REMEDIAL INVESTIGATION AND FEASIBILITY STUDY REPORT

Barbee Mill Site

Prepared for: Barbee Mill Co., Inc.

Aspect Project No. 050004 / Geosyntec Project No. PNG0869
May 15, 2024 PUBLIC REVIEW DRAFT

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Acronyms

AKART	all known, available, and reasonable treatment methods
Anchor	Anchor Environmental, LLC
AO	Agreed Order
ARAR	applicable or relevant and appropriate requirements
Aspect	Aspect Consulting
Barbee Mill	Barbee Mill Co., Inc.
Barbee Property	former Barbee Mill property
bgs	below ground surface
bml	below mudline
BNSF	Burlington Northern Santa Fe
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
CLARC	cleanup levels and risk calculations
cm	centimeters
cm/sec	centimeters per second
COC	contaminant of concern
COPC	contaminant of potential concern
cPAH	carcinogenic PAH
CSL	Cleanup Screening Level
CSM	conceptual site model
DCA	disproportionate cost analysis
DNAPL	dense non-aqueous phase liquids
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ft/day	feet per day
ft/ft	feet over feet
Geosyntec	Geosyntec Consultants, Inc.

gpm	gallons per minute
IC	institutional control
IDW	inverse distance weighting
IRAP	Independent Remedial Action Plan
ISCR	*in situ* chemical reduction
ISS	*in situ* solidification/stabilization
K_d	partition coefficient
L/kg	liters per kilogram
mg/kg	milligrams/kilograms
µg /kg	micrograms per kilogram
µg/L	micrograms per liter
MNA	monitored natural attenuation
MTCA	Model Toxics Control Act
NAVD88	North American Vertical Datum 1988
NOAA	National Oceanic and Atmospheric Administration
O&M	operation and maintenance
OHW	ordinary high water
OHL	ordinary low water
ORP	oxidation/reduction potential
PAH	polycyclic aromatic hydrocarbons
PAZ	passive attenuation zone
PCB	polychlorinated biphenyl
PCP	pentachlorophenol
PCUL	preliminary cleanup level
POC	point of compliance
PQL	practical quantitation limits
Quendall Property	Quendall Terminals property
Quendall Site	Quendall Terminals Superfund site
RAO	remedial action objective
RBTC	risk-based threshold concentrations
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington

redox	oxidation-reduction potential
REL	remediation level
RETEC	Remediation Technologies
RI/FS	Remedial Investigation/Feasibility Study
RMC	Renton Municipal Code
ROD	Record of Decision
SCO	Sediment Cleanup Objective
SCUM	Sediment Cleanup Users' Manual
Site	Barbee Mill Site
SMA	sediment management areas
SMS	Sediment Management Standards
SVOC	semivolatile organic compound
SWAC	surface-area weighted average concentration
TEQ	toxic equivalency
TOC	total organic carbon
TPH	total petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers
USC	United States Code
UST	underground storage tank
VCP	Voluntary Cleanup Program
VOC	volatile organic compound
WAC	Washington Administrative Code

1 Introduction

On behalf of Barbee Mill Co., Inc. (Barbee Mill), Aspect Consulting (Aspect) and Geosyntec Consultants (Geosyntec) have prepared this Remedial Investigation and Feasibility Study Report (RI/FS) for the Barbee Mill Company Site (Site) in accordance with the Agreed Order between the Washington State Department of Ecology (Ecology) and Barbee Mill effective December 1, 2009 (Agreed Order No. DE5396), the First Amendment to Agreed Order effective December 16, 2010, the Second Amendment to Agreed Order effective May 30, 2012, and Modifications to Agreed Order Schedule and Deliverables letter dated November 17, 2020 (collectively, the AO). This RI/FS was prepared consistent with the requirements of the Model Toxics Control Act (MTCA: Chapter 70A.305 Revised Code of Washington [RCW]) and applicable regulations (Washington State Administrative Code [WAC] 173-340) and the Sediment Management Standards (SMS: WAC 173-204; Ecology, 2013a).

Since 1998, Barbee Mill has completed numerous investigations and remedial actions to address soil, groundwater, and sediment contamination. A Draft RI Report (Aspect, 2019) was completed in May 2019. Ecology reviewed the Draft RI Report and identified data needed to further delineate the extent of elevated arsenic and other chemicals in soil, sediment, and groundwater. Data gaps and work proposed to address those data gaps were described in the RI Work Plan (Aspect, 2021) which included a Sediment Remedial Investigation Work Plan (SRI Work Plan; Geosyntec 2021) as Appendix B. An SRI Work Plan Addendum (Geosyntec, 2022) was developed, in collaboration with Ecology, to address remaining data gaps identified after review of the 2021 RI data. The results of the subsequent investigations were provided in the RI Data Report (Aspect and Geosyntec, 2023). This RI/FS incorporates those results.

1.1 Site Description

The Site is generally located at 4101 Lake Washington Boulevard North in Renton, Washington (Figure 1-1) on the southeastern shoreline of Lake Washington at the mouth of May Creek (Figure 1-2). The Site is located within a former industrial area that now includes residential and potential future commercial uses. The approximately 22-acre Site includes a portion of the former Barbee Mill upland property (Barbee Property), sediments and shoreline banks of the Barbee Property, a portion of state-owned aquatic land located in Lake Washington immediately adjacent to the Barbee Property, and a portion of the Quendall Terminals property (including upland and sediments).

Barbee Mill owned and operated a sawmill on the portion of the property north of May Creek from the 1940s until the early 2000s. The Barbee Property was redeveloped for residential use in 2006, as described in Section 2.1. Former operations on the Barbee Property resulted in impacts to soil, groundwater, and sediments on the Barbee Property, on a portion of the north-adjacent Quendall Property, and on west-adjacent, state-owned aquatic lands of Lake Washington. The Site consists of the area of these properties where

contamination has come to be located, including the areas previously addressed by remedial actions (Section 4.2).

1.2 Objectives

The RI/FS objectives are to identify the nature and extent of contamination, evaluate potential exposure pathways, establish cleanup standards, and develop and evaluate remedial alternatives, to enable Ecology to select a cleanup action for the Site. The selected cleanup action will be documented in a draft Cleanup Action Plan (CAP), which Ecology will issue for public review.

1.3 Report Organization

This RI/FS includes 13 sections and 13 appendices. The main text is organized as follows:

- Section 1 – **Introduction** presents information regarding the project background and objectives.
- Section 2 – **Site Background** provides information about the Site location and history.
- Section 3 – **Environmental Setting** summarizes relevant environmental information including land use, climate, and hydrogeology.
- Section 4 – **Summary of Completed Investigations and Remedial Actions** describes the purpose and scope of each investigation and remedial action conducted at the Site.
- Section 5 – **Screening Levels and Identification of Contaminants of Concern** identifies screening levels for soil, groundwater, and sediment and identifies contaminants of concern (COCs) by comparing these levels to Site data.
- Section 6 – **Nature and Extent of Contamination** describes the occurrence of Site COCs, including historical conditions and present conditions based on data collected.
- Section 7 – **Conceptual Site Model** describes contaminant fate and transport, and evaluates potential exposure pathways.
- Section 8 – **Cleanup Requirements** identifies the applicable or relevant and appropriate requirements (ARARs), the cleanup levels and points of compliance, the remedial action objectives (RAOs), and the areas requiring remediation.
- Section 9 – **Identification and Screening of Remedial Technologies** summarizes all possible remedial technologies for the Site and retains applicable technologies for remedial alternatives.
- Section 10 – **Description of Alternatives** presents five remedial alternatives for the Site.
- Section 11 – **Remedial Alternative Evaluation** presents an evaluation of the alternatives based on MTCA requirements.

- Section 12 – **Summary and Conclusions** summarizes the project and presents conclusions of the RI/FS.
- Section 13 – **References** provides references supporting this report.

Tables, figures, and appendices with supporting information are provided at the end of the main report text.

2 Site Background

This section describes the Site location and surrounding land use (Section 2.1), pre-industrial Site history (Section 2.2), historical industrial Site operations (Section 2.3), and Quendall Property historical operations and cleanup status (Section 2.4).

2.1 Site Location and Surrounding Land Use

As described in Section 1.1, the Site is located near the mouth of May Creek on Lake Washington and includes portions of the Barbee Property, Quendall Property, and state-owned aquatic lands. The Site is surrounded by the following:

- The Quendall Terminals Superfund Site (Quendall Site) to the north. The Quendall Property, which was formerly used for creosote manufacturing, is listed on the National Priorities List and being investigated and remediated under the direction of the U.S. Environmental Protection Agency (EPA), as described in Section 2.4. The Quendall Site, which includes all of the upland portion of the Quendall Property, partially overlaps with the Site. Additional discussion of the relationship between the Site and the Quendall Site is provided in Section 6. The Quendall Property is currently vacant but is planned to be redeveloped for mixed residential and commercial use in conjunction with remediation of the Quendall Site.
- The former BNSF Railroad right-of-way, located to the east and south. The railroad is no longer in use; the right-of-way was sold to the Port of Seattle in 2009 and later conveyed to King County. It is currently used as a trail.
- State-owned aquatic lands of Lake Washington to the west.

In 2006, Conner Homes at Barbee Mill LLC (Conner Homes) purchased the Barbee Property. Conner Homes subdivided the Barbee Property into 114 residential lots. The development includes common space areas, parking areas, City of Renton rights-of-way, a walking trail along May Creek, riprap shoreline, and an overwater dock for transient moorage.

The residential development is served by underground utilities, including natural gas, water, sewer, fiber optic communications, and electricity. Stormwater is collected in a lined detention pond (Mill Pond[1]) in the center of the Barbee Property, with an outfall discharging to Lake Washington. Figure 2-1 shows utility locations.

2.2 Pre-Industrial Site History

The Site is in the traditional territory of the Duwamish, a Southern Coast Salish people, and within the historical May Creek delta, where May Creek has flowed into Lake

[1] In spite of its name, the Mill Pond was not a historical surface water feature but was created as a detention pond during Property development.

Washington. May Creek was known to the Duwamish as Šbal'tu, meaning "place where things are dried" (i.e., a fish processing station), and a village consisting of two to three houses of the Duwamish group called the Subaltuabs was recorded in the area until ca. 1855 (CRC, 2012). At that time, the May Creek mouth was northeast of the Site. The Site area was generally submerged[2] until 1916, when the Lake Washington water level was lowered with the connection of Lake Washington to Lake Union. Between 1855 and 1930, many of the Duwamish living in the area were relocated to the Muckleshoot or Port Madison Indian Reservations (Larson, 1997). The Muckleshoot Tribe exercises treaty fishing rights in Lake Washington.

2.3 Historical Industrial Site Operations

Much of the Site operational history discussed below was described in the "Independent Remedial Action Plan" (IRAP; Hart Crowser, 2000b) and is based on Barbee Mill records and discussions with Alex Cugini (former President of Barbee Mill); Robert Cugini (current President of Barbee Mill); and Michael Lloyd, a consultant to Barbee Mill on waste management and permitting issues.

2.3.1 Early Operations

The first known operations at the Site date back to at least the 1920s, when a dock and rail line in the southern portion of the Barbee Property were associated with the May Creek Lumber Company and Railway, and a small lumber mill was reportedly present. An aerial photograph from 1936 does not show any structures, but many log rafts were present, and May Creek had been rerouted through the center of the Barbee Property. In May 1943, the Barbee Property was deeded to Barbee Marine Yards, and a shipyard was created to construct barges, tugs, and other vessels during World War II. Figure 2-2 shows the location of the former shipyard area, based on information provided by Robert Cugini. In the 1950s, the shipyard area was also reportedly leased to Pan Abode, which may have conducted wood treatment using pentachlorophenol (PCP). Little information from this period is available, as most records were destroyed in a fire in 1957.

2.3.2 Barbee Mill Operations

A 1945 deed indicates ownership of the Barbee Property was transferred from Barbee Marine Yards to Barbee Mill. A 1946 photograph shows the Barbee Property was used as a lumber mill, and May Creek was rerouted to just north of its present location. The mill continued to operate into the 1950s, with additional upland area added to the facility by placement of fill along the shoreline. This included filling a portion of state-owned aquatic lands that were leased from the Port of Seattle and later from the Washington State Department of Natural Resources (DNR). This area of historical shoreline fill was removed to restore aquatic habitat in 2005.

[2] Prior to construction of the Lake Washington Ship Canal, the lake level may have fluctuated as much as 7 feet in recent history due to rainfall variability. In addition, over the past 7,000 years, the shoreline has occasionally fluctuated more dramatically due to earthquakes causing landslides and/or uplift; in particular, significant uplift of the area occurred ca. 1,100 years ago during an earthquake on the Seattle fault. Fluctuating levels of Lake Washington likely periodically inundated the shoreline and associated Native American sites (Larson, 1997).

In 1957, the mill was almost destroyed by a fire and was subsequently rebuilt. By 1974, the area north of May Creek was completely paved. In the early 2000s, mill operations were reduced substantially, with only some limited cut-line activities occurring. In 2005, the mill was closed, and equipment was auctioned off. Mill buildings were demolished in 2005 and 2006.

2.3.2.1 Log Rafting

As part of lumber mill operations, untreated logs were stored offshore, prior to processing, in areas leased from DNR. Log rafting occurred throughout the period of mill operation. Log transfer and rafting operations resulted in historical accumulations of wood debris in Lake Washington sediments that were periodically dredged to facilitate navigation.

2.3.2.2 Wood Treatment Operations

In the late 1940s, an arsenic-based compound was used for treatment of wood pilings in the northeast portion of the Site. This process is reported to have been an experimental operation that was present on the Site for a very short time. Barbee Mill records include a patent issued in 1938 for "Processes for Preserving Felled Green Timber Containing Its Natural Sap." This patent refers to a water-soluble mixture containing arsenic trioxide, copper sulfate, zinc sulfate, and iron sulfate that was to be injected into recently felled timber.

A fungicide product containing PCP (Permatox 100) was used for sap stain control until approximately 1978. Permatox 100 was replaced by PQ8, a copper-based product that was used until approximately 1988. Between approximately 1988 until mill operations ceased, a proprietary fungicide product, Sta Brite P, was used for sap stain control. The fungicides were applied in three spray areas, as shown on Figure 2-2. The spray areas were relatively small, with a maximum of approximately 100 gallons of sap stain control solution mixed at any given time. Mist and drippings from the spray process were recycled and reused. The easternmost spray area, at the Press Area (Building C on Figure 2-2), was not placed in service until after the use of Permatox 100 was discontinued in approximately 1978.

2.3.2.3 Sawmill Operational Areas

Figure 2-2 shows the locations of historical sawmill operational areas. Equipment and chemical products formerly used in these areas are described below.

Former sawmill buildings and equipment are labeled on Figure 2-2 as letters A through L, which are referenced below. Buildings and equipment were decommissioned and removed from the Site in 2005 and 2006.

A. Sawmill. The sawmill was built in 1959 and included a fungicide treatment area. The fungicide spray area was established in the late 1970s, and used three chemical fungicides during different time periods, as described in Section 2.3.2.2. Sawmill operations required the use of hydraulic fluid, grease, oil, and welding supplies.

A transformer corral was located on the east side of the former sawmill. Transformers in the corral were replaced in the late 1960s and were not checked for polychlorinated biphenyls (PCBs) prior to removal. The replacement transformers in the corral were

labeled PCB-free. Smaller transformers were also located inside the former sawmill. Some of these smaller transformers were replaced in the past without PCB testing. Several of the smaller transformers were tested and found to be PCB-free (Hart Crowser, 2000b).

B. Planer. The planer was also built in 1959 and included a fungicide treatment area. The fungicide spray area used three chemical fungicides during different time periods, as described in Section 2.3.2.2. The planer fungicide spray area was rebuilt in the early 1980s to include double containment and a product recycling system.

The planer had several small transformers, some of which were confirmed to be PCB-free (Hart Crowser, 2000b). Planer machinery was primarily pneumatic, but some hydraulic fluid was used. Machinery also required the use of grease, oil, and welding supplies.

C. Press/Old Dry Kiln. The old dry kiln was built in 1962. The dry kiln was taken offline in approximately 1973, and starting in 1978, the building housed a press operation. A fungicide spray operation was associated with the press operation and was placed in service in the early 1980s, after Permatox 100 was no longer used at the Site. Spray from the system was contained and discharged, after passing through an oil/water separator, to the Metro sanitary sewer.

D. Shop. The shop was built in the mid-1950s, before the 1957 fire, and was used for miscellaneous activities associated with mill operation and maintenance. A babbit pot for casting-saw guides was located in the southeastern portion the shop, and molten babbit (nickel, lead, and tin) was handled there. A parts washer was located in the shop and serviced by Safety-Kleen. The parts washer used nonchlorinated solvents and was eventually switched to a water-based compound.

E. Storage/Loading Facility. This building was built in the early 1960s and was used to load trucks and rail cars leaving the facility. After the sawmill was closed, this building was used to store inactive mill vehicles. No chemical storage was reported in this area.

F. Dry Kiln. This building, completed in 1973, housed the dry kiln for the sawmill. A small area for consolidated waste oil and antifreeze accumulation was present inside the building. The building was also used for lumber storage. The area between the dry kiln and the shop was used for steam cleaning of mill equipment. An oil/water separator was present in the catch basin for the wash down area. The storm sewer system conveyed effluent from the catch basin to Outfall 001.

G. Stacker. The stacker, built in 1963, operated via a hydraulic system and electric motors. The stacker machinery required the use of grease, oil, and welding supplies.

H. Boise Building/Cut Line/High Lean To. The Boise Building was constructed in approximately 1956. Adjacent to the Boise Building was the cut-line building with associated machinery, lumber storage, and a bermed waste material storage area (dating from the early 1980s). Materials stored in the waste material storage area included latex paint used for stenciling, hydraulic oil, saw oil, motor oil, Sta Brite P, antifreeze, used oil, grease, and lubricants.

I. Black Building. The 'Black' building was constructed prior to 1957. The building had a concrete floor and was used for storage of equipment, including motors, wire, metal, paper wrap, and latex paint.

J. Warehouse 1. This building was built in 1964 and was used for lumber storage.

K. Warehouse 2. This building was built in 1971 and was also used for lumber storage.

L. Office. No chemical handling, other than use of typical office supplies, was reported in the office building. Office building wastewater discharged to a septic system on its north end.

Two other operational areas shown on Figure 2-2 are the Log Storage Area and Parking Area.

