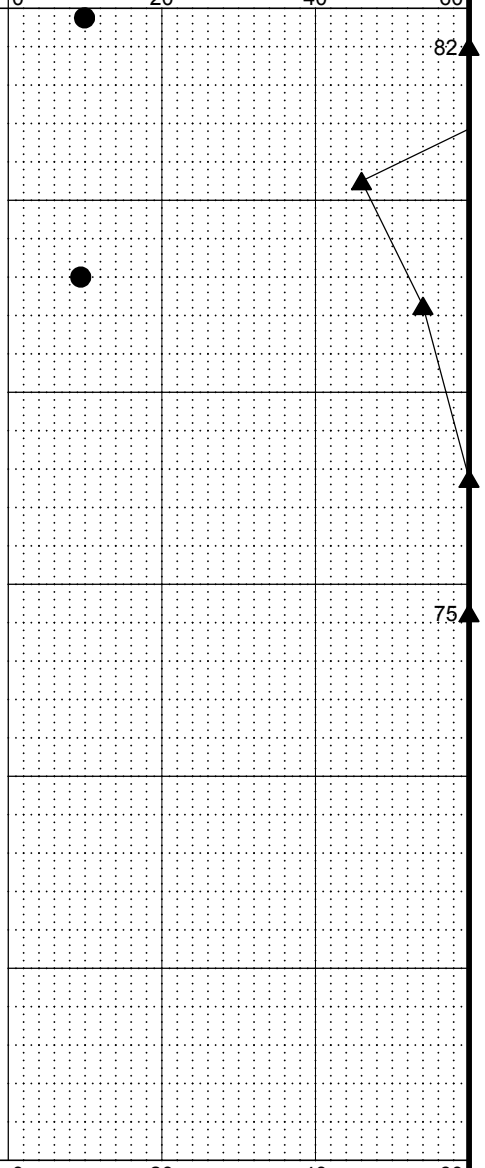
NOTE: Boring was drilled with mud rotary methods and 5" casing, reaching refusal in caving gravel at 47.5 feet on 10/11/2013; unable to drive casing through gravel. All cuttings and drill mud were lost into this gravel layer. Boring was backfilled with bentonite grout to the mudline.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water Depth, ft.

Samples: 10, 11, 12, 13, 14

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered
E Environmental Sample Obtained
2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-4

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FIG. A.1-5
Sheet 2 of 2

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*71.8 ft.*	Northing:	*~ 225,558 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -24 ft.*	Easting:	*~ 1,267,703 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	*~*	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	*~*	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

No sampling.

4.0

Very loose, black, sandy SILT, trace of gravel; wet; scattered shell and abundant wood fragments, slight sheen, wood preservative odor; (He/Hf) ML.

12.0

Medium dense to very dense, gray to gray-brown, sandy GRAVEL, trace of silt; wet; trace of shell and wood fragments, wood preservative odor; (Hb/Hf) GP.
- Blow counts may be artificially high due to the presence of gravel.

20.0

Very dense, yellow-brown, slightly clayey, fine gravelly, fine sandy SILT; wet; weathered; (Qvrl/Qvro) ML.

21.0

Medium dense to dense, gray, sandy GRAVEL, trace of silt; wet; rounded to subangular gravel, possible slough; (Qvro) GP.

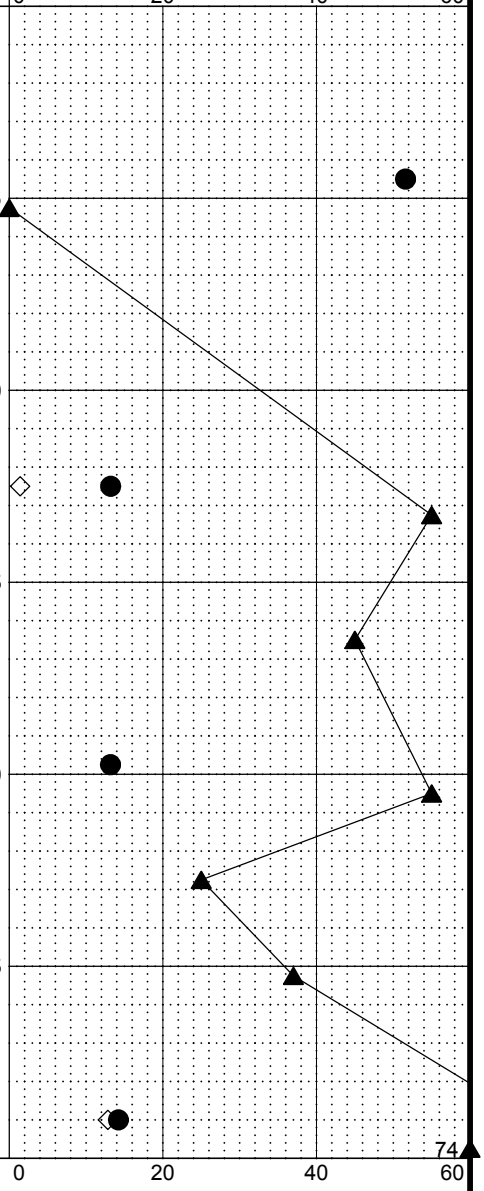
29.0

CONTINUED NEXT SHEET

Depth, ft.	Symbol	PID, ppm	Samples	Ground Water Depth, ft.
4.0		0	1	0/18" (WOH)
12.0		0	2	
		0	3	
20.0		0	4	
21.0			5	
			6	
29.0			7	

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-5

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-6
Sheet 1 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*71.8 ft.*	Northing:	*~ 225,558 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -24 ft.*	Easting:	*~ 1,267,703 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	*~*	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	*~*	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very dense, yellow-brown, silty, fine gravelly SAND; wet; weathered; (Qpgo) SM.