Log Storage Area. This area was used for unprocessed wood storage. Most unprocessed wood storage has historically occurred in Lake Washington. This area was also occasionally a stockpile area for dredge spoils.

Parking Area. The former employee parking area was also used to stockpile dredge spoils prior to hauling off the Site.

2.3.2.4 Storm Drainage Systems

The area north of May Creek was served by a storm sewer system with four outfalls to Lake Washington, and one connection to the sanitary sewer. The former drainage systems are shown on Figure 2-2. The areas served by each outfall are as follows:

Outfall 001. Outfall 001 drained the central portion of the facility. The system included two oil/water separators.

Outfall 002. Outfall 002 drained the northwest portion of the facility.

Outfall 003. Outfall 003 drained the log storage area in the southern portion of the mill.

Sawmill Outfall. A catch basin, oil/water separator, and outfall were located adjacent to the sawmill, as shown on Figure 2-2.

2.3.2.5 Underground Storage Tanks

From December 1989 through February 1990, five underground storage tanks (USTs) were removed from the Site. B & C Equipment Co., of Seattle, conducted this work (Hart Crowser, 2000b). Approximate locations of the former tanks are shown on Figure 2-2. Following tank removal, Barbee Mill converted most vehicles to compressed natural gas, eliminating the need for replacement tanks.

Tank 1 (Closed and Removed). Tank 1 was an underground 7,000-gallon fuel oil tank used to provide backup fuel in the event of a disruption in natural gas service. The tank was installed in the 1970s and removed and closed in December 1989.

Tank 2 (Closed and Removed). Tank 2 was an underground 2,000-gallon diesel tank installed in the early 1960s and removed and closed in February 1990. The tank was used to fuel vehicles prior to conversion of most vehicles to compressed gas.

Tank 3 (Closed and Removed). Tank 3 was an underground 2,000-gallon gasoline tank installed in the early 1960s and removed and closed in February 1990. The tank was used to fuel vehicles prior to conversion of most vehicles to compressed gas.

Tank 4 (Closed and Removed). Tank 4 was an underground 200-gallon heating oil tank installed in the mid-1960s to provide heat for the shop. The tank was removed and closed in early 1990.

Tank 5 (Closed and Removed). Tank 5 was an underground 8,000-gallon fuel oil (PS300) tank, installed in approximately 1960, to provide fuel for the old dry kiln. The tank was removed and closed in December 1989.

Tank 6 (Removed). Tank 6 was an aboveground double-walled 2,000-gallon diesel tank that provided fuel for vehicles that did not operate on compressed gas. This tank was removed after the mill closed.

2.4 Quendall Property

The adjacent Quendall Property, located north of the Barbee Property, was historically used for creosote manufacturing. Creosote and coal tar releases during manufacturing operations contaminated soil, sediments, and groundwater. The Quendall Property is part of the Quendall Terminals Superfund Site (Quendall Site) and is being remediated under the direction of the EPA. The cleanup status of the Quendall Site and the relationship between environmental conditions at the Quendall Site and the Site are summarized below. The Quendall Property and Quendall Site are shown on Figure 1-2.

2.4.1 Quendall Site Cleanup Plan and Status

The Quendall Site RI (Anchor and Aspect, 2012) was completed in 2012, and the FS was completed in 2016 (Aspect and Arcadis, 2016). The Record of Decision (ROD) was issued in July 2020. The Quendall Site ROD divided the Quendall Site into two operable units: OU-1 (upland) and OU-2 (sediment) and identified the following remedial elements:

OU-1

- *In situ* smoldering combustion to treat upland dense non-aqueous phase liquids (DNAPL) source material causing groundwater contamination
- *In situ* solidification to stabilize soil containing remaining source material
- A soil cap
- Institutional controls (ICs) and monitoring

OU-2

- Dredging of sediments containing DNAPL source material
- Placing an engineered sand cap in sediments within the groundwater discharge area
- Implementing enhanced natural recovery in remaining contaminated sediment areas

- ICs and monitoring

Pre-remedial design activities for the Quendall Site are underway.

2.4.2 Environmental Conditions - Relationship Between the Quendall Site and the Site

The Quendall Property and the Barbee Property have very similar environmental settings. They are adjacent to each other, are located on the shore of Lake Washington, and have similar geologic units and hydrogeologic characteristics. The releases at both sites are the result of historical industrial use; however, the specific uses were different and separate. The Quendall Property was used primarily for creosote manufacturing, and the Barbee Property was used primarily for manufacturing lumber with limited wood treatment operations.

At the time of the creosote manufacturing operations, the May Creek channel was located on the Quendall Property, creating a separation between the northern two-thirds and southern third of the Quendall Property (Anchor and Aspect, 2012). Creosote operations were located north of the former May Creek channel and, as a result, contamination on the Quendall Property is primarily in the central and northern areas. However, releases of creosote to the former May Creek channel have resulted in a groundwater plume of creosote-related contaminants within the southern portion of the Quendall Property, which overlaps the northern portion of the Site. Figures from the Quendall Site FS Report (Aspect and Arcadis, 2016) showing groundwater conditions, including groundwater flow direction and occurrences of arsenic, naphthalene, and carcinogenic polycyclic aromatic hydrocarbons (cPAHs), are provided in Appendix A.

Arsenic Occurrences. Most of the COCs identified for the Quendall Site are constituents of coal tar and creosote, including benzene, toluene, ethylbenzene, and xylenes (BTEX); and polycyclic aromatic hydrocarbons (PAHs). However, arsenic, which is not associated with coal tar or creosote, is also a Quendall Site COC based on elevated concentrations in groundwater. Arsenic occurrences on the two sites have different characteristics:

- Arsenic was reportedly used on the Quendall Property for weed control; however, no significant source of arsenic in soil has been detected on the Quendall Property. In general, arsenic occurrences are elevated in groundwater in the Deeper Alluvium on the Quendall Site in areas of coal tar and creosote DNAPL, suggesting that the elevated concentrations may be due to mobilization of naturally occurring arsenic under the highly reducing conditions from the presence of both natural organic materials (e.g., peat) and coal tar and creosote. A figure from the Quendall Site RI Report (Anchor and Aspect, 2012) showing arsenic distributions in Deeper Alluvium groundwater on the Quendall Site is provided in Appendix A.
- On the Barbee Property, historical releases of an arsenic-containing aqueous wood-treating formulation have resulted in groundwater contamination primarily within the Shallow Alluvium, with a more localized occurrence close to the source area in the Deeper Alluvium. Arsenic contamination within the Shallow Alluvium on the Quendall Site is located far north of the Site groundwater plume.

A figure from the Quendall Site RI Report (Anchor and Aspect, 2012) showing the distribution of arsenic in Shallow Alluvium groundwater on the Quendall Property is provided in Appendix A.

PAH Occurrences. A figure from the Quendall Site FS (Aspect and Arcadis, 2016) showing the extent of groundwater contamination for benzene, naphthalene, and carcinogenic PAHs (cPAHs; benzo[a]pyrene equivalent) is provided in Appendix A. In general, the extent of BTEX and PAHs exceeding Quendall Site cleanup levels in the Shallow Alluvium do not extend as far south as the Site arsenic plume. There are two exceptions, as follows:

- A low concentration of cPAHs (0.3 micrograms per liter [µg/L]) was detected in groundwater at well BH-29A, within the Site arsenic plume. This value exceeds the Quendall Site cleanup level of 0.2 µg/L and the Site screening level (see Section 5.1.1) of 0.0043 µg/L.
- A low concentration of naphthalene (18 µg/L) was detected in groundwater at well BH-29A within the Site arsenic plume. This concentration exceeds the Quendall Site cleanup level of 1.4 µg/L and the Site screening level of 8.9 µg/L.

BH-29A was resampled in November 2020 as part of Quendall Site pre-remedial design activities. At that time, naphthalene was not detected and the cPAH concentration was lower (0.045 µg/L).

Sediments containing elevated levels of PAHs are located offshore of the upland portion of the Quendall Property. PAH concentrations in surface sediments are highest along the former T-dock alignment and close to Quendall Pond (see figure 5.4-4 from Quendall Site RI Report in Appendix A, Attachment A-5). PAH concentrations exhibit a decreasing trend moving south from these areas but are present above Site screening levels within Site sediments, as described in Section 6.2.2.3.

TOC and Wood Debris Occurrences. Sediments containing elevated levels of total organic carbon (TOC) and wood debris are located offshore of the Barbee Property, on the aquatic portion of the Quendall Property, and on adjacent aquatic state-owned lands, due to historical use of these in-water areas by Quendall Property tenants for log rafting, similar to the log rafting that occurred at the Site. A figure showing elevated wood debris and TOC in sediments from the Quendall Site RI Report (Anchor and Aspect, 2012) is provided in Appendix A. Sediment within these areas have not been removed, but bioassay testing was conducted, and results showed no significant adverse effects from elevated TOC and wood debris concentrations on benthic biota. Sediment containing elevated concentrations of TOC and wood debris offshore of the Barbee Property were dredged in 1999 and 2002 as part of a sediment removal action described in Sections 4.2.1 and 4.2.2.

2.5 Environmental Justice Screening

Washington state is committed to reducing environmental and health disparities in the state and improving the health of all its residents. State and national studies have found that people of color and low-income people continue to be disproportionately exposed to environmental harms in the places they live. As a result, there is a higher risk of adverse

health outcomes for those communities. This risk is amplified when overlaid on communities with preexisting social and economic barriers and environmental risks, creating cumulative environmental health impacts.

In order to address and prevent such environmental health disparities, Ecology requires remedial investigations to include a determination of whether the population threatened by a contaminated site includes a likely vulnerable population or overburdened community (WAC 173- 340-350(6)(h)(iii)).

- Vulnerable populations are groups that are more likely to be at higher risk for poor health outcomes in response to environmental harms, due to: (i) adverse socioeconomic factors, such as unemployment, high housing and transportation costs relative to income, limited access to nutritious food and adequate health care, linguistic isolation, and other factors that negatively affect health outcomes and increase vulnerability to the effects of environmental harms; and (ii) sensitivity factors, such as low birth weight and higher rates of hospitalization. Vulnerable populations include, but are not limited to, racial or ethnic minorities, low-income populations, populations disproportionately impacted by environmental harms, and populations of workers experiencing environmental harms.
- An overburdened community is defined as a geographic area where vulnerable populations face multiple, combined environmental harms and health impacts and includes, but is not limited to, highly impacted communities. Highly impacted communities are communities designated by the Washington State Department of Health based on cumulative impact analyses or a community located in census tracts that are fully or partially on "Indian country" as defined in 18 U.S.C. Sec. 1151.

In accordance with the legislation, this remedial investigation includes an environmental justice screening to determine whether the potentially exposed population includes a likely vulnerable population or overburdened community. This screening is conducted in accordance with the Healthy Environmental Act for All (HEAL) Act, Chapter 70A.02 RCW, WAC 173-340-200 (Ecology, 2024). Tools identified in “Implementation Memorandum No. 25: Identifying Likely Vulnerable Populations and Overburdened Communities under the Cleanup Regulations” (Ecology, 2024) were used to complete the environmental justice screening, including the Environmental Health Disparities (EHD) Index from the EHD Map maintained by the Washington State Department of Health (DOH, 2022) and the EJScreen tool from the EPA (EPA, 2023).

2.5.1 EHD Disparities Index Results

The EHD Map is divided into communities based on census tracts, which vary in size from 2,000 to 8,000 people. Communities are assigned an environmental health disparity index using a 1 to10 ranking scale, with 1 being low risk and 10 being high risk for environmental health disparities. The Site is split between two census tracts: 53033025301 (southern portion of the Site) and 53033024702 (northern portion of the Site).

Both communities associated with the Site had an overall environmental health disparity ranking of 9, which is considered high. This ranking is calculated based on environmental exposures, environmental effects, socioeconomic factors, and sensitive populations, as described below.

- Environmental exposures had a high (9) ranking for the Site, due to the proximity to the highway (Interstate 405) and associated diesel PM2.5 emissions, and toxic releases from facilities (Barbee Site and Quendall Site).
- Environmental effects had a medium (6) to high (8) ranking due to the proximity to an EPA Superfund site (Quendall Site) and proximity to hazardous waste treatment storage and disposal facilities.
- Socioeconomic factors were ranked low (3) for the community that includes the northern portion of the Site, and medium (7) for the community that includes the southern portion of the Site. The medium ranking for the southern portion of the Site (which includes a portion of downtown Renton) was due to a high percentage of people of color (37 percent), unaffordable housing, limited English speaking, and few high school diplomas.
- Sensitive populations had a high (9) ranking for the community that includes the northern portion of the Site and medium (7) for the community that includes the southern portion of the Site, due to high death rates from cardiovascular disease and high percentages of low birth weight.

2.5.2 EJ Screen Results

The EJScreen tool from EPA is divided into census block groups similar to the communities in the EHD Map. The Site is in block group 530330247043 and is bordered to the south by block group 530330253042. Both of these block groups were selected for the environmental justice screening in order to capture all areas of the community that may be affected.

EJScreen was used to assess socioeconomical indicators including the Demographic Index (low income and people of color) and the Supplemental Demographic Index (low income, unemployment, lack of English proficiency, less than high school education, and low life expectancy). The Demographic Index for the Site is within the 35th percentile for the state and 30th percentile for the nation. The Supplemental Demographic Index for the Site is within the 33rd percentile for the state and 25th percentile for the nation.

2.5.3 Overall Screening Results

Ecology considers the potentially exposed population to include a likely vulnerable population or overburdened community if (1) the population has a ranking of 9 or 10 on the Environmental Health Disparities Index from DOH's EHD Map, or (2) the potentially exposed population is located in a census tract that is at or above the 80th Washington state percentile of the Demographic Index or Supplemental Demographic Index from EPA's EJScreen (Ecology, 2024). Although the Site is below the 80th Washington state percentile of the Demographic Index or Supplemental Demographic Index, the Site is located in two census tracts that each have a ranking of 9 on the EHD Map. Therefore,

the potentially exposed population includes a likely vulnerable population or overburdened community.

An assessment of the impact of potential cleanup actions on vulnerable populations will be included in evaluation of remedial alternatives in the FS (Section 11).

3 Environmental Setting

This section describes Site characteristics, including topography and surface water characteristics (Section 3.1), geologic and hydrogeologic conditions (Section 3.2), and climate and natural resources (Section 3.3).

3.1 Topography and Surface Water Characteristics

The Site is located along and includes a portion of Lake Washington's eastern shoreline (Figure 1-2). Upland elevations at the Site range from approximately 17 feet North American Vertical Datum of 1988 (NAVD88)[3] along the shoreline to approximately 30 feet at the eastern property boundary. Most of the Site slopes gently to the west. The Barbee Property is approximately 5 to 10 feet higher than the Quendall Property to the north due to fill placed by Conner Homes during redevelopment in 2007; a retaining wall and fence separates the two properties. East of the Site, steep wooded slopes rise to an elevation ranging from approximately 300 to 500 feet to a residential area. The Site extends into Lake Washington and is adjacent to May Creek. Both surface water bodies are described below.

The Site also contains a stormwater detention pond that was installed by Conner Homes as part of the redevelopment in 2007 (see Figure 2-1). The detention pond was constructed with an impermeable liner (overlain by a protective layer of sand) to isolate the pond contents from the groundwater system. A second protective layer of gravel was placed above the sand layer in July 2012. The detention pond collects stormwater from the Conner Homes residential development and discharges to Lake Washington.

3.1.1 Lake Washington

Lake Washington is a naturally occurring freshwater lake that was connected via canals to Lake Union and eventually the Puget Sound in the early 1900s. The water level of Lake Washington is controlled by the U.S. Army Corps of Engineers (USACE) at the Hiram M. Chittenden Locks and ranges seasonally from its ordinary low water (OLW) elevation of 16.7 feet in winter to its ordinary high water (OHW) elevation of 18.7 feet in summer. Water levels are typically increased starting in mid-February and reach OHW by June. Because these levels are controlled and the Site is not tidally influenced, sea level rise due to climate change is not expected to directly affect the Site.

Water depths in the middle of the lake average 108 feet, with a maximum water depth of 214 feet. In the vicinity of the Site, the lake bottom is at a water depth of approximately 15 feet at the toe of the shoreline slope.

3.1.2 May Creek

The May Creek drainage flows through the Barbee Property and discharges to Lake Washington (Figure 1-2). Due to upstream urban development, the creek experiences

[3] Elevations provided in this RI/FS are referenced to the NAVD88 datum unless otherwise noted.

elevated peak flows and relatively large sediment loads (Anchor and Aspect, 2012). Maintenance dredging at the mouth of May Creek has been performed periodically to remove accumulated sediment. The last maintenance dredging event was 2019.

3.2 Geologic and Hydrogeologic Conditions

Site soil, sediment, sediment porewater, and groundwater conditions have been characterized by test pits, soil borings, monitoring wells, sediment grab samples, sediment cores, and porewater samples. Site explorations are shown on Figure 3-1. This section summarizes the regional hydrogeologic setting (Section 3.2.1) and describes Site geology (3.2.2) and groundwater conditions (Section 3.2.3).

3.2.1 Regional Hydrogeologic Setting

The Site is located in the southeastern part of the Puget Sound Lowland. The hills to the east of the Site are composed of glacial and nonglacial soils with bedrock outcrops. The physiographic features of the lowland are dominated by repeated advances and recessions of glacial ice within the lowland. Soils in the vicinity of the Site are characterized by alternating sequences of fine- and coarse-grained materials.

The groundwater flow system is characterized by recharge in the upland areas east of the Site and the May Creek drainage, with flow towards the west and discharging to Lake Washington. Site groundwater likely originates from precipitation on and east of the Site and recharge from alluvial deposits in the May Creek drainage.

3.2.2 Site Geology

The geologic units mapped within the study area include Quaternary alluvium and Pre-Fraser Glacial Drift deposits. Site subsurface exploration logs are provided in Appendix B. Soils consist of the following, from the surface down:

- **Recent Fill:** Over most of the Site, up to 10 feet of fill soils were placed on the Barbee Property during redevelopment by Conner Homes in 2007, to raise the grade and allow installation of gravity sewers. Fill was also placed in areas excavated during interim remedial actions in 2006 and 2007. In particular, the area where arsenic-contaminated soil was excavated was filled with 1- to 1.5-inch crushed rock, general fill, and structural fill at depths up to approximately 18 feet relative to current Site grade on the Barbee Property.
- **Historical Fill:** Beneath the Recent Fill is a layer of older fill materials, generally up to approximately 5 feet thick, consisting of sand and gravel with silt and locally abundant wood and saw dust. The Historical Fill layer is thickest along the western edge of the Site (at the shoreline).
- **Shallow Alluvium:** Beneath the Historical Fill is an approximately 20- to 30-foot-thick layer of very heterogeneous alluvial sand, silt, and peat associated with deltaic deposits from May Creek. This layer is present to a depth of approximately 30 to 40 feet based on current Site grade on the Barbee Property.
- **Deeper Alluvium:** A thick sequence of dense sands and gravels underlies the Shallow Alluvium. Based on deep geotechnical borings drilled at the Site (Anchor and Aspect, 2012), this sequence is estimated to be at least 80 feet thick.

Cross sections depicting the distribution of the different soils encountered are presented on Figures 3-2 and 3-3. Cross-section locations are shown on Figure 3-1.

3.2.3 Groundwater Conditions

Site groundwater is encountered at depths ranging from approximately 2 to 13 feet below ground surface (bgs). Groundwater levels fluctuate seasonally and are influenced by the seasonal elevation of Lake Washington and the stage of May Creek. Lake water levels are highest in the summer and lowest in the winter. The lake water level fluctuation results in seasonally varying hydraulic gradients that are highest in the winter, when the lake is low and recharge is high, and lowest in the summer, when the lake is high and recharge is low. Winter (January 2022) groundwater elevation contours for the Shallow Alluvium are presented on Figure 3-4, and contours for the Deeper Alluvium are presented on Figure 3-5[4]. Based on historical seasonal groundwater monitoring (Aspect, 2019), groundwater flow directions across the Site are relatively constant throughout the year, generally flowing to the west or west-northwest.

Appendix C provides a summary of the groundwater hydraulic characterization studies that have been completed, including slug tests, water level measurements, and pumping tests. Section 3.2.3.1 summarizes the findings of these studies.

3.2.3.1 Flow Direction and Hydraulic Gradients

Water level data from area monitoring wells were used to evaluate groundwater elevations and hydraulic gradients. Horizontal hydraulic gradients are generally westward toward Lake Washington, with a northerly component in the northern portion of the Site. Vertical hydraulic gradients are upward near the lake, based on measurements at monitoring well clusters CMW-2S/2D, and CMW-4S/4D. Based on 13 water level monitoring events, conducted between March 2012 and January 2023, the average upward vertical gradient at these locations was 0.03 feet per foot (ft/ft). On the eastern edge of the Site, historical water levels at HCMW-05(S) and HCMW-05(D) indicate downward hydraulic gradients. Adjacent to the northeast portion of the Site, at former wells BH-17A and BH-17B (located on the Quendall Property), and along the north boundary of the Barbee Property at BH-26A and BH-26B, downward hydraulic gradients are also present.

3.2.3.1.1 Hydraulic Conductivity Measurements

Hydraulic conductivity measurements are based on slug tests completed at multiple wells during the IRAP (Hart Crowser, 2000b). Results of the slug tests are included in Appendix C. The geometric mean of the 11 wells tested during the IRAP investigation is 3.1×10^{-3} centimeters per second (cm/sec), which is consistent with the expected range of literature values for silty sand to gravelly sands (Fetter, 2001).

In addition to the IRAP hydraulic conductivity measurements, several aquifer pumping tests were conducted during the installation of the groundwater pump-and-treat system in

[4] On the Quendall Site, 'shallow' and 'deep' groundwater generally refers to groundwater in the Shallow and Deeper Alluvium, with wells with a 'B' designation generally installed within the Deeper Alluvium. Some wells on the Site have 'S' or 'D' designations referring to relative depth (shallow or deep), but are both within the Shallow Alluvium.

2007 (see Section 4.2.9). Eight-hour constant rate aquifer tests were performed at extraction wells EW-2 (native soil area) and EW-6 (excavation backfill area, see Section 4.2.9). Data from the EW-2 test indicate a hydraulic conductivity of 1.2 x 10^{-2} cm/sec (35.7 feet per day [ft/day]). Considering the degree of heterogeneity observed in the shallow aquifer, the hydraulic conductivity estimate from the EW-2 constant rate pumping test reasonably agrees with earlier testing and modeling efforts.

The EW-6 constant rate test resulted in only 0.45 foot of drawdown after pumping for 8 hours at a rate of 20.2 gallons per minute (gpm). Traditional aquifer test analysis methods are not valid at EW-6, due to two factors: the extremely high conductivity of the backfill material (consisting of 1- to 1.5-inch clear rock) and the limited lateral extent of the excavation area (standard aquifer analysis methods assume infinite horizontal aquifer extent). The observed head decline across the entire excavated area was nearly uniform, indicating an extremely high hydraulic conductivity. The aquifer test results from EW-6 are not representative of natural Site conditions; however, the hydraulic properties of the excavation backfill influence the operation of the groundwater pump-and-treat system (see Section 4.2.9).

3.2.3.2 Geochemical Conditions

During a pre-RI geochemical field investigation conducted in 2006, soil samples from four direct-push borings (AP-1 to AP-4) and groundwater samples from eight monitoring wells were analyzed for a comprehensive suite of organic and inorganic geochemical indicator analytes (Aspect, 2006a). With the field parameters, these data provide an understanding of Site oxidation-reduction potential (redox) conditions.

Reducing conditions have been documented across the Site, likely due to the presence of naturally occurring organic materials (e.g., peat) within the Shallow Alluvium. These organics act as a food source (electron donor) for indigenous microbial consumption. These geochemical conditions affect the fate and transport of COCs, as discussed in Section 7.1.

3.2.4 Sediment Substrate

The lake bottom slopes gently to the west. The lake bottom substrate consists of sandy silt with silty clay and sand lenses at depth, based on pre-2020 sediment investigations. Surface sediment substrate observed post-2020 was comprised of mostly sandy silt with varying amounts of organic matter. Areas containing significant accumulation of woody debris from former log rafting operations were dredged in 1999 and 2002. Pre-dredging bathymetry near the Site is shown on Figure 3-6 (1996; included in Remediation Technologies [RETEC], 1997). Post-dredging bathymetry is shown on Figure 3-7 (2005/2008; compiled from National Oceanic and Atmospheric Administration [NOAA] bathymetric surveys in 2005 [Survey H11377] and 2008 [Survey H11810]; NOAA, 2020).

A habitat restoration project completed in 2005 included removing a former bulkhead, removing fill that had been placed in former aquatic lands, and placing a layer of gravel just offshore of the northern portion of the Barbee Property.

3.2.5 Shoreline Features

The Site shoreline features a mix of substrate conditions, engineered slope structures, and vegetation extending from the top of bank down to the lake water. It includes an area of dense vegetation towards the north, a gravelly beach area delimited by an overwater dock, restoration area, riprap, and a bulkhead south of the dock. The shoreline is accessible by residents through the private yards facing the lake and through the common areas, including the dock. The slope ranges from vertical walls (bulkheads) to gentle beach slopes. The concrete dock and the bulkhead to the south appear to be in good condition. Shoreline types observed at the Site and their extents are shown on Figure 3-8.

The accessible beach area, visually surveyed in 2022, starts north of the Barbee Property (on the Quendall Property) and extends south towards the concrete dock, located in the center of the Barbee Property shoreline. The width of the beach area varies with water level, depending on precipitation and drainage to the lake. During the 2022 survey, the beach width ranged from about 10 feet up to 20 feet. Beach substrate was mostly coarse gravel and pebbles, with sparse areas where engineered riprap was placed. One outfall, consisting of a metal pipe, was identified within the beach area, about 200 feet north of the dock.

The shoreline south of the concrete dock consists of a bulkhead with minimal access. Access is limited only to those residents with property adjacent to the shore. North of the Barbee Property, the Site shoreline is densely vegetated.

3.3 Climate and Natural Resources

3.3.1 Climate

The Site climate is characterized by mild temperatures and a rainy season, with considerable cloudiness during the winter months. Average winter daytime temperatures are in the 40s (degrees Fahrenheit) and nighttime readings in the 30s. During the summer, daytime temperatures are usually in the 70s, with nighttime lows in the 50s.

April to September is generally the dry season, with July being the driest month of the year. October to March is generally the rainy season, with more than 75 percent of the average annual precipitation falling during that time.

3.3.2 Climate Change

Ecology has identified that preparing and adapting to climate change impacts, including rising sea levels, extreme precipitation events, severe drought, increased wildfire risk, and marine water acidification, is a critical challenge for the state (Ecology, 2023). Assessing the vulnerability of a site remedy involves assessing the remedy's exposure to climate or weather hazards of concern and the remedy's sensitivity to those hazards. Ecology has identified environmental trends in the Pacific Northwest to assist in the evaluation of climate change projections relevant to the vulnerabilities of remedy selection and implementation (Ecology, 2023).

Based on the Site location and topography, climate change is not expected to result in increased wildfire risk, landslide risk, or adverse effects from sea level rise. Potential effects of climate change at the Site include changes in weather such as seasonal rainfall

patterns and the magnitude and frequency of extreme storm events, which could increase flooding risk in some areas. However, the water level in Lake Washington is artificially controlled by the US Army Corps of Engineers at the Hiram M. Chittenden Locks, which greatly reduces the risk of flooding at the Site. Potential impacts from climate change are not anticipated to have a significant effect on Site environmental conditions.

3.3.3 Natural Resources

3.3.3.1 Flora and Fauna

The Site is a combination of a suburban development on the Barbee Property, and vacant, undeveloped land on the Quendall Property. Vegetation in the Barbee Property is moderate, which is consistent with the predominantly suburban setting. The area is typical of suburban, developed land, with vegetation limited to landscaped planting areas, street-side trees, and lawns and plantings on the residential properties. Vegetation on the Quendall Property, which is currently vacant and generally unpaved, primarily consists of early successional species and invasive species, including large stands of Himalayan blackberry and Scot's broom (Anchor and Aspect, 2012). Aquatic vegetation in the area consists primarily of Eurasian milfoil. Fish that may use the Site include Chinook salmon, steelhead, and bull trout, which are listed as threatened species under the Endangered Species Act (ESA). Birds observed at the Site include bald eagle and osprey.

3.3.3.2 Drinking Water Use

Properties in and surrounding the Site are served by municipal water supplies. The City of Renton public water supply system is supplied by groundwater from wells located approximately 4 miles southeast of the Site. The Site is outside the City of Renton's aquifer protection zone.

A drinking water use survey for the area was completed as part of the Quendall Site RI (Anchor and Aspect, 2012). No use of groundwater or surface water for drinking purposes was identified in the vicinity of the Site. As discussed in more detail below, environmental covenants that prohibit taking of groundwater for any use was recorded on the Barbee Property in 2008 and on the portion of the Quendall Property that includes the Site in 2023.

3.3.4 Types and Functions of Habitats

The upland area of the Site mainly consists of a residential development with landscaping and limited open space.

Aquatic habitats in Lake Washington include lake bottom (bedded sediment with or without wood debris), water column (in-water structures, vegetation, and the water column itself), and riparian habitats. Due to urban development and shoreline modification over the past century, Lake Washington has lost a large portion of the natural riparian vegetation (Center for Lake Washington Studies, 2023), and most of the riparian vegetation is invasive species of low to moderate height (King County, 2020; Center for Lake Washington Studies, 2023). However, the riparian habitat that exists along the shoreline of the Site may provide shelter for birds and mammals that feed in both upland and in-water areas.

As described in Section 3.2.4, the majority of the lake bottom substrate in Site sediment is sandy silt. However, in the areas subject to currents, wind-driven waves, or boat traffic (shallow nearshore), and in the habitat restoration area (northern portion of the Site; Figure 3-8), bottom substrates are primarily gravel, cobble, or exposed beds of till or clay. The bedded lake sediment provides a source of food and structure for benthic organisms. The dominant taxa in Lake Washington are chironomids (31 percent of identified organisms) and the second most dominant is Oligochaetes (21 percent; King County, 2020); although, variability in these and other organisms may be found at different depths and grain-size distributions. These organisms are likely found in Site sediment.

The offshore water column zone adjacent to the Site shoreline is the shallow littoral zone. Because sunlight penetrations to the sediment in this zone, it supports benthic and floating vegetation. Eurasian watermilfoil (*Myriophyllum spicatum*), an invasive species, has colonized a large percentage of the littoral zone of the lake and replaced the majority of the native aquatic vegetation in these areas (Patmont et al., 1981). Currently, milfoil along with another nonnative species (fragrant water lily) are dominant aquatic vegetation (King County, 2020); milfoil was observed during deployment of the porewater samplers offshore of the Site during the 2021 sampling event (Aspect and Geosyntec, 2023). Vegetation is important because it can provide shelter and foraging areas for juvenile fishes, including chinook salmon (King County, 2020; Warner and Fresh, 1998). Aquatic vegetation patches also result in areas of increased organic matter, which is a source of food for benthic invertebrates.

4 Summary of Completed Investigations and Remedial Actions

This section summarizes the environmental investigations and remedial actions completed at the Site. Several stages of Site characterization and remediation work were conducted between 1998 and 2009, under Ecology's Voluntary Cleanup Program (VCP Site Number NW0182). Cleanup activities at the Site since December 1, 2009, have been completed under formal Ecology oversight (AO No. DE5396). Environmental investigations are summarized in Section 4.1, and remedial actions are summarized in Section 4.2.

In addition to the Site work summarized in this section, extensive investigation of soil, groundwater, sediment, and sediment porewater contamination has been conducted at the Quendall Site adjacent to the north. That data is provided in the RI Report for Quendall Site (Anchor and Aspect, 2012), and data relevant to the Site are included in this RI/FS Report.

4.1 Environmental Investigations

Multi-media Site investigations span over 25 years (1996 through 2022). A summary of analytes and media sampled under each investigation and remedial action is provided in Table 4-1. Monitoring well construction details are provided in Table 4-2. Boring logs and tabulated analytical data from the work discussed below are provided in Appendices A and B, respectively. Site exploration locations referenced below are shown on Figure 3-1. Sediment explorations including explorations from the adjacent Quendall Site are shown on Figure 4-1.

4.1.1 Initial Soil and Groundwater Sampling, 1996

In 1996, RETEC drilled eight soil borings (RSB-0l through RSB-08), five of which were completed as monitoring wells RMW-0l through RMW-05 (RETEC, 1996). The boring locations were distributed around the Site and in some targeted potential source areas, such as former tank removal locations (RMW-04/RSB-04 and RMW-05/RSB-07), the former shipyard area (RMW-01/RSB-01), and the oil/water separator associated with Outfall 001 (RMW-02/RSB-02).

Two soil samples from each boring were collected and analyzed for several categories of constituents, including: BTEX, total petroleum hydrocarbons (TPH), chlorophenols, priority pollutant metals, PAHs, and PCBs. Groundwater from each of the five monitoring wells was sampled, and the samples were analyzed for volatile organic compounds (VOCs), TPH, metals (filtered and unfiltered), PAHs, and chlorophenols. Sediment samples were also collected from stormwater catch basins, with five composite samples collected and analyzed for priority metals, chlorophenols, PAHs, PCBs, and TOC.

4.1.2 Initial Sediment Investigation, 1997

In 1997, RETEC advanced eight sediment cores, VB-1 through VB-8, offshore of the Site (RETEC, 1997). One soil sample from each core was collected and analyzed for wood debris, TPH, priority pollutant metals, PAHs, and PCBs. RETEC also conducted side-scan sonar and diver surveys to describe distribution of wood debris in sediments and sediment profile imaging to delineate wood debris accumulations and redox characteristics.

4.1.3 Follow-up Sediment Investigations, 1999 and 2002

In 1999, Hart Crowser and Lloyd Associates collected surface sediment samples at nine locations that were analyzed for wood debris, metals, and PAHs (Anchor, 2002). In 2002, Anchor Environmental, LLC (Anchor), conducted an offshore sediment investigation at 21 locations to characterize the extent of sediments that exceeded Site-specific cleanup levels identified by Ecology (Anchor, 2002). The 2002 investigation included 21 samples that were analyzed for zinc, TOC, wood debris, ammonia, and sulfide.

4.1.4 Soil and Groundwater Investigations, 1998 and 1999

Hart Crowser conducted a subsurface investigation in 1998, focusing on the RETEC investigation locations where elevated arsenic concentrations were measured (RMW-03/RSB-04). The investigation was conducted in several phases between March and September 1998, when 38 probe explorations (HC-l through HC-38) were advanced. Three permanent monitoring wells (HCMW-0l(S), and HCMW-0l(D), and HCMW-02) were also installed to supplement the monitoring well network installed by RETEC.

In 1999, additional environmental investigations were proposed based on a comprehensive Site history review and discussions with Ecology. An additional 11 probes (HC-39 through HC-49) were completed, and four additional monitoring wells were installed (HCMW-03, HCMW-04, HCMW-05(S), and HCMW-05(D)). The HCMW-05 well pair was installed to provide upgradient analytical data for evaluating background groundwater arsenic concentrations (Hart Crowser, 2000b).

4.1.5 Geochemical and Sediment Porewater Sampling, 2005

Aspect conducted a follow-up evaluation of arsenic-contaminated groundwater in August 2005 (Aspect, 2006a). The objectives of this investigation included updating the measured arsenic distribution in Site groundwater and measuring geochemical parameters that affect arsenic mobility and/or treatment. The investigation included:

- Advancing four soil probes (AP-1 through AP-4) and collecting eight soil samples for analysis. Soil samples were analyzed for TOC, sulfur, sulfide, aluminum, arsenic, iron, and manganese.
- Collecting groundwater samples from eight Site monitoring wells and analyzing them for total arsenic, alkalinity, biological oxygen demand (BOD), chloride, sulfate, nitrite, nitrate orthophosphate, sulfide, TOC, calcium, iron, magnesium, manganese, potassium, silicon, and sodium.
- Conducting arsenic speciation on the eight groundwater samples.

- Collecting sediment porewater samples at two locations (WP-1B and WP-5) and analyzing them for dissolved arsenic.
- Performing sequential arsenic extraction.

The results of the investigation were used in the evaluation of potential groundwater remedies in the IRAP Addendum (Aspect, 2006b).