33.0

Very dense, yellow-brown, silty, fine SAND; wet; micaceous, weathered, iron oxide-stained; (Qpgo/Qpgl) SM.

37.0

Very dense, gray-brown to greenish brown, silty, fine to medium SAND; wet; micaceous; (Qpgo) SM.
- Sample S-10 was driven within zone disturbed by sample S-9.

43.0

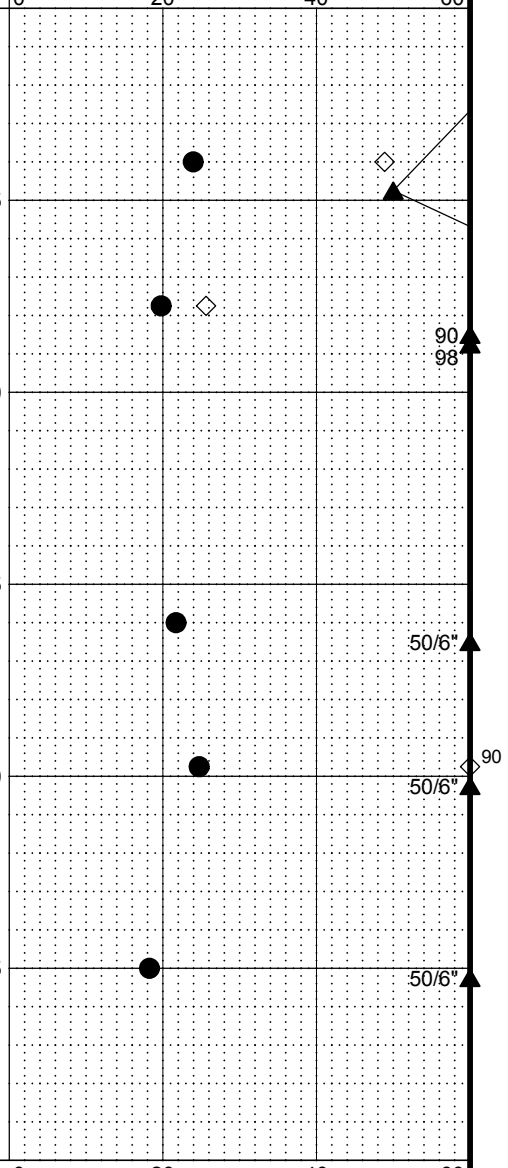
Very dense, green-gray, slightly fine sandy to fine sandy SILT, trace of clay; wet; silty, fine sand layers, yellow-brown above about 50 feet; (Qpgl) ML.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

Samples: 8, 9, 10, 11, 12, 13

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



◇ % Fines (<0.075mm)

● % Water Content

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-5

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-6
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*71.8 ft.*	Northing:	*~ 225,558 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -24 ft.*	Easting:	*~ 1,267,703 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

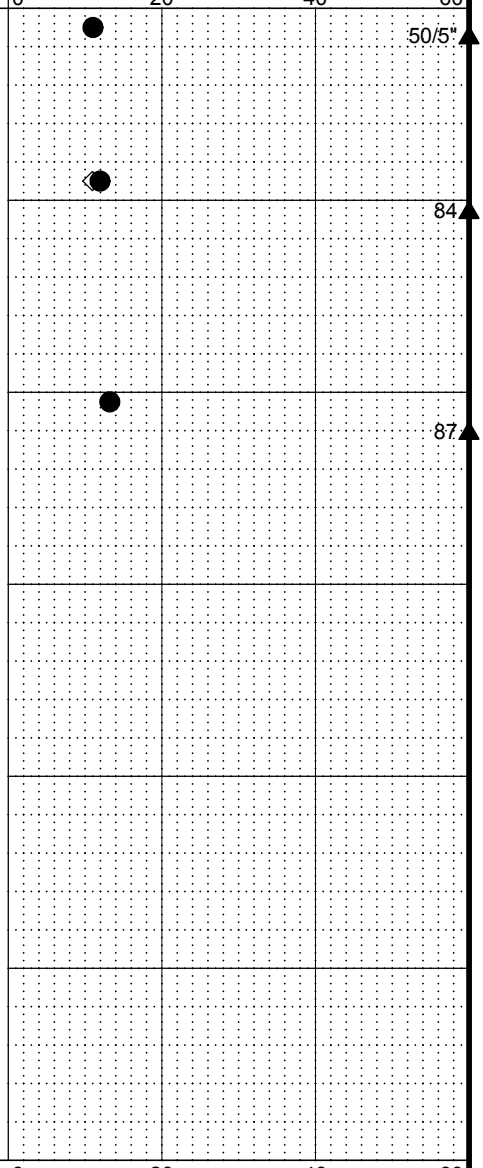
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

Depth, ft.	Description
60.0	Very dense, green-gray, slightly silty to silty, gravelly SAND; wet; (Qpgo) SW-SM/SM.
71.8	BOTTOM OF BORING COMPLETED 10/9/2013

NOTES:

(a) Boring was drilled with mud rotary methods and 5" casing. Shallow cuttings and drill mud were lost into gravel layers from about 18 to 19 feet and below 21 feet.

(b) Boring was backfilled with bentonite grout to the mudline.



LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-5

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
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FIG. A.1-6
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*79.9 ft.*	Northing:	*~ 224,985 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -26 ft.*	Easting:	*~ 1,268,265 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very soft, black to gray, trace to slightly sandy, slightly clayey, organic SILT; wet; trace to scattered shell fragments, trace to abundant wood fragments, strong sulfur odor; (He/Hf) OL.

10.0

Loose to medium dense, mottled brown and black, silty, fine to medium SAND, trace of fine gravel, and WOOD; wet; strong wood preservative odor (drilled through a log); (Hb/Hf) SM.
- Blow counts may be artificially high due to the presence of wood.

12.0

Medium dense to very dense, gray, trace of fine gravel to fine gravelly, slightly silty SAND; wet; abundant shells, scattered wood fragments, and strong wood preservative odor above 15 feet, trace of shell fragments and faint wood preservative odor below 15 feet; (Hb) SP-SM/SW-SM.
- Wood fibers in cuttings at about 24 feet.
- Lost drilling fluid circulation at about 20 feet.
- Blow counts may be artificially high due to the presence of gravel and wood.

25.0

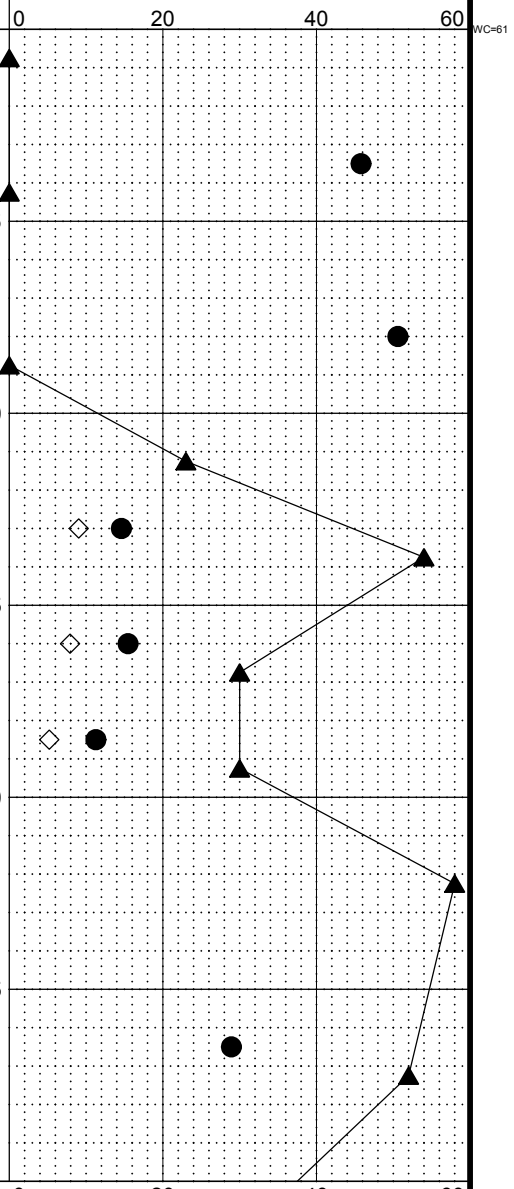
Hard, gray, slightly gravelly, slightly sandy, silty CLAY; moist; weathered clasts, seams of fine to medium sand and gravel; (Hls?/Qpgl?) CH.

CONTINUED NEXT SHEET

Depth, ft.	Symbol	PID, ppm	Samples	Ground Water Depth, ft.
		0	1	0/18" (WOR)
		0	2	0/18" (WOR)
		0	3	0/18" (WOR)
		0	4	
		0	5	
		0	6	
		0	7	
			8 *	
			9	

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-6

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-7
Sheet 1 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	79.9 ft.	Northing:	~ 224,985 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ -26 ft.	Easting:	~ 1,268,265 ft.	Drilling Company:	Holt Services	Rod Diam.:	2-5/8" NWJ
Vert. Datum:	NAVD 88	Station:	~	Drill Rig Equipment:	CME 85 Truck	Hammer Type:	Automatic
Horiz. Datum:	NAD 83/91	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

- Inconclusive evidence for Hls.
- 5-inch diameter casing was advanced to 27.0 feet prior to collecting sample S-9.
- Sample S-9 was disturbed during sampling by gravel in the split spoon shoe.

32.0

Very stiff, gray, slightly gravelly, sandy, silty CLAY; wet; trace of wood fibers and shell fragments, distorted texture - possibly due to sampling process; (Hls?/Qpgl?) CH.
- Inconclusive evidence for Hls.

36.0

Hard, gray, gravelly, sandy, silty CLAY; moist; diamict, weathered clasts; (Qpgm) CH.