4.1.6 Biological Evaluation, 2005

In 2005, Anchor conducted a biological evaluation (Anchor, 2005a) to support shoreline habitat restoration work (see Section 4.2.3). The biological evaluation examined the effects of the proposed restoration project on listed, proposed, and candidate anadromous fish and wildlife species that may occur in the area.

4.1.7 Assessment of Environmental Conditions, 2006

As part of property due diligence, Conner Homes' consultant, Urban Redevelopment, conducted a Site investigation in 2006 (Urban Redevelopment, 2006). The investigation included excavation of nine test pits (TP-1 through TP-7, TP-8N, and TP-8S) in former process areas and analysis of 21 soil samples and one groundwater sample for diesel-range and oil-range hydrocarbons (TPH-D and TPH-G), VOCs, PAHs, PCP, Resource Conservation and Recovery Act (RCRA) metals, tin, and/or PCBs.

4.1.8 Shoreline Characterization, 2006

Aspect conducted a shoreline soil investigation (Aspect, 2006d) in support of the habitat restoration work. The shoreline characterization was conducted to further investigate PAH occurrences that were identified in this area by RETEC in 1996 and involved advancing 11 borings along the shoreline and collecting and analyzing 16 samples for PAHs.

4.1.9 Pan Abode Area PCP Characterization, 2006

To investigate the potential for PCP releases in the former Pan Abode lease area in the northwest corner of the Site, Aspect conducted a subsurface investigation was conducted in 2006 (Aspect, 2006c). The investigation included the following:

- Excavating seven test pits (AA13, AA15, AA17, Y14, Y16, Y18, and TP-PA6) below the water table, to an approximate depth of 6 feet.
- Advancing two soil borings (PY-17 and PAA-17) to a depth of 15 feet.
- Collecting 15 soil samples and analyzing them for TPH-D, TPH-O, and PCP.
- Collecting one groundwater sample from well HCMW-1S and analyzing it for TPH-D, TPH-O and PCP.

4.1.10 Investigation of TPH- and PCP-Contaminated Soil, 2006

Site investigations had identified two areas of soil exceeding MTCA Method A cleanup levels for diesel-range hydrocarbons. The diesel-impacted areas were located: (1) near a former UST (East TPH Area), and (2) south of the former mill building (West TPH Area). In addition, elevated levels of PCP were detected near a former fungicide-spray

area (PCP Area). The East TPH Area, West TPH Area, and PCP Area were further delineated by Aspect with test pit explorations in March and April 2006 (Aspect, 2006f).

4.1.11 Groundwater Remediation Design Investigations, 2006

The groundwater remedy proposed in the IRAP Addendum (Aspect, 2006b) included installation of a passive attenuation zone (PAZ) to immobilize arsenic in groundwater along the downgradient Property line and a pump-and-treat system to remove arsenic upgradient of the PAZ. After the IRAP Addendum was submitted to Ecology, Aspect designed the preferred alternative selected in the IRAP Addendum. The Engineering Design Report (Aspect, 2006g) included the following field investigations:

- Confirmation groundwater sampling using temporary probes to sample from multiple depths (to a maximum depth of 35 feet) at 57 locations within and downgradient from the 2006 arsenic soil excavation footprint. Eighty-four samples were collected and analyzed for dissolved arsenic.
- Groundwater sampling from monitoring wells located downgradient of the excavation (RMW-01, RMW-02, HCMW-01S, and HCMW-01D). Groundwater samples were analyzed for dissolved arsenic.
- Groundwater sampling upgradient of the Site from a temporary probe (BG-1) to support development of a Site-specific background concentration for arsenic in groundwater.
- Porewater sampling from three locations from a depth of 10 centimeters (cm) in offshore sediments at locations PW-N, PW-M, and PW-S. Porewater samples were analyzed for dissolved arsenic.

4.1.12 Bioassay Testing, 2009

The Quendall Site RI included bioassay testing of surface sediment samples to evaluate the potential for toxic effects on benthos from wood debris conducted by Anchor QEA. These samples were located in the area immediately to the north of the Barbee Property in areas of wood debris and TOC impacts. Sediment bioassay tests were performed on samples with less than 50 percent wood debris by volume (visual estimate) and on samples with elevated concentrations of wood debris (>50 percent). Samples were also analyzed for TOC to further determine the potential for toxic effects to benthos from wood debris and TOC in sediments.

The bioassay testing suite included 28-day amphipod (*Hyalella 25ilute*) and 20-day midge (*Chironomus 25ilutes*) survival and growth endpoints for 12 test samples and 3 reference samples. All 12 test stations were located within the area to the north of the Site (Area to the north defined by NS-01, NS-02, NS-06, WD-09, SS-01, WD-07, WD-08, WD-03, WD-06, WD-01, SS-02, NS-07; Figure 4-1). Background samples were collected from two 1-mile-long transects along the shoreline, beginning approximately 1 mile north and 1 mile south of the Site (BG-02, BG-03 and BG-13).

Only the bioassay from NS-07 resulted in significant differences in survival for the *Chironomus 25ilutes* (NS-07 is located approximately 545 feet north of Barbee Property); no significant differences were identified for other samples or endpoints when compared to reference samples (Anchor and Aspect, 2012). The test samples with the maximum

wood debris and TOC did not result in significant impacts to either test species, indicating that elevated concentrations of wood debris and TOC at 100 percent and 35 percent, respectively, do not pose adverse risks to benthos.

4.1.13 Data Gaps Investigation, 2018

In 2018, Aspect conducted a field investigation (2018 Data Gaps Investigation under the AO to collect additional Site-specific data needed to develop and evaluate remedial alternatives. The objectives of this investigation were to define the vertical and lateral extent of arsenic contamination downgradient of the PAZ, and to ensure that the final Barbee Mill remedy is compatible with future Quendall Property use (Aspect, 2018). The investigation included:

- Collocated sediment and temporary groundwater samples from multiple depths at five offshore borings (B-01 through B-05). Samples were collected every 4 feet from the top of sediment surface to a maximum depth of 27 feet bgs. Fourteen sediment samples were analyzed for total arsenic and 15 groundwater samples were analyzed for dissolved arsenic.
- Collocated soil and temporary groundwater samples from multiple depths at 10 upland borings (B-06 through B-15) and temporary groundwater samples from 2 additional upland borings (B-16 and B-17). Soil samples were collected every 4 feet from ground surface to a maximum depth of 31 feet bgs. Groundwater samples were collected from every 4 feet to a maximum depth of 40 feet bgs. Seventy-three soil samples were analyzed for total arsenic and 67 groundwater samples were analyzed for dissolved arsenic.
- Groundwater samples collected at two offshore temporary well points screened from 1 to 5 feet. Two groundwater samples were analyzed for dissolved arsenic.

4.1.14 Remedial Investigation, 2021 and 2022

In 2021 and 2022, Aspect and Geosyntec conducted field investigations under the AO to address upland and sediment data gaps in accordance with the RI Work Plan (Aspect, 2021). The RI Work Plan included a Sediment Remedial Investigation Work Plan (SRI Work Plan; Geosyntec, 2021) as Appendix B. An SRI Work Plan Addendum (Geosyntec, 2022) was developed to address remaining data gaps identified after review of the 2021 RI data. These investigations and results are described in the RI Data Report (Aspect and Geosyntec, 2023).

Upland Investigations. Upland investigations were conducted in 2021 to evaluate the occurrence of contaminants of potential concern (COPCs) and delineate the northern extent of arsenic in deep groundwater. The primary COPC data gaps evaluated whether the soil-to-groundwater pathway is complete for the following COPCs: barium, manganese, mercury, selenium, zinc, and cPAHs. To fill these data gaps, additional groundwater monitoring was conducted at the existing Site monitoring wells CMW-1, CMW-2S, MW-4S, and CMW-6, and extraction wells EW-2 EW-4, EW-6, and EW-8. Groundwater samples at these eight locations were analyzed for the following:

- Total antimony, arsenic, barium, mercury, and selenium

- Dissolved antimony, arsenic, barium, iron, manganese, mercury, selenium, and zinc
- PAHs

To provide a northern boundary for arsenic occurrences in deeper groundwater and provide separation between elevated arsenic attributed to the Site and elevated arsenic attributed to the Quendall Site, a new well (BH-31B) was installed between BH-26B and BH-21B. BH-31-B was installed with a screened interval of 30 to 40 feet bgs in 2021 and sampled for total and dissolved arsenic.

Sediment Investigations. In August 2021, Geosyntec sampled sediment and porewater in accordance with the SRI Work Plan (Geosyntec, 2021). The purpose of sampling was to evaluate current conditions and risks, fill data gaps, refine the sediment Site boundary based on perimeter samples, and evaluate human health beach-play risks in the limited nearshore beach area accessible to residents. Fifteen Site surface sediment samples (BM-SED-01 to BM-SED-15), sixteen perimeter surface sediment samples (PER-SED-01 to PER-SED-16), three nearshore sediment samples (NS-SED-01 to NS-SED-03), and two porewater samples collocated with surface sediment samples (BM-PW-16 and BM-PW-17) were collected. The porewater samples were used to assess surface water quality close to the point of compliance (POC) at locations downgradient of known upland arsenic groundwater plumes. Results were below screening level criteria as documented in the RI Data Report (Table 4d, Aspect and Geosyntec, 2023) and reported in Appendix D.4. In 2022, bioassay testing was conducted at sediment sample station BM-SED-16 to address an arsenic exceedance; bioassay test results passed state criteria (Geosyntec, 2022).

4.2 Completed Remedial Actions – Soil and Sediment

Site remedial actions have included dredging contaminated sediments, excavation of contaminated soil, installation of an *in situ* PAZ for groundwater treatment, and installation and operation of a groundwater extraction and treatment (pump-and-treat) system. Areas addressed by removal actions (dredging or excavation) are shown on Figure 4-2, and the locations of the PAZ and pump-and-treat infrastructure are shown on Figure 4-3. These actions, and associated performance monitoring, are sequentially described below.

4.2.1 Sediment Removal, 1999

In 1999, Barbee Mill dredged approximately 6,000 cubic yards of bark, wood debris, and associated sediment in an area adjacent to the Barbee Mill facility to address wood debris in sediment. Thirteen samples of stockpiled dredged material were collected and submitted for analysis for TPH, VOCs, semivolatile organic compounds (SVOCs), and metals to determine potential reuse of the material (Hart Crowser, 2000a).

4.2.2 Additional Sediment Removal, 2002

In the summer/fall 2002, approximately 20,000 cubic yards of sediment was dredged from the Lake Washington shoreline adjacent to the Property to address TOC and wood debris in sediment above Site-specific cleanup levels (see Section 5.1.1). After dredging was completed, confirmation samples were collected from 17 locations and analyzed for

TOC and wood debris. Work was documented in the "Completion Report, Independent Remedial Action, Barbee Mill Sediment Cleanup Project" (Anchor, 2003).

Sediments removed in 1999 and 2002 (26,000 cubic yards in total) were stockpiled on the Site and characterized for potential reuse. A total of 18,000 cubic yards of the dredged sediment were below the MTCA Method B criteria for unrestricted beneficial reuse and, following Ecology's concurrence, these sediments were subsequently sold and/or reused on the Property (Hart Crowser, 2000a; Anchor 2003). The remaining 8,000 cubic yards of sediment contained cPAHs above the MTCA Method B criteria of 0.14 milligrams per kilogram (mg/kg) and were disposed of at the Olympic View Sanitary Landfill in Kitsap County, Washington.

4.2.3 Shoreline Habitat Restoration, 2005

In 2005, an area of leased aquatic land that had historically been filled and used for upland mill operations was restored to beach habitat. The habitat restoration project included removal of a wooden pier and pilings, excavation of upland fill and removal of a bulkhead, and construction of beach consisting of coarse sand and gravel (ACC Hurlen, 2006; Anchor, 2005b).

4.2.4 Excavation of Arsenic-Contaminated Soil, 2006

In 2006, arsenic-impacted soil was removed from the Property (Aspect, 2006e). The remedial action was conducted between January 23 and May 12, 2006, with earthwork activities conducted between February 7 and May 5, 2006. Soil exceeding 20 mg/kg arsenic was excavated to a maximum depth of 15 feet. A total of 54,215 tons (approximately 34,000 cubic yards) of arsenic-impacted soil were excavated and transported to the Roosevelt Regional Landfill in Roosevelt, Washington, for disposal as nonhazardous waste.

Soil samples were collected during the work from test pits, direct-push soil borings, and the excavation sidewalls and bottom to determine the extent of impacted soil and confirm that soil remaining in place met cleanup levels. A total of 749 samples were collected and analyzed for arsenic. A subset of these (232 samples) was also analyzed for zinc. Three hundred fifty-two of the 749 samples analyzed for arsenic and 90 of the 232 samples analyzed for zinc were collected at or beyond the final excavation limits.

Removal, backfill, and confirmation sampling results are documented in the "Construction Report, Barbee Mill Arsenic Remediation," dated June 21, 2006, (Aspect, 2006e).

4.2.5 Excavation of TPH- and PCP-Contaminated Soil, 2006

The East TPH Area, West TPH Area, and PCP Area were excavated in April 2006 to remove soil exceeding MTCA Method A or B cleanup levels for unrestricted use. A total of 623 tons of impacted material was transported to Roosevelt Regional Landfill for disposal as nonhazardous waste. Twelve test pit exploration soil samples and 17 confirmation soil samples were collected from the three areas.

Removal, backfill, and confirmation sampling results are documented in the "Construction Report, Barbee Mill TPH and PCP Remediation" dated June 21, 2006 (Aspect, 2006f).

4.2.6 PAZ Column and Pilot Testing, 2006

In July and August 2006, a column test was performed to evaluate the effectiveness of potential treatment media for the PAZ. Based on that column test, granular iron was selected as the most cost-effective medium (Aspect, 2006g). In September 2006, a pilot test of the PAZ was conducted by constructing a small (40 feet long and 15 feet deep) PAZ along the downgradient Property boundary. Groundwater monitoring for arsenic and iron was performed between September 2006 and January 2007 at a series of five wells and well points upgradient, within, and downgradient of the pilot PAZ (Aspect, 2006h).

4.2.7 Passive Attenuation Zone Installation, 2007

Based on the performance of the pilot-scale PAZ, the full-scale PAZ was installed between February and April 2007. The installed PAZ consisted of a 690-foot-long, 10- to 35-foot-wide mixture of granular iron filings and sand placed in a trench to intercept the arsenic-impacted groundwater plume (maximum depth of 22 feet at the time of installation). Arsenic in groundwater passing through the iron/sand mixture is immobilized by the iron and iron mineral precipitates. The iron concentration in the upper 15 feet was low (maximum 3.3 percent by weight) to prevent accumulation of arsenic above the unrestricted use cleanup level. The as-built construction details are available in the "Construction Report – Passive Attenuation Zone," dated October 5, 2007 (Aspect, 2007).

The PAZ was designed to capture the majority of arsenic contamination remaining in groundwater after the 2006 excavation. It was installed along the downgradient side of the Barbee Property boundary to prevent migration of arsenic in groundwater to Lake Washington above the Site-specific natural background screening level established at that time (20 µg/L). The PAZ was not designed to capture limited areas exceeding the screening level located south of it or in the deeper groundwater system near the east end of it. Exceedances in these areas were localized, sporadic, possibly attributed to natural background conditions[5] (Aspect, 2006). Substantial and costly PAZ expansion would have been required to address these exceedances. PAZ performance monitoring is conducted annually.

As part of the remediation system performance monitoring, eight monitoring wells (CMW-1, CMW-2S/2D, CMW-3, CMW-4S/4D, CMW-5, and CMW-6) were installed in August 2007 downgradient of the PAZ, and two piezometers (PZ-1 and PZ-2) were installed in November 2007 upgradient of the PAZ to provide additional water level monitoring. Two well points (WP-1A and WP-8) were installed near the shoreline in January 2009. Boring and well construction logs for the monitoring wells, well points, and piezometers are provided in Appendix B.

4.2.8 Environmental Covenant, 2008

An environmental covenant (Exhibit F of the AO) was placed on the Barbee Property on May 8, 2008. The covenant prohibits taking groundwater for any use or any activities that may interfere with the integrity of the interim remedial actions.

[5] Although the natural background concentration was calculated to be 16 µg/L, the natural background dataset includes values up to 28 µg/L.

4.2.9 Pump-and-Treat System Installation, 2007 and 2009

The pump-and-treat system was constructed in two phases to coordinate the work with the Conner Homes redevelopment. Phase I of construction was completed in May 2007, and included the following:

- Installing, developing, and conducting hydraulic tests on eight groundwater extraction wells (EW-1 through EW-8).
- Installing conveyance piping (dedicated 1-inch-diameter Schedule 80 PVC) and electrical conduit between the extraction wells and the landscape area south of EW-1 (future location of the vault and control panel).
- Installing the 3-inch-diameter vault discharge pipe and connecting it to the existing sanitary sewer line beneath Williams Avenue North, located west of the landscape area.

Phase II of construction was completed in April/May 2009, and included installation of pumps, controls, and a subsurface treatment vault. Design and construction of the pump-and-treat system is documented in the "Interim Action Design and Implementation Report," dated June 1, 2010 (Aspect, 2010b).

Pump-and-treat operation began on June 3, 2009. The purpose of operation was to remove arsenic from groundwater exceeding the site-specific background arsenic concentration upgradient of the PAZ. The system was operated for just over 2 years[6] and was shut down on August 5, 2011, to conduct a rebound analysis (evaluate the potential for arsenic concentrations to increase without active pumping). The rebound analysis is ongoing. During the operating period, the system removed 15,700,000 gallons of groundwater containing an estimated 37 pounds of arsenic.

4.2.10 Groundwater Remediation Performance Monitoring, 2007 - 2023

Thirty-three rounds of groundwater monitoring (between August 2007 and January 2023) have been conducted since the PAZ was installed. Monitoring was conducted quarterly from August 2007 to June 2012, biannually from December 2012 to June 2016, and annually from December 2016 to present. Ongoing annual performance monitoring of the groundwater remedy is conducted in accordance with the AO and the "Performance Monitoring Plan" (Aspect, 2010a) and includes the following:

- Collecting groundwater samples from wells CMW-2S/2D, CMW-3, CMW-4S/4D, and CMW-5, and analyzing for the following parameters:
  - Dissolved arsenic, to monitor effectiveness of the PAZ at removing arsenic from groundwater.
  - Dissolved iron, pH, conductivity, dissolved oxygen, and oxidation/reduction potential (ORP), to evaluate changes to water chemistry from the PAZ.