44.0

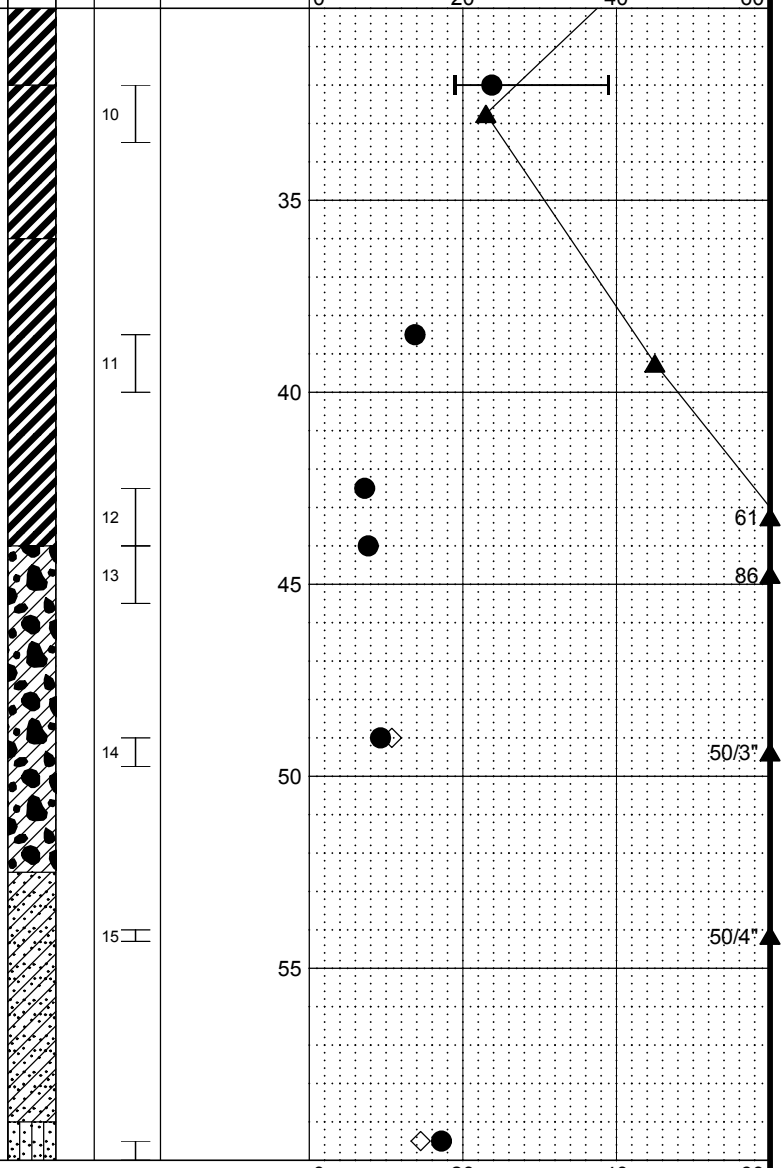
Very dense, gray, clayey, sandy GRAVEL and slightly silty, sandy GRAVEL; moist; diamict, weathered clasts; (Qpgm) GC/GP-GM.

- Interbedded below 49.3 feet with fine to medium sand, trace of silt and fine gravel; SP.

52.5

Very dense, gray, clayey, silty, gravelly SAND; wet; (Qpgm) SC.
- Layer description is based on poor sample recovery.

59.0



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-6

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-7
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	79.9 ft.	Northing:	~ 224,985 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ -26 ft.	Easting:	~ 1,268,265 ft.	Drilling Company:	Holt Services	Rod Diam.:	2-5/8" NWJ
Vert. Datum:	NAVD 88	Station:	~	Drill Rig Equipment:	CME 85 Truck	Hammer Type:	Automatic
Horiz. Datum:	NAD 83/91	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very dense, gray-green, slightly gravelly, silty, fine to medium SAND; wet; micaceous; (Qpgo) SM.

64.0

Very dense, gray-green, sandy GRAVEL, trace of silt; wet; (Qpgo) GP.
- Layer description is based on poor sample recovery.

68.0

Very dense, light gray-green SILT, trace of clay and fine sand; wet; rapid dilatancy; (Qpgl) ML.

78.0

Very dense, gray-green, fine to medium SAND, trace of silt; wet; interbedded with fine gravelly, silty, fine sand, diamict; (Qpgo) SP.

79.9

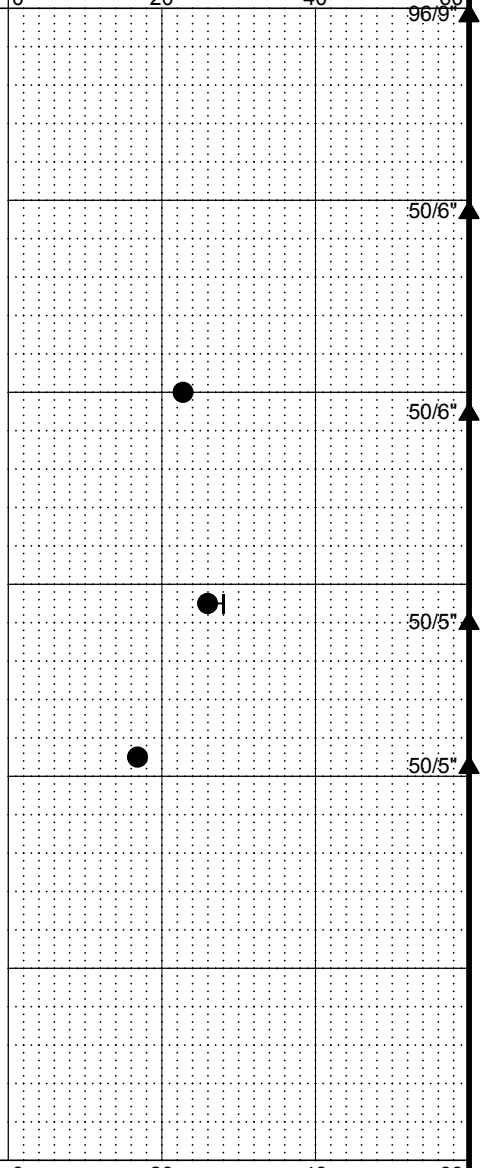
BOTTOM OF BORING
COMPLETED 10/25/2013

NOTE: Boring was drilled with mud rotary methods and 5" casing. Boring was backfilled with bentonite slurry to the mudline.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-6

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-7
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*101.9 ft.*	Northing:	*~ 224,849 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -38 ft.*	Easting:	*~ 1,268,259 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	*~*	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	*~*	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Very loose, dark gray and gray, trace to slightly fine gravelly, silty SAND; wet; fine organics, trace of shell fragments and cinders, strong sulfur odor; (He/Hf) SM.

12.0

Very loose, gray, slightly fine gravelly SAND, trace of silt; wet; trace of shell and wood fragments, scattered pockets of silty, fine sand with abundant shells, sulfur odor; (Hb/Hf) SP.

- Sample S-4 was collected to obtain additional soil volume and overlapped with sample S-3.

16.0

Medium dense to very dense, gray, slightly silty, sandy GRAVEL; wet; trace of shell fragments, subrounded to rounded gravel; (Hb) GP-GM.