[6] Operation was conducted under the AO starting in December 2009.

- Collecting groundwater samples from well points WP-1A and WP-8 and analyzing for the following parameters:
  - Dissolved arsenic,[7] to monitor the rate of attenuation downgradient of the PAZ.
  - Dissolved iron, pH, conductivity, dissolved oxygen, and ORP, to evaluate changes to water chemistry downgradient of the PAZ.
- Collecting groundwater samples at wells CMW-1 and CMW-6, located at either end of the PAZ, and analyzing for dissolved arsenic and iron, to confirm capture of the arsenic plume.
- Collecting groundwater samples from extraction wells EW-1 through EW-8 and analyzing for dissolved arsenic and iron, to evaluate concentrations of these chemicals upgradient of the PAZ.
- Collecting groundwater samples from BH-29A and analyzing for dissolved arsenic and iron, to evaluate trends for arsenic concentrations downgradient of the PAZ.
- Measuring groundwater elevations at the above wells and well points and at piezometers PZ-1 and PZ-2, and wells BH-26A, BH-26B, BH-29B, and BH-31B. Measured elevations will be used to estimate Site groundwater flow patterns and confirm arsenic plume capture by the PAZ.

In addition to the ongoing monitoring program described above, additional monitoring was conducted quarterly between June 2009 and March 2010, as follows:

- Analysis of groundwater samples collected from wells CMW-2S/2D, CMW-3, CMW-4S/4D, and CMW-5 for copper, lead, and zinc.
- Analysis of porewater samples collected from stations PW-CMW-2, PW-CMW-3, and PW-CMW-4 for dissolved arsenic and iron.

Under the AO, confirmation groundwater monitoring was also conducted to evaluate performance of the TPH removal actions as follows:

- **East TPH Area.** Groundwater samples were collected from three wells downgradient of the East TPH Area (wells CMW-1, EW-1, and EW-3). Quarterly samples were collected for 1 year and analyzed for TPH-D and TPH-O to confirm cleanup of groundwater in the East TPH Area. These samples were collected

[7] Monitoring events that included both dissolved and total arsenic generally did not identify significantly higher concentrations of total versus dissolved arsenic for samples from the same well. During operation of the pump-and-treat system, iron fouling in the extraction piping resulted in entrainment of iron precipitates in nonfiltered samples, resulting in occasional anomalously high total iron and arsenic concentrations; based on discussions with Ecology at that time, the dissolve arsenic analysis was determined to be more representative of groundwater conditions. During the 2021 RI (see Section 4.1.14), total and dissolved arsenic concentrations in confirmation monitoring wells (which are unaffected by extraction piping fouling) were equivalent.

during the May 2009, September 2009, December 2009, and March 2010 groundwater sampling events.

- **West TPH Area.** One groundwater sample was collected downgradient of the West TPH area and analyzed for TPH-D, to evaluate the effectiveness of the soil removal from this area. This groundwater sample was collected on January 4, 2008, using a direct-push drill rig and a temporary PVC well screen placed below the water table. The sample was collected 10 feet west (downgradient) of the West TPH Area excavation footprint.

5 Screening Levels and Identification of Contaminants of Concern

Section 5.1 identifies potentially applicable screening levels for contaminants in soil, groundwater, and sediment. Section 5.2 identifies COCs based on historical Site use and statistical screening of the available data.[8] The nature and extent of COCs is described in Section 6.

5.1 Site Screening Levels

Site screening levels were selected to consider the following potential exposure pathways:

- Groundwater
  - Human ingestion (drinking water)
  - Protection of surface water (via discharge to Lake Washington)
  - Protection of indoor air (via vapor intrusion)
  - Protection of sediment (via sorption onto Lake Washington sediments)
- Soil
  - Human direct contact (ingestion)
  - Protection of groundwater (including surface water and sediment receptors)
- Sediment
  - Ecological – benthic community direct contact
  - Ecological – wildlife (ingestion of fish and shellfish)
  - Human – direct contact (incidental ingestion and dermal contact)
  - Human health – (ingestion of fish and shellfish)

For protection of terrestrial plants and/or animals, the Site qualifies for an exclusion from the terrestrial ecological evaluation under WAC 173-340-7491(1) (see Appendix E). In addition, a portion of the Site on the Barbee Property was covered with clean fill as part of development and the soil erosion to sediment pathway is not complete. Therefore, screening levels for these pathways were not identified.

[8] For the purposes of identifying COCs, all historical data were used, including data collected before remedial actions were performed.

5.1.1 Site Screening Levels for Soil and Groundwater

Potentially applicable Site screening levels for soil and groundwater are presented in Tables 5-1 through 5-5 and were identified using Ecology's *Preliminary Cleanup Level (PCUL) Workbook* dated, August 3, 2022 (provided in Appendix F), considering the potential exposure pathways identified above. Adjustments were also made based on Site-specific natural background levels. Naturally reducing conditions have resulted in elevated background concentrations for redox-sensitive metals arsenic, iron, and manganese in groundwater. Background calculations are provided in Appendix G. The groundwater screening level for arsenic was set at 16 µg/L, based on Site-specific natural background. The current risk-based screening level would be 0.018 µg/L, based on protection of surface water (Appendix F). However, in accordance with MTCA, the current value has been adjusted up to the Site-specific natural background of 16 µg/L (Appendix G).

The soil screening level for arsenic was set at 20 mg/kg, based on the Method A cleanup level. This is the cleanup level used in the 2006 remedial action involving excavation of arsenic-contaminated soils. The Method A cleanup level is described as being based on natural background, though a more recent study concluded that the natural background concentration in the Puget Sound basin is 7.3 mg/kg (Ecology, 1994). A Site-specific decision was made to keep the arsenic screening level at 20 mg/kg to be consistent with the previously approved cleanup level. The direct soil contact pathway is protected because most of the Site is covered with clean fill combined with an environmental covenant to prevent disturbing the fill. The environmental covenant also prevents groundwater from being used as a drinking water supply. The PAZ prevents arsenic-contaminated groundwater from reaching Lake Washington. The cleanup level of 20 mg/kg is protective for this Site because all exposure and transport pathways are being controlled by the remedy.

5.1.2 Site Screening Levels for Sediment

An array of preliminary screening levels and benchmark values were identified in the SRI Work Plan (Geosyntec, 2021) to evaluate the data quality relative to data quality objectives, identify COPCs, and develop a preliminary Site boundary. Receptors considered during this analysis include benthic organisms and human receptors. The human population potentially affected by the Site includes a likely vulnerable population or overburdened community based on the Environmental Justice Community Report (see Section 2.5). Preliminary screening levels were derived for the following receptors (benthic organisms and human health), exposure pathways (ingestion and direct contact), exposure areas (Site-wide and nearshore), and media (surface sediment):

- Protection of benthic organisms (Site-wide surface sediment) including:
  - Washington State Benthic Sediment Cleanup Objective (SCO) and Cleanup Screening Level (CSL)
  - Site-specific cleanup levels for wood debris and TOC levels (50 percent and 13.5 percent, respectively; Ecology 2002)
- Human health; direct contact:

  - Beach play (nearshore sediment only)
  - Net-fishing[9] (Site-wide)
  - Tribal clamming[10] (site-wide)
- Human and ecological health; fish and shellfish ingestion (Site-wide surface sediment)
  - Washington State bioaccumulative SCO and CSL, based on natural background or regional background concentrations, respectively.

The process used to select screening levels for surface sediment was described in the SRI Work Plan and is presented in Table 5-6. Screening levels were selected based on the SMS and the Sediment Cleanup Users' Manual (SCUM; Ecology, 2021) guidance. For the Site-wide sediment screening levels, the most conservative of the benthic and human health screening levels (excluding the beach play pathway) were selected, while the nearshore sediment screening levels were based on the beach play pathway (Table 5-6). Screening levels were adjusted to natural background if risk-based screening levels were below natural background. A more detailed overview of the screening level selection process is provided below.

Benthic Screening Levels

Benthic screening levels for freshwater sediment are based on the SCO and CSL for chemical and biological endpoints (Ecology, 2021) and on Site-specific cleanup levels previously established for wood debris and TOC (Ecology, 2002; Anchor, 2003).

COCs in Site-wide surface sediments were identified by comparing point-based concentrations and estimated percentages of wood debris and TOC to the screening levels. The Site-specific cleanup standards developed in 2002 for earlier remedial actions at the Site (Anchor, 2003) were used as screening levels for percent wood debris and percent TOC in the Draft RI Report (Aspect, 2019). The screening level of wood debris is 50 percent, and the screening level for TOC is 13.5 percent.

Biological tests measuring effects on survival and growth in several species were also used to determine whether sediment might be toxic to benthic organisms. Biological effects are considered definitive with respect to compliance with SMS criteria and override chemical exceedances that predict a biological effect. Ecology confirmed that the 2002 Site-specific cleanup requirements are still relevant in 2023. Therefore, for COPC screening, 50 percent wood debris and 13.5 percent TOC are the applicable criteria when evaluating potential impacts on a point-by-point basis for this Site.

Human Health Screening Levels – Direct Contact

[9] Net-fishing was not retained as an exposure pathway for the Site because, to our knowledge, net fishing is not conducted in Lake Washington.
[10] Clamming was not retained as an exposure pathway as the substrate (primarily gravel) is unlikely to support clams.

Human health screening levels for direct contact pathways are generally risk-based threshold concentrations (RBTCs) based on a target Hazard Quotient of 1 for noncarcinogenic chemicals and a Lifetime Cancer Risk of 10^{-6} for carcinogenic chemicals. Screening levels are either based on Table 9-3 of the SCUM (Ecology, 2021) or calculated using the SCUM Appendix K Excel workbook[11]. Direct contact screening levels were reported for three exposure scenarios, including: tribal net-fishing, tribal clamming, and beach play. The POC for these exposure pathways varies from 10 to 45 cm below mudline (bml) and is discussed in more detail in Section 8.2.3.

COCs in Site-wide and nearshore surface sediments were identified by comparing point-based concentrations to the screening levels and retained for risk evaluation, as discussed in Section 7.3. Risk to human and ecological receptors was evaluated in Site-wide and nearshore surface sediments by comparing surface averaged concentrations to the RBTCs estimated for the relevant exposure pathway.

Human and Ecological Health Screening Levels - Bioaccumulation

Human health screening levels for fish or shellfish consumption pathways are evaluated for bioaccumulative chemicals based on Puget Sound natural background (Ecology, 2021) or Lake Washington regional background (Ecology, 2017). The natural background-based screening levels are also applicable to wildlife consumption of fish and shellfish, as Site-specific tissue data to support the calculation of a risk-based threshold for wildlife is unavailable.

When natural or regional background were not available, concentrations representative of ambient levels in Lake Washington surface sediments were evaluated based on Site-specific considerations for the following COPCs:

- For arsenic, a finalized background value for Lake Washington was not included in Ecology (2017); however, at Ecology's recommendation, the arsenic dataset in Ecology (2017) and the arsenic background analysis done for Gas Works Park were considered applicable to this Site, and the threshold (24 mg/kg) was applied as a preliminary regional background value.
- For selenium, a threshold (90th percentile) representative of ambient concentrations in Lake Washington surface sediment was calculated, as described in Appendix H. The threshold was needed because selenium is considered a bioaccumulative, there are no natural or regional background values available for comparison, and the practical quantitation limit (PQL) is not representative of ambient conditions in Lake Washington.
- For cPAH toxic equivalency (TEQ), natural and regional background values are available (Ecology, 2021). The bioaccumulative SCO, based on natural background, is the most conservative screening threshold (21 micrograms per

[11] The Appendix K workbook used to calculate RBTC was updated by Ecology in October 2023. The CLARC workbook updated in July 2023 was used to retrieve input parameters. These Ecology-revised workbooks were used in this RI/FS report.

kilogram [µg/kg]). The bioaccumulative CSL is based on regional background (210 µg/kg).

Site-wide and nearshore sediment were evaluated using these screening levels to determine COCs to be carried forward into the risk evaluation and FS.

5.2 Identification of Contaminants of Concern

COCs were identified following the process described in the RI Work Plan (Aspect, 2021) by comparing all available Site data to screening levels for each medium, as described below. Summary tables of soil, groundwater, and porewater data are provided in Appendix I, and summary tables of sediment data are provided in Appendix D.

5.2.1 Soil and Groundwater

COCs were identified using a two-step process, as follows:

- COPCs for soil and groundwater were identified based on previous Site use (see Section 2) and comparing all Site investigation data to the lowest potentially applicable screening level (preliminary screening level) for soil and groundwater. Contaminants were identified as COPCs if they were detected above preliminary screening levels in at least one medium or were not detected but all reporting limits were above preliminary screening levels.
- COCs were identified by further evaluating the data to determine if adjustments to preliminary screening levels were warranted (e.g., for incomplete pathways or PQLs) or if the collective data for a chemical did not exceed screening levels based on MTCA statistical guidelines. Contaminants that were detected above adjusted screening levels were identified as COCs.

Identification of COPCs is provided in Tables 5-1 (unsaturated zone soil), 5-2 (saturated zone soil), and 5-3 (groundwater). A summary of COPCs and identification of COCs in soil and groundwater is provided in Table 5-4. Results of these evaluations are summarized below. A summary of COCs and applicable screening levels, adjusted for PQLs if appropriate, is provided in Table 5-5. A summary of the screening results is provided below. A decision flow chart for identifying COPCs and COCs is shown on Figure 5-1.

5.2.1.1 Soil and Groundwater Contaminants of Potential Concern

The following contaminants were identified as COPCs because they were either detected above initial screening levels in at least one medium or were not detected but all reporting limits were above preliminary screening levels (see Tables 5-1 through 5-3):

- **Metals:** Antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc
- **Petroleum Hydrocarbons:** Diesel- and oil-range petroleum hydrocarbons (TPH-D and TPH-O)
- **BTEX:** Benzene, ethylbenzene, and total xylenes
- **Other VOCs:** 1,1,2-trichloroethane, 1,1,2,2-tetracholoroethane, 1,2,3-trichloropropane, 1,2,4-trichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2-

dibromoethane, 1,2-dichloropropane, acrolein, acrylonitrile, bromodichloromethane, carbon tetrachloride, cis-1,2-dichloroethane, dibromochloromethane, trans-1,2-dichloroethene, trans-1,3-dichloropropane, trichloroethene, vinyl chloride

- **PAHs:** cPAHs, 1-methylnaphthalene, 2-methylnaphthalene, pyrene, fluorene, fluoranthene
- **Other SVOCs:** 2,4,6-trichlorophenol, 2,4-dichlorophenol, phenol, hexachlorobutadiene, PCP, dibenzofuran
- **PCBs:** Total PCBs

5.2.1.2 Soil and Groundwater Contaminants of Concern

To identify COCs, COPCs identified for soil and/or groundwater were further evaluated based on:

- Empirical data to determine whether a cross-media pathway is complete, or if an adjusted screening level is appropriate.[12]
- Statistical evaluation of the data set relative to the screening level, including the frequency of detection and compliance with the MTCA 3-part rule.[13]
- For non-detected analytes, comparison of reporting limits to currently available PQLs and consideration of potential historical use.

Table 5-4 presents the results from this further evaluation. Specifically:

- Fourteen of the chemicals identified as COPCs in soil were not identified as COPCs in groundwater. The soil screening levels for these chemicals were modified by eliminating the leaching pathway and evaluating the direct contact pathway. In each case, the maximum soil concentration was below the soil direct contact screening level, so these chemicals were not identified as soil COCs. These chemicals are ethylbenzene, xylenes, barium, chromium, lead, nickel, silver, dibenzofuran, 2,4,5-trichlorophenol, 2,4-dichlorophenol, dibenzofuran, 1-methylnaphthalene, 2-methylnaphthalene, and fluorene.
- Four chemicals were never detected in groundwater but were identified as a groundwater COPC because all of the reporting limits exceeded the screening level. However, the reporting limits for these chemicals are consistent with the best available PQLs, so they were not identified as groundwater COCs. The

[12] Much of the former Barbee Property prior to development was covered with pavement or buildings, which can limit leaching from unsaturated soils. However, the water table at the Site is very shallow and the majority of soil samples exceeding potential screening levels based on the soil-to-groundwater leaching pathway were in the saturated zone. Therefore, the historical data set is considered adequate to empirically evaluate the leaching pathway.

[13] The 3-part rule requires: (1) the upper one-sided 95 percent confidence limit on the true mean shall be less than the screening level, (2) no single sample concentration shall be greater than two times the screening level, and (3) less than 10 percent of the sample concentrations shall exceed the screening level.

maximum soil concentrations were below the soil direct contact screening levels, so they were not identified as soil COCs. These chemicals are benzene, antimony, mercury, and selenium.

- The maximum total concentration of copper in groundwater slightly exceeded the groundwater screening level, but the maximum dissolved concentration did not. The maximum total copper concentration was 15 µg/L, which is less than twice the screening level of 11 µg/L, and there were only two exceedances out of 74 copper samples analyzed. Based on the low concentration and low frequency of these exceedances, copper was not identified as a groundwater COC. The maximum soil concentration was below the soil direct contact screening level, so copper was not identified as a soil COC.
- PCP was identified as a groundwater COPC based on a single detection above the screening level. However, the single detection was below best available PQLs, so PCP was not identified as a groundwater COC. It remains a soil COC because there are detected concentrations above the direct contact screening level.
- Three PAHs – fluoranthene, pyrene, and cPAH TEQ – were identified as exceeding protection-of-groundwater screening levels; however, these screening levels were based on protection of sediment and surface water, and the only detected exceedance of these compounds was at well EW-8, located away from the shoreline, with no detected concentrations at wells along the shoreline. Based on this limited occurrence, the groundwater-to-sediment and groundwater-to-surface water pathways for PAHs are incomplete. No PAH concentrations exceeded drinking water screening levels. Two cPAH TEQ concentrations exceeded the direct contact screening level, but the cumulative cPAH TEQ dataset is in compliance following the MTCA three-part rule described above. Therefore, PAHs were not identified as soil or groundwater COCs.
- A total of 20 chemicals were never detected in groundwater with reporting limits above their screening levels and above best available PQLs. These chemicals are cadmium, thallium, hexachlorobutadiene, PCBs, and 16 VOCs. However, cadmium was not detected above natural background, PCBs and thallium were not detected in soil, and hexachlorobutadiene and VOCs were not analyzed in soil. These chemicals were analyzed as part of a standard suite of analytes, but there is no record of their use at the Site. These chemicals were not identified as soil or groundwater COCs.
- Iron and manganese were detected above groundwater screening levels, but these metals are not attributed to historical Site releases. These are redox-sensitive metals that are naturally elevated due to reducing conditions from peat and organic silt deposits. These chemicals were retained as COPCs because one or more concentrations exceeded screening levels (based on Site-specific background calculations), but were not retained as COCs for the following reasons:
    - **Iron.** Because the PAZ includes iron, performance groundwater monitoring has included analysis of iron to ensure that the interim action does not increase iron above background. The only samples that have exceeded the Site

background level were collected before the PAZ was installed or from upgradient of the PAZ. Therefore, the PAZ does not influence these samples.

- **Manganese.** Manganese was not used in Site operations or a component of interim actions. The only sample exceeding screening levels was part of the data set used to calculate Site background.[14]

The resulting COCs for the Site in soil and/or groundwater, based on all historical data, are as follows:

- **Metals:** arsenic and zinc
- **Petroleum Hydrocarbons:** TPH-D and TPH-O
- **SVOCs:** PCP

5.2.2 Sediment

The evaluation of sediment COPCs and COCs was performed in the two steps described below.

5.2.2.1 Sediment Contaminants of Potential Concern

COPCs were identified in the RI Work Plan (Aspect, 2021) by comparing the maximum concentration in the historical sediment dataset to the relevant preliminary screening levels. Chemicals exceeding screening levels were identified as a COPC for the sediment portion of the Site. Site-related COPCs were those considered a COPC in the upland area and with potential historical sources and pathways from the upland to sediment. A chemical was considered a COPC not related to the Site if there were no historical sources or if the fate-and-transport pathway was incomplete.

Site-related sediment COPCs were:

- Arsenic, wood debris, and TOC

COPCs not Site-related were:

- Lead, selenium, benzo(ghi)perylene, fluoranthene, pyrene, and Total cPAH TEQ[15]

5.2.2.2 Sediment Contaminants of Concern

Sediment COCs were identified by comparing all historical and current surface sediment data to pathway-specific screening levels. Background concentrations and PQLs were also considered in this step. COCs were conservatively identified by comparing the maximum concentration from all historical and current surface sediment COPCs to the screening levels. The data were also reviewed to evaluate if the chemical was Site related,

[14] Upland Site Shallow Alluvium groundwater data was used to calculate background to allow screening of porewater data.

[15] Three individual bioaccumulative PAHs and cPAH TEQs were identified in the SRI Work Plan as COPCs because the maximum concentrations exceeded the bioaccumulative SCO (PQL or natural background). Thus, total cPAH TEQ was used to represent all bioaccumulative PAHs (including benzo(ghi)perylene, fluoranthene, pyrene) because the cPAHs are the most toxic of the bioaccumulative PAHs.

meaning it was present in the upland areas and has a complete pathway from the upland area to sediment exposure area (Site-wide or nearshore). At this step, net-fishing and tribal clamming human health direct contact pathways were eliminated because of lack of substrate or limited subsistence/recreational use in the area.

The sediment surface screening levels are presented in Table 5-7 and 5-8. Sediment analytical data summarized in these tables are provided in Appendix D. A summary of retained COCs and applicable screening levels, adjusted for PQLs or natural background if appropriate, is provided in Table 5-9. The identified COCs are listed below.

- **Arsenic.** The maximum Site-wide concentration (34.4 mg/kg) exceeded the screening level (11 mg/kg) based on natural background. Arsenic is also an upland COC in groundwater and is a Site-related COC in sediment.
- **Lead.** The maximum Site-wide concentration (51.3 mg/kg) exceeded the bioaccumulative SCO (21 mg/kg). However, lead was not previously identified as an upland COPC, and there were no known Site sources of lead to sediment (which is supported by the spatial distribution of lead in surface sediments); therefore, lead is a non-Site-related COC in sediment.
- **Selenium.** Detected selenium concentrations did not exceed the Lake Washington ambient levels represented by the 90th percentile (2.0 mg/kg). However, the maximum reporting limit for non-detected results (3.3 mg/kg) exceeded Lake Washington ambient levels. In the initial Work Plan screen, selenium was also considered a benthic COPC because the highest non detected reporting limit (20 mg/kg) exceeded the benthic SCO (11 mg/kg). However, selenium detection limits were much lower (10-fold lower than the benthic SCO) in the 2021 dataset, and there were 15 samples with detected concentrations below the benthic SCO. Therefore, based on newer data, selenium is not retained as a benthic COC. Selenium was identified as an upland COPC based on detected concentrations in soil and groundwater above preliminary screening levels; however, there are no known Site-related sources of selenium, and no clear pathways from upland to sediment, so it is not considered a Site-related COC in sediment. It is conservatively retained as a COC for risk evaluation based on reporting limits exceeding the selected screening level.
- **cPAH TEQ.** The maximum Site-wide surface sediment concentration (674 µg/kg) exceeded the screening level (21 µg/kg). In the nearshore area, the maximum detected concentration of total cPAH TEQs (155 µg/kg) exceeded the screening level (90 µg/kg; based on human health [child] beach play). No significant sources of cPAHs from historical operations have been identified for the Site; however, a 1957 mill fire may have contributed to low-level occurrences of cPAHs in soil. Based on these results, cPAH TEQ is a non-Site-related COC.
- **Wood Debris** and **TOC.** The maximum concentrations of wood debris (100 percent) and TOC (47.5 percent) exceeded Site-specific cleanup levels (50 percent wood debris and 13.5 percent TOC). Historically, the Site was used as a lumber mill with operations, including a sawmill, wood treatment, offshore log rafting, and log storage, indicating that they are both Site-related COCs.

6 Nature and Extent of Contamination

This section describes the occurrence of Site COCs. Because numerous previous remedial actions have removed much of the contamination that was present, this section includes a summary of historical contaminant nature and extent based on all available data and a summary of current conditions based on recent data (typically, data collected after remedial actions were completed). The number of samples with detected concentrations of COCs exceeding screening levels for each medium is summarized for all historical data (Table 6-1a) and for data collected after implementation of remedial actions (Table 6-1b), including all soil collected after the 2006 soil removal actions, sediment data collected after the 2002 sediment removal action, and all groundwater and porewater data collected since PAZ installation in May 2007. Figures displaying the extent of historical and current COC concentrations are provided in this section. For upland data, figures showing historical data including data collected prior to completed remedial actions are indicated as "All Data" and figures only showing data post-remedial actions are indicated as "Current Conditions." The dates of current data represented on the figures are defined in the figure notes. Current conditions are used in Section 7 as the basis of evaluating risk and identifying Site areas requiring additional remedial action.

6.1 Soil and Groundwater

This section describes the extent of contamination in soil and groundwater for each COC. Where possible, soil and groundwater are discussed and illustrated on the same figures. Arsenic data is presented on multiple figures because of the much-larger data set. The maximum extent of contamination for each COC is based on all historical data, while current conditions are generally based on data collected after the 2006 and 2007 remedial actions for soil and groundwater.

Soil and groundwater COCs include the following:

- **Metals:** arsenic and zinc
- **SVOCs**: PCP
- **TPH:** TPH-D and TPH-O

Soil and groundwater data are provided in Appendix I. Occurrences of each of these COCs in soil and groundwater are described below.

6.1.1 Arsenic

Arsenic was a component of the wood-treating solution used in the 1940s in the northeast portion of the Site (Area C, Figure 2-2). Arsenic was identified as the primary COC in the initial Site investigations conducted in 1998 and 1999 (Hart Crowser, 2000b) and was the focus of interim remedial actions conducted between 2006 and 2010. Arsenic occurrences in soil and groundwater are described below.

6.1.1.1 Soil Occurrences

Site investigations identified an area of soil in the center of the Property containing arsenic at concentrations exceeding the screening level (20 mg/kg). As discussed in Section 4.2.4, 54,215 tons of arsenic-impacted soil was removed from this area in 2006 (Aspect, 2006e). The highest concentration of arsenic detected during investigation and performance sampling was 2,600 mg/kg. A total of 1,045 soil samples have been analyzed for arsenic. The excavation area and samples collected at the perimeter, base, or outside the excavation area are shown on Figure 6-1. Because of the sample density, overexcavated samples are not shown on this figure; refer to the Construction Report (Aspect, 2006e) for all sample locations and results.

No soil samples outside the limits of the 2006 excavation exceeded the arsenic screening level, including on the Quendall Property, which was the focus of a 2018 data gaps investigation. During the 2018 investigation on the Quendall Property, arsenic was analyzed at multiple depth intervals in soil within the arsenic groundwater plume, including offshore. There were no exceedances of the soil screening level in any of the 73 samples from 10 upland borings and 14 samples from 5 offshore borings completed to a maximum depth of 31 feet. Refer to the "Data Gaps Investigation Report" (Aspect, 2018) for detailed results of that investigation.

6.1.1.2 Groundwater Occurrences

Arsenic concentrations in Site groundwater (including historical data prior to interim remedial actions and current monitoring data) are shown on Figure 6-2 (shallow groundwater[16]) and Figure 6-3 (deeper groundwater). At locations with data from multiple depth intervals, the highest concentration is shown on these figures. At locations with data from multiple sampling events, the most recent concentration is shown.

In general, arsenic historically exceeded the groundwater screening level in the former source area (now represented by the 2006 Arsenic Remedial Excavation Footprint) and emanated in the downgradient direction (west to west-northwest) from the former source area toward Lake Washington. The highest detected concentration was 52,000 µg/L at HCMW-02 in 1998, and the highest concentrations in off-shore groundwater was 820 µg/L at well point WP-1. The highest concentrations of the historical plume align with the former location of the May Creek channel.

The extent of arsenic exceeding the screening level, and the magnitude of exceedances, are greatest in shallow groundwater. Concentrations exceeding the screening level in deeper groundwater are limited to an area closer to the former source area, near the eastern end of the PAZ, and do not extend to the shoreline. The vertical distribution of arsenic occurrences in groundwater on the Quendall Property is shown on Figure 6-4 and the vertical distribution along cross-sections A-A' and B-B' are shown on Figures 6-5 and 6-6 (cross-section locations are shown on Figure 3-1). Further discussion of the extent of arsenic in shallow and deep groundwater and in sediment porewater (which is

[16] For the purposes of the RI, the shallow system is defined as groundwater less than 30 feet in depth. This approximately corresponds with the distinction between the shallow and deep alluvial units.

indicative of conditions in groundwater discharging to Lake Washington) is provided below.

Arsenic in Shallow Groundwater. In the shallow groundwater interval, groundwater flow is west to northwest, towards Lake Washington, as shown on Figure 6-2.

Groundwater data collected prior to the remedial actions were used to define the southern and eastern boundaries of the plume, as shown on Figure 6-2. There are a few locations shown on Figure 6-2 with low exceedances outside the plume boundary, but these are considered to be outliers and do not define the plume (including AZ-7, B-6, B-11, B-17, HC-10, HC-40, HC-42, HC-48). The concentrations of arsenic in groundwater outside the plume boundary are close to the range of the natural background dataset (up to 28 µg/L), and there are historic groundwater samples below the screening level that help bound the plume. The western boundary beneath Lake Washington is defined by a combination of empirical data and groundwater modeling that predicts that the plume discharges within approximately 100 feet from the shoreline (see Section 7.1.1.2).

In 2018, an investigation was conducted to better define the northern extent of the Site arsenic plume. That work included collecting multiple discrete-depth, groundwater grab samples from direct-push borings in the southwestern area of the Quendall Property (Aspect, 2018). Data from that study are shown on Figure 6-4. The groundwater grab samples collected within the northern part of the Site arsenic plume showed variability from reducing conditions and hydrocarbon effects in individual discrete samples. When reducing conditions occur in groundwater as a result of organics (such as peat or hydrocarbon releases), the more mobile forms of arsenic predominate, and ferric iron, which limits the mobility of arsenic by sorption, reduces to the more soluble and mobile ferrous iron. Therefore, reducing geochemical conditions in groundwater on the Quendall Property increase arsenic mobility, resulting in increased arsenic groundwater concentrations. Figures showing the occurrence of arsenic in groundwater from the Quendall Site RI are provided in Appendix A for reference. The extent of Quendall Site DNAPL is shown on Figures 6-2 and 6-4 for comparison. The extent of arsenic attributed to the Barbee plume versus elevated arsenic concentrations attributed to geochemical conditions resulting from Quendall Site hydrocarbons is shown along cross-section B-B’ on Figure 6-6.

Arsenic concentrations in shallow groundwater at Quendall monitoring wells BH-21A and BH-26A are below the Barbee screening level and define the northern extent of arsenic in shallow groundwater. The estimated boundary of Barbee-related arsenic contamination in shallow groundwater is shown on Figures 6-2 and 6-4. This boundary is based on a combination of chemical data, groundwater flow direction, and field observations of elevated natural organics or hydrocarbon contamination corresponding to intervals with arsenic exceedances. Specifically:

- Arsenic exceedances at B-06 and B-17 correspond to field observations of hydrocarbon contamination (e.g., sheen), and the arsenic concentrations are higher than at locations upgradient of those borings (B-11 and B-12). Therefore, these exceedances are attributed to Quendall Site-related contamination.

- Arsenic exceedances at B-11 correspond to soil intervals with high levels of natural organics (wood). The concentrations are within the range of the background data set, and the average concentration within the shallow interval is less than the Site background level. Therefore, these exceedances are attributed to naturally reducing background conditions.

Deeper Groundwater. In the deeper groundwater interval, groundwater flow is west towards Lake Washington, as shown on Figure 6-3.

Direct-push groundwater grab samples from the 2018 study identified arsenic in the deep interval west of BH-26B, along the northern Property boundary, up to a maximum concentration of 84 µg/L at B-15. This is similar to the maximum concentration detected in this area and depth during PAZ design (100 µg/L). The 2018 study, and data from well BH-29B, define the western extent of the arsenic plume in deeper groundwater.

In 2021, well BH-31B was installed to evaluate the northern extent of arsenic above the screening level. The maximum concentration detected in this well (30 µg/L, in January and February 2022) exceeded the screening level, but the concentration was below the screening level in the initial sampling event (September 2021) and the most recent sampling event (January 2023). The estimated northern extent of arsenic in deeper groundwater, shown on Figures 6-3 and 6-4, is based on the maximum concentration detected at BH-31B, the westerly groundwater flow direction, and limited to south of Quendall Site DNAPL occurrences.

Sediment Porewater. Arsenic concentrations in sediment porewater were measured by using a passive sampling approach at two 2021 locations (BM-PW-16 and BM-PW-17). Porewater sampling was conducted offshore at the downgradient edge of the arsenic groundwater plume to evaluate the potential migration of arsenic into Lake Washington, which is discussed further in Section 7.1 (Contaminant Fate and Transport). Porewater concentrations were compared to groundwater screening levels which were developed to be protective of surface water.

Porewater sample locations have generally paired with shoreline monitoring well and/or well point locations to support future monitoring that will primarily be conducted at the shoreline. These measurements demonstrated significant attenuation of arsenic concentrations along the groundwater-to-surface water discharge pathway, as documented in the "Barbee Sediment Data Gaps Evaluation Memorandum" (Anchor and Aspect, 2010) provided in Appendix J. Porewater sampling data are provided in Appendix I and Appendix D.

Historical arsenic concentrations in porewater samples are shown in Figure 6-7. Prior to remedial actions, arsenic concentrations in two porewater samples exceeded the Site groundwater screening level with a maximum concentration of 1,400 µg/L at monitoring well WP-1B, located at the distal end of the center of the arsenic plume. Concentrations at locations away from the center of the plume were much lower; the second-highest arsenic concentration detected in porewater was 20 µg/L at monitoring well PW-S.

Since the PAZ was installed, 1 sample (out of 19 collected) exceeded the screening level based on groundwater Site-specific background concentrations (16 µg/L), with a

maximum concentration of 17 µg/L (PW-CMW-2, October 2009). PW-CMW-2, PW-CMW-3, PW-CMW-4, and PW-Control were sampled quarterly from May 2009 to March 2010, and NS01-C1, WD-01, WD-02 were sampled once in June 2009. None of the most recent samples exceeded the screening level, including two collected in 2021 (BM-PW-16 and BM-PW-17). The attenuation of arsenic in groundwater prior to surface water discharge is illustrated along cross-section A-A' on Figure 6-5.

6.1.1.3 Summary of Current Conditions

The 2006 excavation removed soils within 15 feet of the ground surface that contained arsenic at concentrations above the screening level (20 mg/kg). A limited number of bottom confirmation samples within the excavation footprint remain above the screening level. A total of 9 of the 352 confirmation soil samples (soil left in place) contain arsenic above the MTCA Method A cleanup level (20 mg/kg; Figure 6-1), at a maximum 88 mg/kg concentration.

All of the confirmation soil samples exceeding the screening level were located at depths of 15.5 to 16 feet bgs (during the 2006 remedial excavation). Since the 2006 excavation was completed, the Property has been regraded, and the confirmation soil samples exceeding the screening level are now located 17 to 22 feet bgs.

Current groundwater data are shown on Figure 6-8. Groundwater samples were collected from monitoring wells BH-21A, BH-21B, BH-26A, BH-26B, and BH-29B in November 2020, and all other wells were sampled in January 2023.

Arsenic concentrations in Site groundwater are much lower than prior to remedial actions, with a maximum concentration detected in January 2023 of 240 µg/L at EW-8, compared to the pre-remedial action maximum concentration of 52,000 µg/L. Arsenic concentrations continue to exceed screening levels in groundwater within and downgradient of the former source area but are generally declining; concentration trends are shown on Figures 6-9 and 6-10. A detailed analysis of current conditions and trends is provided in the "Annual Progress Report and Performance Monitoring Report" (Annual Report; Aspect, 2023) and summarized below for three specific areas: upgradient of the PAZ, at the PAZ ends, and downgradient of the PAZ.

Upgradient of the PAZ. Groundwater monitoring upgradient of the PAZ is conducted at the extraction wells EW-1 through EW-8. Concentrations in this area have steadily declined following removal of the source area (see Figure 6-9). The extraction system has not been operated since 2011.