- Blow counts may be artificially high due the presence of gravel.

20.0

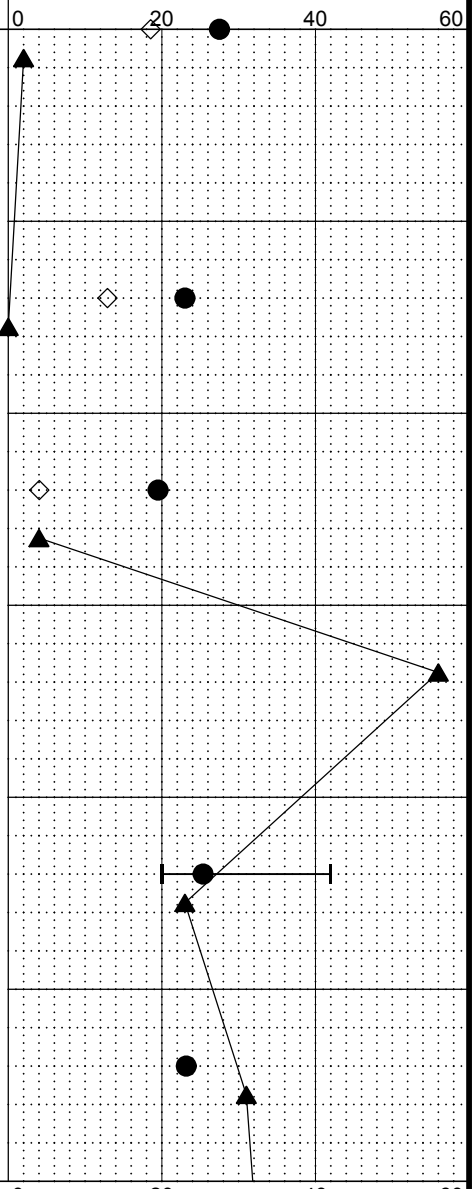
Very stiff to hard, gray, silty CLAY, trace of sand and fine gravel; moist; trace of shell fragments above 25 feet; (Qpgl) CL.

Depth, ft.	Symbol	PID, ppm	Samples	Ground Water Depth, ft.
		0	1	
		0	2	
12.0		0	4	
		0	3	
16.0		0	5	
20.0			6	
			7	

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0/18" (WOR)



◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-7

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-8
Sheet 1 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*101.9 ft.*	Northing:	*~ 224,849 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -38 ft.*	Easting:	*~ 1,268,259 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

32.0

Very stiff to hard, gray, silty CLAY, trace of fine sand and fine gravel; moist; sand partings and layers of clayey sand, diamict; (Qpgl/Qpgm) CH.

46.0

Hard, gray, silty CLAY, trace of sand and fine gravel; moist to wet; (Qpgm/Qpgl) CH.

57.0

Hard, gray, gravelly, sandy, silty CLAY; moist to wet; (Qpgm) CH.

8 9 10 11 12 13

0 20 40 60

35 40 45 50 55

74

0 20 40 60

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-7

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-8
Sheet 2 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*101.9 ft.*	Northing:	*~ 224,849 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -38 ft.*	Easting:	*~ 1,268,259 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

63.0

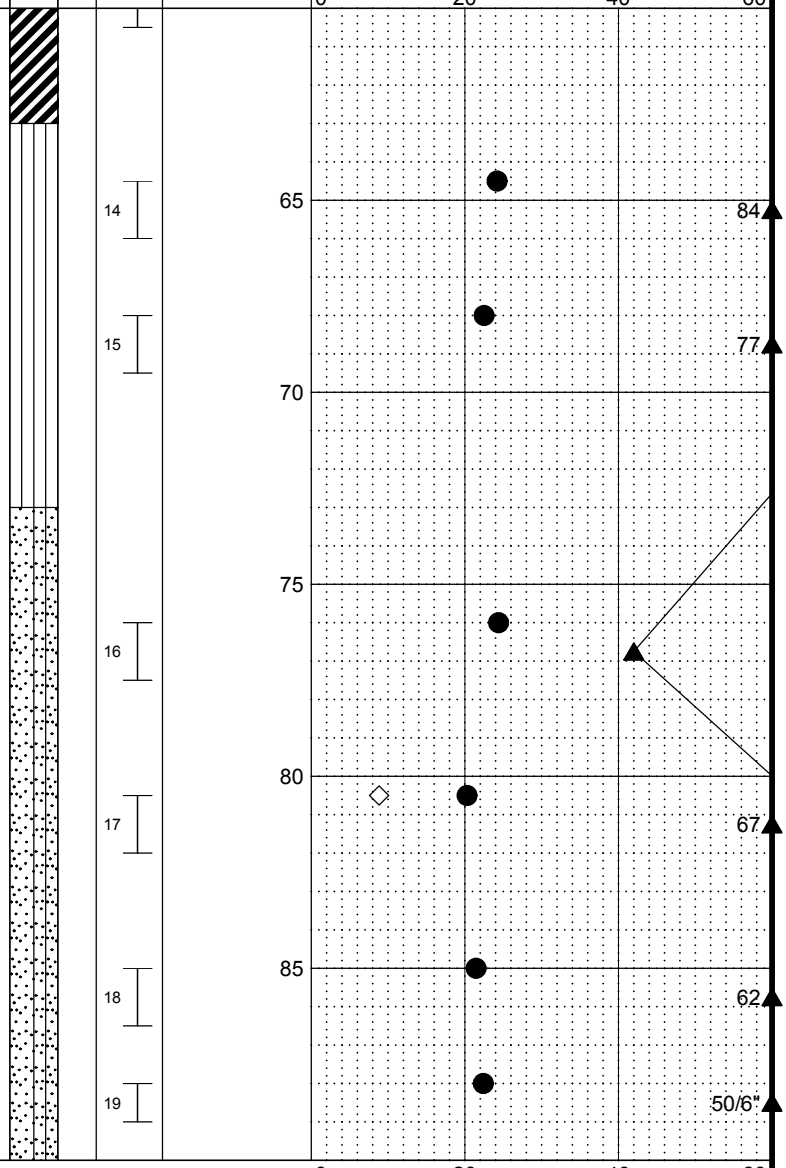
Very dense, gray-green, trace to slightly fine sandy SILT, trace of clay; wet; layers and seams of fine to medium sand; (Qpgl) ML.

73.0

Dense, gray-green to gray, slightly silty, fine to medium SAND, trace of fine gravel; wet; micaceous; (Qpgo) SP-SM.

- 1-inch-thick, gray-green gravelly layer with mica and trace of organics at 85 feet.

- 2-inch thick layer of gray-green, slightly silty sand at 88 feet.



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-7

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SHANNON & WILSON, INC.
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FIG. A.1-8
Sheet 3 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Total Depth:	*101.9 ft.*	Northing:	*~ 224,849 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ -38 ft.*	Easting:	*~ 1,268,259 ft.*	Drilling Company:	*Holt Services*	Rod Diam.:	*2-5/8" NWJ*
Vert. Datum:	*NAVD 88*	Station:	~	Drill Rig Equipment:	*CME 85 Truck*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD 83/91*	Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | PID, ppm | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60

95 100 105 110 115

20 21

50/5" 50/5"

101.9

BOTTOM OF BORING
COMPLETED 10/29/2013

NOTE: Boring was drilled with mud rotary methods and 5" casing. Boring was backfilled with bentonite grout to the mudline.

0 20 40 60

LEGEND

* Sample Not Recovered

E Environmental Sample Obtained

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

Waterfront Seattle Program
Seattle, Washington

LOG OF BORING WS-7

March 2018 21-1-21504-432

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A.1-8
Sheet 4 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E 21-21504-200.GPJ SHAN_WIL.GDT 3/27/18 Log: MJW Rev: WTL/JKF Typ: PVH

Appendix B
Field Forms

Daily Log

Anchor QEA, LLC
720 Olive Way, Suite 1900
Seattle, WA 98101
Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Pier 63 Sediment Sampling **DATE:**

SITE ADDRESS: 1951 Alaskan Way, Seattle, WA 98101 **PERSONNEL:**

WEATHER: **WIND FROM:**

N	NE	E	SE	S	SW	W	NW
SUNNY		CLOUDY		RAIN		?	

LIGHT	MEDIUM	HEAVY

TEMPERATURE: ° F . ° C
[Circle appropriate units]

TIME	COMMENTS

Signature: _____

Surface Sediment Field Log

Job: Pier 63 Sediment Sampling | Station:

Job No: 220795-01.01 | Date:

Field Staff: | Sample Method:

Contractor: | Proposed Coordinates: Lat.

Horizontal Datum: | Long.

Water Height

DTM Depth Sounder:

DTM Lead Line:

Tide Measurements

Time:

Height:

Sample Acceptability Criteria:

1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Mudline Elevation (lower low water-large tides): calculated after sampling

Notes:

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth (in)	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc.
		WGS 84 (N)	WGS 84 (E)			

Sample Description: surface cover, (density), moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

Sample Containers:

Analyses:

Appendix C
Health and Safety Plan

This appendix is provided in a separate document.

Appendix C
Field Forms

Daily Log

ANCHOR QEA

Anchor QEA, LLC
720 Olive Way, Suite 1900
Seattle, WA 98101
Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Pier 63 Sediment Sampling **DATE:** 4/27/23

SITE ADDRESS: 1951 Alaskan Way, Seattle, WA 98101 **PERSONNEL:** N. Maas, R. Acker

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | ?

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F . °C [Circle appropriate units]

TIME	COMMENTS
0800	R Acker + N. Maas load onto Gravity vessel, H&S Safty meeting
0815	Begin sampling at PG3-01, Attempt 1, good recovery
0830	Move to PG3-02
0836	Attempt 1, jaws ajar, no recovery
0841	Attempt 2, good recovery
0900	Move to PG3-03
0903	Attempt 1, good recovery
0915	Move to PG3-04
0918	Attempt 1, jaws ajar, no recavery
0921	Attempt 2, jaws ajar, no recovery
0923	Attempt 3, good recovery
0930	Move to PG3-05
0938	Attempt 1, poor seal, ~10 cm recovered, keep as back up
0945	Attempt 2, jaws ajar, ~4 cm recovery
0949	Attempt 3, jaws sealed, good recovery, dump attempt 1
1050	Demob off water, N. Maas & R Acker return to office
	End field day

N. Maas 4/27/23

Signature: _____

ANCHOR QEA

Surface Sediment Field Log

Job: Pier 63 Sediment Sampling
Job No: 220795-01.01
Field Staff: N. Maas, R. Acker
Contractor: Gravity
Horizontal Datum:

Station: P63-SS-01
Date: 4/27/23
Sample Method: Grab
Proposed Coordinates: Lat.
Long.

Water Height
DTM Depth Sounder: 54.8
DTM Lead Line: —

Tide Measurements
Time:
Height:

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation (lower low water-large tides): calculated after sampling

Grab #	Time	Confirmed Coordinates (datum) WGS 84 (N)	Confirmed Coordinates (datum) WGS 84 (E)	Sample Accept (Y/N)	Recovery Depth (in) cm	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc.
1	0816 PM 0830	225742.82	7828948.52	Y	19	jaws closed

Sample Description: surface cover, (density), moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

Dark grey sandy silt, prominent shell fragments, no odor/sheen one small stick

Sample Containers: 4-8oz clear jars

Analyses:

ANCHOR QEA

Surface Sediment Field Log

Job: Pier 63 Sediment Sampling
Job No: 220795-01.01
Field Staff: N. Maas, R Acker
Contractor: Gravity
Horizontal Datum:

Station: PG3-SS-02
Date: 4/27/23
Sample Method: Grab
Proposed Coordinates: Lat.
Long.