At the PAZ Ends. The PAZ's effectiveness at capturing arsenic in groundwater above the screening level is evaluated based on the arsenic concentrations at two monitoring wells (CMW-1, at the PAZ's south end, and CMW-6, at the PAZ's east end), and on the Site groundwater flow patterns. Arsenic concentrations at CMW-1 and CMW-6 increased initially after construction of the PAZ, due to radial flow from the backfilled excavation. Current conditions, as of the January 2023 annual monitoring event, are as follows:

- At CMW-6, the arsenic concentration (140 µg/L) remains above the screening level, but has shown a slight, overall decreasing trend since 2011 (Aspect, 2023).

Groundwater concentrations downgradient of this area have steadily decreased since PAZ installation.

- At CMW-1, the arsenic concentration (64 µg/L) also remains above the screening level and has shown an increasing trend since 2011 (Aspect, 2023). The concentration at this well is below levels previously determined to be protective of porewater, based on shoreline groundwater/porewater pairs (see Section 4.1.14).

The arsenic plume's southern boundary is estimated considering historical and current analytical data and groundwater flow direction. Because of the increase in arsenic concentrations at CMW-1 since PAZ construction (from 31 to 64 µg/L) and the estimated groundwater flow contours (see Figure 6-2) that indicate radial groundwater flow around the south end of the PAZ, additional porewater data was collected in 2021 to verify that concentrations in porewater remained below the screening level (see Section 6.1.1.2).

Downgradient of the PAZ. Arsenic concentrations at most wells and well points downgradient of the PAZ are either below the screening level (wells CMW-2S, CMW-3, CMW-5, BH-29B, WP-1A) or steadily declining (CMW-4D, BH-29A, WP-8) as treated water flushes out residual arsenic. Arsenic concentrations at one deep well, CMW-2D, initially declined after PAZ installation and then rebounded, although concentrations remain below pre-remediation levels at this location and have recently exhibited a declining trend, with arsenic measured at 170 µg/L in January 2023. The long-term increasing trend at CMW-2D may be a result of the permeable backfill in the arsenic-contaminated soil excavation area. After the remedial excavation in 2006, the area was backfilled below the water table with quarry spalls, which are more permeable than surrounding soils. This may have created a downward vertical gradient near the western edge of the backfill, resulting in the migration of arsenic under the PAZ. Arsenic concentrations are expected to continue to decline based on the observed attenuation of arsenic upgradient of the PAZ. Based on historical groundwater/porewater evaluations, the arsenic concentrations at CMW-2D would not impact porewater above the arsenic screening level.

6.1.2 Zinc

Zinc was a component of the arsenic-based wood-treatment product, and the majority of zinc exceedances were located within the arsenic source area that was excavated in 2006. The extent of zinc exceeding screening levels was generally more limited than the extent of arsenic exceeding screening levels.

Soil Occurrences. Of the 749 soil samples analyzed for arsenic during the 2006 interim action, 232 samples were analyzed for zinc. A total of 280 Site soil samples have been analyzed for zinc. The distribution of all available zinc soil data compared to screening levels is shown on Figure 6-11.

Groundwater Occurrences. The distribution of all available zinc groundwater data compared to the screening level is shown on Figure 6-11. Zinc was detected above the groundwater screening level (100 µg/L) at two locations, both sampled in 1999: at HC-47 (110 µg/L) along the shoreline and at HC-39 (150 µg/L) in the 2006 excavation area.

Summary of Current Conditions. The current distribution of zinc in soil and groundwater, based on historical data of soil not removed during remedial actions and on groundwater data collected after the 2006 interim action, is shown on Figure 6-12. Current data shown on the figure includes soil data from 1999 through 2006 which was not overexcavated and groundwater data collected in 2010 and 2021. During the 2006 interim action, 90 soil samples were collected at or beyond the final excavation limits and analyzed for zinc. Of these 90 soil samples, three samples in the saturated zone exceeded the screening level (85 mg/kg). Following the removal of arsenic- and zinc-impacted soil in 2006, zinc was monitored quarterly for 1 year from May 2009 to March 2010 at performance monitoring wells CMW-2S, CMW-2D, CMW-3, CMW-4, CMW-5S, and CMW-5D. Zinc was not detected in 20 of 24 total groundwater samples collected over the four quarters. The maximum detected zinc concentration in these confirmation samples was 14 µg/L, below the screening level (100 µg/L). Zinc was not detected in recent groundwater samples collected in 2021, including at CMW-2S and CMW-2D (adjacent to the historical shoreline exceedance) and EW-4 (adjacent to the highest detected concentration remaining in soil).

6.1.3 Pentachlorophenol

PCP was a component in Permatox 100, which was used as a sap stain treatment at the sawmill and planer spray areas prior to 1978. In 2006, an area of PCP-contaminated soil that was identified during Site investigations was removed. This area (PCP Excavation Area) and sample locations where PCP has been analyzed in soil or groundwater are shown on Figure 6-13.

Soil Occurrences. Twenty-eight soil samples were analyzed for PCP in the initial Site (RETEC, 1996) and IRAP investigations (Hart Crowser, 2000b), and none exceeded the screening level, with a maximum concentration of 0.15 mg/kg detected. During the 2006 Site investigation (Urban Redevelopment, 2006), PCP was detected above the screening level in one sample (TP4-SL; SL=sawdust layer) collected from a test pit located in a former spray area. The PCP exceedance appeared to be associated with a sawdust/wood debris layer located approximately 2 feet bgs; PCP concentrations in samples collected below this layer were below the screening level. Additional soil samples were collected in this area as part of performance monitoring. In all, 65 soil samples have been analyzed for PCP, with the maximum detected concentration (220 mg/kg) at location HSE B-7.

Groundwater Occurrences. The distribution of PCP in groundwater is shown on Figure 6-13. During the initial Site investigation (RETEC, 1996), PCP was not detected in any Site groundwater samples. Low PCP detections in soil near the former sawmill area prompted additional groundwater sampling during the IRAP investigation (Hart Crowser, 2000b), and a sample downgradient of the former Pan Abode lease area was analyzed for PCP by Aspect in 2006 (Aspect, 2006c).

PCP was not detected downgradient of the former Pan Abode lease area, and also not detected in five of six temporary groundwater samples collected at six direct-push borings in the former sawmill area, including at HC-41 located directly downgradient of the PCP Excavation Area (prior to excavation). The single PCP detection was at HC-42, at 0.06 µg/L, below the PQL (1 µg/L).

Summary of Current Conditions. In 2006, approximately 160 cubic yards of soil were removed from the PCP Excavation Area. All the final confirmation samples met the PCP screening level (2.5 mg/kg), with the maximum detected confirmation sample containing PCP at 2.4 mg/kg. PCP occurrences in soil are shown on Figure 6-13.

6.1.4 Total Petroleum Hydrocarbons

Two areas of TPH concentrations above screening levels were discovered during Site characterization. Both areas were subsequently delineated and excavated in 2006: the East TPH Area, near former storage tanks, and the West TPH Area, south of the former mill building (Historical Operational Area A – Figure 2-2). Excavation areas and sample locations where TPH-D[17] has been analyzed are shown on Figure 6-14.

Soil Occurrences. A total of 75 soil samples were analyzed for TPH-D. Only one sample (TP1-3; 4,600 mg/kg) exceeded the screening level (2,000 mg/kg). This sample was located in the West TPH Area.

Groundwater Occurrences. A total of 32 groundwater samples were analyzed for TPH-D. Groundwater at only one location (RMW-4), located in the East TPH Area, exceeded the screening level (500 µg/L), at a maximum concentration of 1,600 µg/L.

Summary of Current Conditions. At the East TPH Area, five confirmation samples were collected following the remedial excavation (four sidewall samples and one bottom sample), and all samples were below the TPH-D screening level (2,000 mg/kg). The maximum TPH-D confirmation sample result was 160 mg/kg. Confirmation groundwater samples were collected in four consecutive quarters, downgradient of the East TPH Area (wells CMW-1, EW-1, and EW-3) between May 2009 and March 2010. TPH-D was not detected in any of these groundwater samples.

At the West TPH Area, five confirmation samples were collected following the remedial excavation (four sidewall samples and one bottom sample). TPH-D was not detected in any samples. After excavation, a confirmation groundwater sample was collected from a temporary well 10 feet downgradient (west) of the West TPH Area excavation footprint. TPH-D was not detected in this groundwater sample.

In summary, locations exceeding soil and groundwater screening levels for TPH-D were excavated during the interim actions. None of the confirmation soil samples exceeded the TPH-D screening level in soil, and TPH-D was not detected in any confirmation groundwater samples.

6.2 Sediment

This section presents the extent of Site-related sediment COCs and refines the preliminary Sediment Boundary presented in the SRI Work Plan (Geosyntec, 2021). Collocated non-Site related sediment COCs are also discussed.

[17] TPH-G was not identified as a COC. Only one sample exceeded screening levels for TPH-O, which was collocated with a TPH-D exceedance. Therefore, this discussion focuses on TPH-D results.

Figures 6-15a to 6-17a illustrate the distributions of Site-related COCs (arsenic, wood debris, and TOC), Figures 6-18 to 6-20 show the Site Sediment Boundary, which was based on arsenic and in relationship to Site-related COCs, and Figures 6-21a to 6-23a illustrate the distribution of non-Site related COCs (lead, selenium, and cPAHs), based on all data to date. A parallel set of figures (Figures 6-15b to 6-17b and Figures 6-21b to 6-23b) show distributions based on current conditions (i.e., data collected after sediment removal actions and the 2006 habitat restoration).

The maximum extent of Site-related COCs exceeding sediment screening levels (Sediment Boundary: see Section 6.2.3) is shown on Figure 6-18a in relation to sediment Site-related COC concentrations and bioassay test results. Tables 6-2a and 6-2b provide the descriptive statistics for the historical dataset and the current conditions dataset, respectively, and all surface sediment analytical data used in these tables are provided in Appendix D. The Sediment Boundary relative to individual point estimates of arsenic, wood debris, TOC, lead, selenium, and cPAHs, are shown on Figures 6-18 through 6-23, respectively. Historical subsurface sediment data are reported in Table 6-3 and exceedances are shown on Figure 6-24.

6.2.1 Site-Related COCs

The following subsections describe extent of exceedances of Site-related COCs, including arsenic, TOC, and wood debris, and summarize relevant changes observed between historical and current sediment conditions.

6.2.1.1 Arsenic

The distribution of arsenic concentrations in surface sediment is shown on Figure 6-15a (all data) and Figure 6-15b (current conditions). Statistical summaries of all arsenic data and current conditions data are provided in Tables 6-2a and 6-2b, respectively.

Sediment Occurrences. Historically, there were three detected exceedances of the benthic and bioaccumulative SCOs (14 mg/kg and 11 mg/kg, respectively; Figure 6-15a); two additional samples demonstrated nondetects at reporting limits above the benthic SCO. The highest detected historical concentration (30 mg/kg) was from a station located just offshore of former Outfall 001. However, this area was dredged in 2002. The highest arsenic concentration in sediment detected in the potential groundwater discharge area was 16 mg/kg at WD-01, which is slightly above the screening level. However, arsenic was not detected in another sediment sample collected at approximately the same location (WD-01-SS) at an 8 mg/kg detection limit. Just south of the Quendall Site, a sample (JB-01) collected for the Quendall RI (RETEC, 1997) is shown as an exceedance of the Benthic SCO. A few historical samples potentially exceeded the benthic SCO for arsenic, based on nondetect results at an elevated reporting limit of 20 mg/kg.

During a 2018 data gaps investigation (Aspect, 2018), five borings (B-01 through B-05) were advanced offshore using a geoprobe to evaluate arsenic concentrations at depth from migrating groundwater. Arsenic concentrations did not exceed the screening level in any subsurface sediment samples (Table 6-3 and Figure 6-24), which were collected to a maximum depth of 20 feet bml in the northern portion of the Site (Aspect, 2018). Older borings from 1997 (VB-01 to VB-04) showed no detections or exceedances of the

benthic or bioaccumulative SCOs in subsurface sediment samples at detection limits below the SCOs (Table 6-3 and Figure 6-24).

Summary of RI Current Conditions. Arsenic concentrations were all below the benthic and bioaccumulative SCOs, except for two locations (Figure 6-15b). At BM-SED-14, the arsenic concentration was 12 mg/kg, which exceeded the bioaccumulative SCO (11 mg/kg). At BM-SED-16 the arsenic concentration was 20.1 mg/kg in 2021 and 34.4 mg/kg in 2022, both of which exceeded the benthic and bioaccumulative SCOs (14 mg/kg and 11 mg/kg, respectively). The historical stations with elevated non-detects were reoccupied in 2021 and arsenic concentrations were detected below the SCOs.

6.2.1.2 Wood Debris and TOC

The distribution of historical wood debris and TOC in surface sediment is shown on Figures 6-16a and 6-17a, respectively (all data). The current conditions for wood debris and TOC spatial distributions are shown on Figures 6-16b and 6-17b, respectively. Statistical summaries of the historical and current wood debris and TOC data are provided in Tables 6-2a and 6-2b, respectively.

Historical Sediment Occurrence. Historically, numerous samples within and north of the 2002 Sediment Removal Area (Figures 6-16a and 6-17a) exceeded Site-specific screening levels for wood debris and TOC (50 percent and 13.5 percent, respectively [Ecology, 2002]). The 2002 sediment removal action offshore of the Barbee Property focused on removal of TOC and wood debris impacts, and only these analytes were evaluated in post-removal samples (Anchor, 2003). In addition, as part of the Quendall Site investigation, sediment samples collected just south of the Quendall Site were assessed for toxicity in bioassay tests using benthic organisms. The TOC and wood debris concentrations are discussed in Section 6.2.2.1 in relationship to bioassay test results.

Summary of RI Current Conditions. Following the completion of the sediment dredging cleanup action in 2002 (Anchor, 2003), confirmation sediment samples were collected at 19 locations in a 125-foot grid pattern and analyzed for TOC and wood debris. The maximum post-dredge concentration of wood debris (35 percent) was below the screening level (50 percent). The RI current conditions data (post-dredge) show no exceedances of wood debris and TOC in the dredged and restoration areas. Only one station near the Quendall Site had greater than 50 percent wood debris (Figure 6-16b). For TOC, two samples within the sediment portion of the Site had greater than 13.5 percent (Figure 6-17b).

6.2.1.3 Benthic Toxicity Evaluation

Results of the 2021 sampling showed an arsenic exceedance above the benthic SCO (14 mg/kg) in the surface sediment sample (BM-SED-16). To assess potential toxicity to the benthic community, additional sample volume was collected in 2022 and submitted for benthic toxicity testing in accordance with SCUM (Ecology, 2021). Surface sediment (0–10 cm) was collected from SED-16 and two nearby reference areas, as detailed in the RI

Data Report (Aspect and Geosyntec, 2023), and submitted for chemical and bioassay testing (two acute tests and one chronic bioassay test).[18]

All bioassays (and all test endpoints) for BM-SED-16 passed both the SCO and CSL criteria and show compliance with SMS standards. Specifically, the results by species, test, and endpoint in Table 6-4 show the following:

- **10-day Larval Midge Survival and Growth**: Midge survival and growth meets the SCO and CSL. There were statistical differences between the reference and Site sediment survival rates ($p<0.05$), but the difference was less than 20 percent. For growth, there were no statistical differences between the reference and Site sediment growth rates ($p<0.05$), and the ratio of mean individual growth between the two was greater than 0.8.
- **10-day Amphipod Survival**: Amphipod survival meets the SCO and CSL; there was a statistical difference between the reference and Site sediment survival rates ($p<0.05$), but the difference was less than 20 percent.
- **28-day Amphipod Survival and Growth**: Amphipod survival and growth meets the SCO and CSL. There was no statistical difference between the reference and Site sediment survival rates ($p<0.05$) and the difference was less than 10%. For growth, there was no statistical difference between the reference and Site sediment growth rates ($p<0.05$) and the ratio of mean individual growth between the two was greater than 0.75.

These bioassay results override the exceedance of the chemical SCO criteria for arsenic, indicating there are no benthic risks at station BM-SED-16.

6.2.2 Sediment Boundary

The preliminary Sediment Boundary presented in the SRI Work Plan (Geosyntec, 2021) was refined in this report by:

- **Step 1:** Establishing the benthic boundary based on:
  - The extent of Site-related COC exceedances in the sediment RI/FS dataset which includes results for (1) samples collected during the 2021 and 2022 investigations, and (2) historical samples collected within the preliminary Sediment Boundary but outside the 2002 dredging footprint. Data were evaluated on a point-by-point basis, as shown in Figures 6-15 to 6-17.
  - The bioassay override was applied to determine if there are any individual stations with Site-related COC exceedances that show no benthic risks (measured as toxicity). This information was used to establish the sediment boundary based on benthic protection on Figure 6-18a.
- **Step 2:** Establishing the bioaccumulative boundary based on interpolating the arsenic data to confirm the extent of exceedances of Site-related COCs. The extent of arsenic exceedances was evaluated using inverse distance weighting

[18] Reference samples BG-2 and BG-12A, selected based on similar grain size to BM-SED-6.

(IDW) interpolation to establish the bioaccumulative boundary based on protection of human/ecological health, as shown on Figure 6-18b.

- **Step 3:** Combining the sediment boundary based on benthic protection and the sediment boundary based on human/ecological health to determine the Site Sediment Boundary, which represents the area encompassing both the benthic and bioaccumulative boundaries. The resulting Site Sediment Boundary is shown on Figure 6-18c.

The Sediment Boundary encompasses all samples exceeding sediment screening levels for arsenic (natural background, 11 mg/kg), and includes all historical exceedances of benthic COCs (TOC, wood debris). This area covers 11.6 acres and encompasses the former dredging event completed in 2002 and a shoreline restoration performed in 2005 as shown in Figure 6-18c.

The following subsections provide details on the implementation of these steps.

6.2.2.1 Sediment Benthic Boundary

The extent of Site-related COCs including arsenic, TOC, and wood debris was mapped using the combined dataset of post-removal action historical data and new data (with reoccupied stations replacing historical data). The data also included nondetect results at one-half the method detection limit.

Point-by-Point Comparison to Evaluate Extent of Exceedances. During Step 1, the Sediment Benthic Boundary was initially determined on a point-by-point basis as the area with Site-related COCs above screening levels. Exceedances of arsenic benthic-based SCO (14 mg/kg) delimit the Sediment Benthic Boundary. Sampling locations delimiting the Sediment Boundary to the north include one location (BM-SED-14) exceeding the bioaccumulative SCO, and another location (BM-SED-16) exceeding the benthic SCO and CSL (maximum detected concentration of 34 mg/kg in sample collected during the 2022 field event); these exceedances are bounded by sediment samples without COC exceedances. The footprint of the 2002 sediment removal area delimits the Sediment Benthic Boundary to the south.