Water Height
DTM Depth Sounder: 42.8, 43.2
DTM Lead Line: -

Tide Measurements
Time:
Height:

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation (lower low water-large tides): calculated after sampling

Grab #	Time	Confirmed Coordinates (datum) WGS 84 (N)	Confirmed Coordinates (datum) WGS 84 (E)	Sample Accept (Y/N)	Recovery Depth (in) cm	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc.
1	0836	225801.16	7829017.08	N	-	bottle 3 wood in jaw
2	0841	225806.23	7829026.34	Y	18	minor debris in jaw (small sticks, bag)

Sample Description: surface cover, (density), moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

dark grey & brown sandy silt, sheen (looks biological), no odor shell fragments, wood pieces, kelp, worm, fragments of concrete (2-6in) x2 and bottle 1 in grab

Sample Containers: 4-8oz jars (clear)

Analyses:

ANCHOR QEA

Surface Sediment Field Log

Job: Pier 63 Sediment Sampling
Job No: 220795-01.01
Field Staff: N. Maas, R. Acker
Contractor: Gravity
Horizontal Datum:

Station: P63-SS-03
Date: 4/27/23
Sample Method: Grab
Proposed Coordinates: Lat.
Long.

Water Height
DTM Depth Sounder: 37.6
DTM Lead Line: -

Tide Measurements
Time:
Height:

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation (lower low water-large tides): calculated after sampling

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth (in) cm	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc.
		WGS 84 (N)	WGS 84 (E)			
1	0903	225800.96	7829082.11	Y	27	some debris in jaw

Sample Description: surface cover, (density), moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

Dark grey sandy silt, full shells, kelp, biologic sheen, general organic matter (sticks, wood etc.)

Sample Containers: 4-8oz jar clear

Analyses:

ANCHOR QEA

Surface Sediment Field Log

Job: Pier 63 Sediment Sampling
Job No: 220795-01.01
Field Staff: N. Maas, R. Acker
Contractor: Gravity
Horizontal Datum:

Station: P63-SS-04
Date: 4/21/25
Sample Method: Grab
Proposed Coordinates: Lat.
Long.

Water Height
DTM Depth Sounder: 17.6, 18.2, 18.4
DTM Lead Line: —

Tide Measurements
Time:
Height:

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation (lower low water-large tides): calculated after sampling

Grab #	Time	Confirmed Coordinates (datum) WGS 84 (N)	Confirmed Coordinates (datum) WGS 84 (E)	Sample Accept (Y/N)	Recovery Depth (in) cm	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc.
1	0918	22571263	7829242.74	N	-	No recovery shell/metal spike in jaw
2	0921	225717.29	7829244.95	N	-	Stick in jaw no recovery
3	0923	22570201	7829231.73	Y	13	jaws closed kelp front

Sample Description: surface cover, (density), moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

dark grey sand silt, small shell fragments prevelant, no odor some biological sheen, kelp

Sample Containers: 4-8oz jars

Analyses:

ANCHOR QEA

Surface Sediment Field Log

Job: Pier 63 Sediment Sampling
Job No: 220795-01.01
Field Staff: N. Mags, R. Acker
Contractor: Gravity
Horizontal Datum:

Station: P63-SS-05
Date: 4/27/23
Sample Method: Grab
Proposed Coordinates: Lat.
Long.

Water Height
DTM Depth Sounder: 36.4, 36.8, 36.4
DTM Lead Line: –

Tide Measurements
Time:
Height:

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation (lower low water-large tides): calculated after sampling

Grab #	Time	Confirmed Coordinates (datum) WGS 84 (N)	Confirmed Coordinates (datum) WGS 84 (E)	Sample Accept (Y/N)	Recovery Depth (in cm)	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc.
1	0938	225713.26	7829061.87	N	10	poor seal
2	0945	225716.18	7829067.53	N	~4	Jaws proped open
3	0949	225724.88	7829064.80	Y	20	Jaws Closed

Sample Description: surface cover, (density), moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

dark grey sandy silt, shell fragments w/ whole shells prevelant, slight odor and rainbow sheen

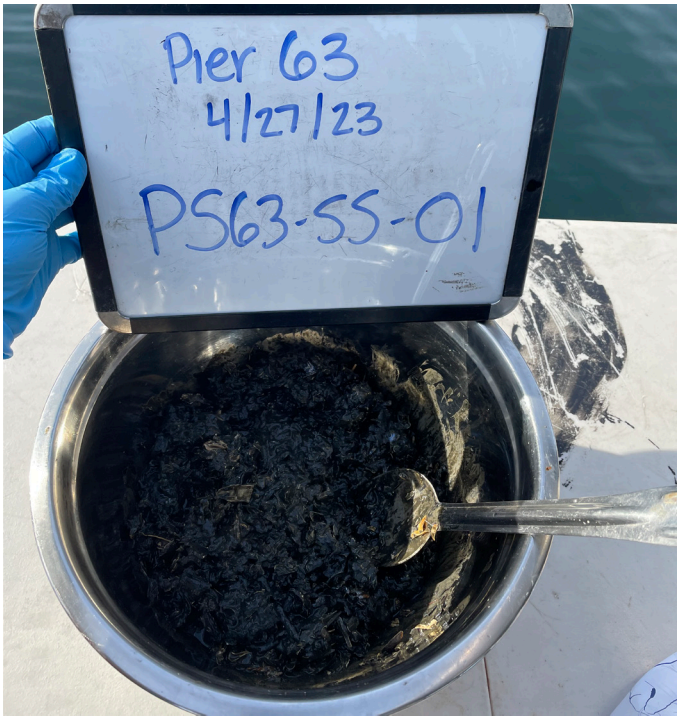
Sample Containers: 4-8oz jars clear

Analyses:

Appendix D
Field Photographs

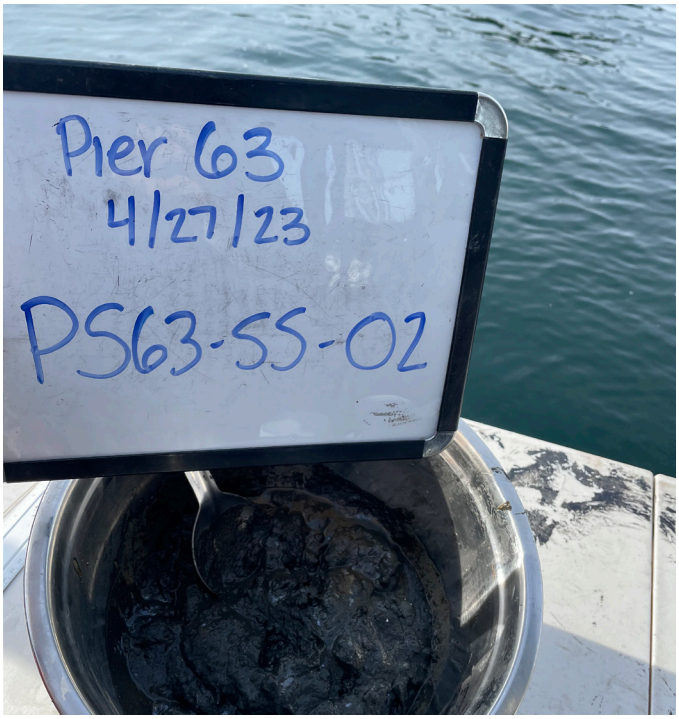
Photograph D-1
Sediment Grab P63-SS-01

Photograph D-2
Homogenized Sediment Grab P63-SS-01



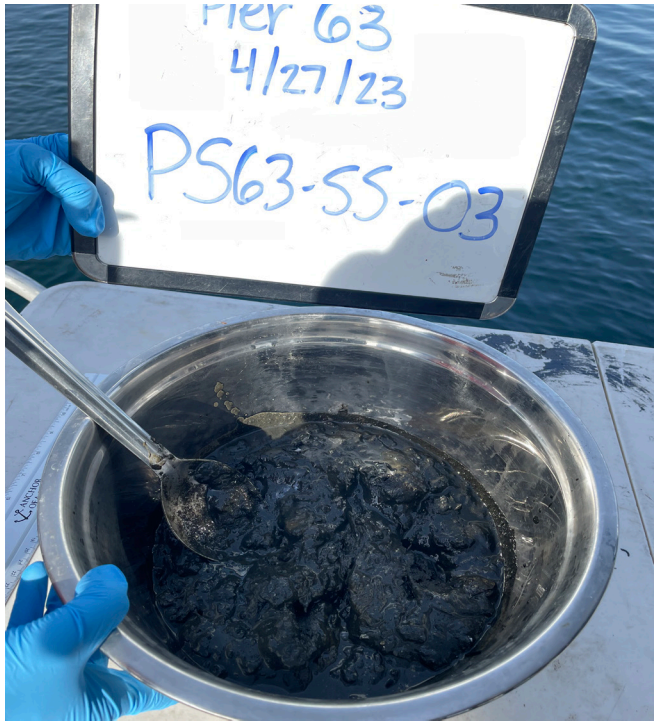
Photograph D-3
Sediment Grab P63-SS-02

Photograph D-4
Homogenized Sediment Grab P63-SS-02



Photograph D-5
Sediment Grab P63-SS-03

Photograph D-6
Homogenized Sediment Grab P63-SS-03

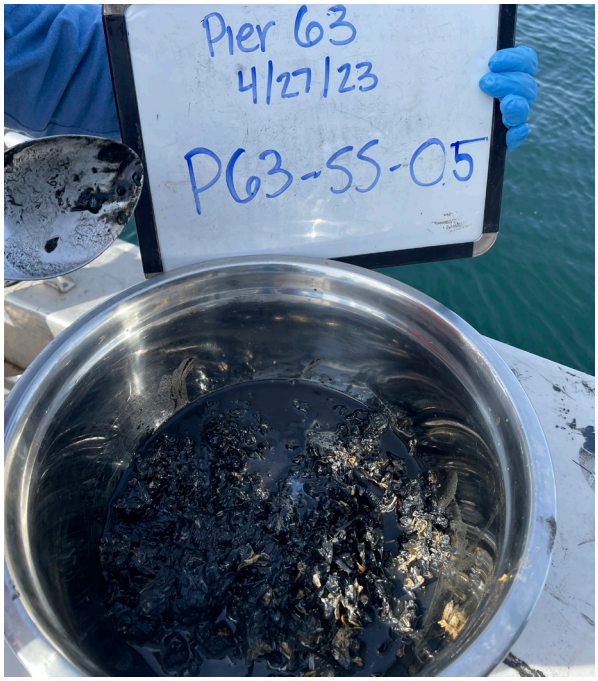


Photograph D-7
Sediment Grab P63-SS-04

Photograph D-8
Homogenized Sediment Grab P63-SS-04

Photograph D-9
Sediment Grab P63-SS-05

Photograph D-10
Homogenized Sediment Grab P63-SS-05



Appendix E
Laboratory Reports

Appendix F
Data Validation Report