Benthic Toxicity Evaluation and Bioassay Overrides. Benthic toxicity was evaluated in Site sediment during Step 1 by comparing chemistry results and bioassay tests to SCO and CSL criteria as presented in Table 6-5.

Arsenic SMS Exceedances. In 2021, arsenic was the only Site-related COC that exceeded the benthic SCO, at one station (BM-SED-16). In 2022, benthic toxicity testing at this station showed no toxicity for any endpoints or species relative to reference test results (Table 6-4). The SMS allow for bioassay test results to override chemical exceedances; therefore, there are no Site risks to benthic organisms at BM-SED-16.

TOC/Wood Debris Exceedances. TOC or wood debris concentrations within the Sediment Benthic Boundary exceeded the Site-specific cleanup levels established during the Quendall RI at a few stations (Anchor and Aspect, 2012). However, historical bioassay tests performed for the Quendall Site within the Sediment Benthic Boundary all passed screening criteria (showed no significant toxicity) in areas with elevated wood debris (100 percent) and TOC concentrations (35 percent) outside of the dredge footprint.

Thus, while these areas exceed Site-specific cleanup requirements, they do not pose a risk to benthic invertebrates[19]. As a result, wood debris and TOC are not benthic risk drivers at the Site, and the Sediment Benthic Boundary does not include all TOC and wood debris exceedances.

In summary, there are no current Site risks to benthic organisms identified. Arsenic exceeded the benthic SCO at one station in 2021 and 2022, and TOC and/or wood debris remaining after the remedial actions exceeded the Site-specific screening levels at two locations within the Sediment Benthic Boundary. However, all bioassay testing (current and historical) showed no significant toxicity associated with these COCs. These bioassay results override the exceedance of the chemical SCO criteria for arsenic, indicating there are no benthic risks at station BM-SED-16.

Step 1 resulted in the exclusion of sediment sampling locations towards the north, where benthic toxicity was not detected. Bioassay override locations and the refined Sediment Benthic Boundary are shown on Figure 6-18a.

6.2.2.2 Sediment Bioaccumulative Boundary

IDW interpolation methods were used with the ESRI Spatial Analyst tool in GIS to create concentration-gradient maps for arsenic as shown on Figure 6-18b.

IDW interpolation followed the same methodology recommended by the SCUM (Ecology, 2021) and used the same parameters for an adjacent site by Leidos (2020); parameters included power of 3.5, variable search radius, maximum number of neighbors of four samples. IDW grid cell sizes were 1-foot cells. Non-detected results were included at half the reporting limit/PQL, per Ecology (2021), and data were transformed prior to interpolation.[20]

During Step 2, the Sediment Bioaccumulative Boundary footprint was identified after interpolation of arsenic concentrations within the sediment portion of the Site; the interpolation estimates the extent of contamination surrounding two sampling locations with exceedances (BM-SED-14 and BM-SED-16) and is bounded by samples demonstrating no SMS exceedances.

6.2.2.3 Site Sediment Boundary

The Site Sediment Boundary was identified by overlaying the extent of benthic and bioaccumulative exceedance areas as showed on Figure 6-18c. Interpolation Figures 6-19 and 6-20 show the Site Sediment Boundary based on arsenic (>11 mg/kg) relative to individual point estimates of wood debris and TOC, respectively.

[19] During a July 8, 2021, meeting, Ecology confirmed the bioassay override applies Site-wide extending to the Barbee Mill Sediment Site.

[20] All historical and current Site data were collectively used to evaluate the nature and extent of contamination and determine the Site boundary. To evaluate Site risks, only current and post-dredge data were used.

6.2.3 Collocated Non-Site-Related COCs

The following subsections discuss exceedances of non-Site related COCs collocated with Site-related COCs, including lead, selenium, and cPAHs, and summarize relevant changes observed between historical and current sediment conditions.

6.2.3.1 Lead

The distribution of lead concentrations in surface sediment is shown on Figure 6-21a (all data) and Figure 6-21b (current conditions). Interpolated lead concentrations within the Site Sediment Boundary are presented on Figure 6-21c. Statistical summaries of the historical lead data and the RI current data are provided in Tables 6-2a and 6-2b, respectively.

Historical Sediment Occurrence. Nine surface sediment samples (0 to 10 cm) within the Site Sediment Boundary and south of the Quendall Site, Operable Unit 2 footprint, exceeded the bioaccumulative SCO (21 mg/kg), but none were above the benthic SCO (360 mg/kg). Outside of the Site Sediment Boundary, four additional samples exceeded the bioaccumulative SCO, but all data were below the benthic SCO. Lead was not identified as an upland COC, and there are no known Site sources of lead to sediment. This is supported by the lack of a spatial gradient in lead surface sediment concentrations from the nearshore area to offshore areas.

In subsurface sediment, lead marginally exceeded the bioaccumulative SCO in one horizon of one sediment core (23 mg/kg); no other subsurface exceedances were measured (Table 6-3 and Figure 6-24).

Summary of RI Current Conditions. Most of the elevated lead concentrations within the Sediment Boundary were removed as part of the 2002 dredging. Thus, the current data show two bioaccumulative SCO exceedances of lead in Site-wide surface sediment samples, which are located within the outermost areas of the Site Sediment Boundary.

6.2.3.2 Selenium

The distribution of selenium concentrations in surface sediment is shown on Figure 6-22a (all data) and Figure 6-22b (current conditions). Interpolated selenium concentrations within the Site Sediment Boundary are presented on Figure 6-22c. Statistical summaries of the historical selenium data and the RI current data are provided in Tables 6-2a and 6-2b, respectively.

Historical Sediment Occurrence. Prior to 2002, selenium demonstrated nondetect results, but with reporting limits (20 mg/kg) that exceeded the benthic SCO (11 mg/kg; Figure 6-22a; Table 6-2a). Selenium was not identified as an upland COC. Because there are no known Site-related sources of selenium, it is not considered a Site-related COC in sediment.

Summary of Current Conditions. Under current conditions, both detected selenium concentrations (46 percent of the results) and nondetects (at the reporting limit) in sediment were below the benthic SCO. Selenium is a bioaccumulative chemical, but there are no natural or regional background concentrations established. Therefore, selenium data also were compared to the ambient Lake Washington surface sediment concentrations, as detailed in Appendix H. At three locations (BM-SED-02, BM-SED-11,

and BM-SED-14), reporting limits for selenium slightly exceeded the 90th percentile of Lake Washington surface sediment concentrations but method detections limits (between 0.2 and 1.2 mg/kg) for selenium were below this value (2.0 mg/kg; Table 5-7; Appendix H). This indicates that selenium is below 2 mg/kg at those locations.

Selenium was also detected in the three nearshore samples (Figure 6-22b), but all nearshore concentrations were well below the screening level that is protective of human health direct contact through beach play (3,300 mg/kg). The maximum selenium concentration in the nearshore area was 1.42 mg/kg.

6.2.3.3 Carcinogenic Polycyclic Aromatic Hydrocarbons

The distribution of total cPAH TEQ in surface sediment is shown on Figure 6-23a (all data) and Figure 6-23b (current conditions). Interpolated cPAH TEQ concentrations within the Site Sediment Boundary are presented on Figure 6-23c. Statistical summaries of the historical and current cPAH TEQ data are provided in Tables 6-2a and 6-2b, respectively.

Historical Sediment Occurrence. Historical cPAH TEQ concentrations in surface sediment exceeded the bioaccumulative SCO and CSL in both the central and northern portions of the Sediment Boundary, with a clear concentration gradient trending from the north near the Quendall Site to the south toward the Site (Figure 6-23a). Total cPAH TEQ concentrations were up to two orders of magnitude higher in the Quendall Site compared to Site sediment. Historical creosote operations are a known source of cPAHs at the Quendall Site, where DNAPL is present and cPAH concentrations in surface sediment are as high as 166 mg/kg. In contrast, no significant sources of cPAHs from historical operations have been identified for the Site. Even though cPAHs have been detected in Site groundwater and soil, the pattern of contamination indicates that there is an incomplete pathway from upland media to sediment.

Summary of RI Current Conditions. Similar to historical data, the current dataset shows a gradient in cPAH TEQ concentrations from the Quendall Site to the north towards the Site. Most cPAH TEQ surface sediment sample concentrations exceeded the bioaccumulative SCO (21 µg/kg; natural background) and eight samples exceed the bioaccumulative CSL (210 µg/kg; regional background; Figure 6-23b).

Total cPAH TEQ concentrations were also detected in the three nearshore samples and exceeded the screening level (90 µg/kg; based on human health [child] beach play) at station NS-SED-34 (Table 6-8b; Appendix D). However, the detected concentration at NS-SED-34 is below the bioaccumulative CSL.

7 Conceptual Site Model

Cleanup action selection and implementation are based on a conceptual site model (CSM). The CSM is a conceptual understanding of the Site that identifies potential or suspected sources of hazardous substances, potentially contaminated media, and actual and potential exposure pathways and receptors. A summary of the CSM prior to the remedial actions, including contaminant migration and potential exposure pathways, is illustrated on Figure 7-1. The current CSM is illustrated on Figure 7-2. In summary:

- Upland releases from historical Site operations resulted in contamination—primarily arsenic, but with more limited occurrences of zinc, PAHs, PCP, and TPH—in Site soil and/or groundwater.
- In-water releases from historical Site operations resulted in arsenic and wood debris in Site sediment.

In addition to Site-related COCs, concentrations of PAHs, selenium, and lead in sediment exceed screening levels but these occurrences are not Site-related, as discussed in Section 6.2.3.[21]

Remedial actions to date have removed contamination and limited exposure pathways. The following sections describe elements of the CSM for current Site conditions as follows:

- Section 7.1, **Contaminant Fate and Transport**, describes transport and transformation of COCs within and between Site media.
- Section 7.2, **Exposure Pathway Assessment**, identifies potentially complete exposure pathways under current and potential future Site conditions.
- Section 7.3, **Sediment Risk Screening Evaluation**, evaluates potential risks for each sediment exposure pathway based on current Site data.

7.1 Contaminant Fate and Transport

Site COCs in Site media can migrate within and between media through a variety of mechanisms, as follows:

- Within groundwater by advection, dispersion, and diffusion
- From groundwater to surface water by advection
- From soil to sediment by erosion

[21] Although PAHs were identified as COCs in the upland, the available data indicate that the soil/groundwater-to-sediment/surface water pathways are incomplete, and the PAH concentrations and distribution in sediment are consistent with contributions from regional background and the adjacent Quendall Site.

- From soil to groundwater by leaching
- From groundwater to soil or sediment by sorption

In addition, COCs can undergo a variety of transformation processes, including:

- Chemical transformation, such as a change in valence state or precipitation of metals
- Biological degradation, such as degradation of wood debris

The majority of Site COCs have shown little mobility. For example:

- PCP was identified as a soil COC, but not a groundwater COC, and the area of PCP exceedances was very limited, as described in Section 6.1.3.
- Zinc exceedances in groundwater were generally identified within the area of soil contamination, and no exceedances in groundwater are currently detected, as described in Section 6.1.2.
- TPH-D exceedances in groundwater were historically identified within the area of soil contamination, and no exceedances in groundwater are currently detected, as described in Section 6.1.4.
- Wood debris degrades slowly and may remain in aquatic environments for decades. Wood debris is typically found at the highest levels at or near the site of disposal, unless there are high flows in the area (Ecology, 2013b).

The exception to this is arsenic, which has demonstrated greater mobility and is the primary COC remaining at the Site. Arsenic fate and transport at the Site is described below.

7.1.1 Fate and Transport of Arsenic

The primary transport mechanisms for arsenic are leaching from Site soil into groundwater, transport via advection in groundwater, and attenuation via sorption or precipitation onto soil or sediment (including the reactive material of the PAZ). Historically, soil may have been transported to sediment via erosion and discharge through the historical outfalls to Lake Washington; the highest historical concentration of arsenic in sediment was detected near the former Outfall 001. The distribution of zinc above natural background concentrations in historical sediment samples was also consistent with this pathway (Aspect and Geosyntec, 2021), although zinc concentrations were below sediment screening levels. That pathway is incomplete due to clean fill placed as part of Property development, as described in Section 5.1.

Prior to interim actions, arsenic in groundwater discharged to Lake Washington at concentrations above the screening level, based on porewater monitoring data (Section 6.2.1.1). Under current conditions, arsenic attenuates to below the groundwater screening level prior to discharge. Further description of the arsenic transport and attenuation in soil, groundwater, and sediment is described below.

Arsenic is a redox-sensitive transition metal that is more mobile in groundwater under reducing conditions. A Site geochemical investigation was performed in 2005 (Aspect,

2006a) to evaluate conditions affecting arsenic transport. The findings of the geochemical investigation were as follows:

- Site groundwater is highly reducing due to the presence of natural organic materials, such as peat, associated with the May Creek deltaic deposits.
- Arsenic is present in the inorganic form in both the As(III) and As(V) valence states. Very little organic arsenic is present.
- Mobility of arsenic in Site groundwater is most likely controlled by sorption onto clay minerals. Arsenic sorption to soil was measured to be nonlinear, with calculated partition coefficient (K_d)values for soil varying between 3 and 15 liters per kilogram (L/kg).

The geochemical investigation was performed prior to interim actions; therefore, the calculated K_d values may not fully represent conditions after source removal, as the plume attenuates. The K_d value for arsenic identified for arsenic in the cleanup levels and risk calculations (CLARC) database is 29 L/kg. A higher K_d represents stronger sorption to soil (lower mobility in groundwater).

With the arsenic source removed, arsenic remaining at the Site slowly attenuates as residual arsenic on soil leaches into groundwater, is transported through groundwater, and reabsorbs onto soil. Groundwater concentrations are declining at the vast majority of monitoring points, indicating that overall, arsenic is slowly being flushed out and immobilized.

The following sections describe the two models used to predict arsenic fate and transport, as follows:

- Section 7.1.1.1– **Upland Fate and Transport Evaluation**. This section describes the results of a MODFLOW/MT3D groundwater model to predict westward plume extent.[22]
- Section 7.1.1.2 – **Sediment Fate and Transport Evaluation**. This section describes the one-dimensional sediment transport model used to evaluate reductions in arsenic concentrations between groundwater and sediment porewater.

7.1.1.1 Upland Fate and Transport Evaluation

A MODFLOW/MT3D groundwater and contaminant transport model was used to predict the flushing and attenuation of the groundwater plume. The model was originally set up and used to assist in PAZ design (the Design Model: Aspect, 2006g). The Design Model was updated based on the model developed for the Quendall Site, and to incorporate chemical and hydrogeologic data collected after PAZ installation (Anchor and Aspect, 2010). The Design Model used groundwater conditions before PAZ installation to predict the maximum westerly extent of arsenic in groundwater above the screening level.

[22] The MODFLOW/MT3D model is also used in the FS portion of this report to evaluate restoration time frame; see Section 10.

Excerpts from previous reports describing model setup, calibration, and results are provided in Appendix K.

The maximum westerly plume extent was based on modeling performed during the PAZ design, using data collected prior to PAZ installation to determine initial conditions and running the model for 15 years to allow the dispersive edges of the plume to develop. This model is described in Appendix A from the "Engineering Design Report" (Aspect, 2006g), which is included in Appendix K of this report for reference. The maximum westerly extent of arsenic exceeding the screening level[23] was predicted to be 90 feet offshore. Based on data from the 2018 Data Gaps Investigation, the extent of arsenic exceeding the screening level is less than 80 feet west of the shoreline, suggesting that the model estimates are conservative (Aspect, 2018).

7.1.1.2 Sediment Attenuation/Transport Evaluation

For the Quendall RI (Anchor and Aspect, 2012), a combination of detailed sampling and analysis and application of a peer-reviewed one-dimensional contaminant transport model (UT Model) was used to characterize physical mixing processes occurring within 4 feet of the lake bed, and refine the CSM of nearshore groundwater discharge into Lake Washington.

Based on this calibration range developed for the Quendall Site, the UT Model was then used to simulate arsenic transport at the Site. The only model inputs that changed when it was used to calculate arsenic concentrations were the chemical-specific mass transport coefficients for arsenic (diffusivity in water and K_d). Based on collocated analyses of surface sediment arsenic and porewater arsenic concentration at the Site, the average Log-K_d of 3.6 was applied to the model (this value is also within the mid-range of literature values of sediment arsenic K_d). Model assumptions, development, and calibration were summarized in the Sediment Data Gaps Evaluation (Anchor and Aspect, 2010), which is provided in Appendix J for reference.

Even under worst-case maximum transient groundwater arsenic concentrations of up to 1,200 µg/L[24] and under the range of Site-specific seepage rates, sedimentation rates, boundary layer mass transfer coefficients and dispersivity values summarized above, the maximum surface sediment (0 to 10 cm average) porewater concentrations predicted by the UT Model are less than 5 µg/L. This is well below the Site-specific natural background groundwater screening level of 16 µg/L. The available surface sediment porewater data collected at the Site are consistent with this prediction.

The UT Model predicts maximum surface sediment arsenic concentrations less than 14 mg/kg, even under worst-case maximum transient groundwater arsenic concentrations of up to 1,200 µg/L. Current conditions in the primary area of discharge of the arsenic plume, including current arsenic concentrations in sediment, porewater, and groundwater, are shown on Figure 7-3. Elevated arsenic concentrations in sediment were detected in the general area of historical greatest arsenic groundwater concentrations along the

[23] The screening level when the model was run was 20 µg/L. The current screening level is 16 µg/L; however, this is not expected to significantly change the conclusions.
[24] Based on historical well point data.

shoreline of the Quendall Property, but only exceeded the sediment screening level in one sample. The surface-area weighted average concentration (SWAC) of arsenic in surface sediments within the estimated discharge area of the groundwater plume is 11.6 mg/kg[25]. Based on the UT Model, the predominant mechanisms of arsenic attenuation along the groundwater-to-surface water/sediment pathway include net sedimentation of clean sediments onto the Site surface, sediment porewater exchange with Lake Washington, and bioturbation of surface sediments by benthic infauna.

7.2 Exposure Pathways Assessment

Interim actions have removed 26,000 cubic yards of wood debris-contaminated sediments, 54,000 tons of arsenic-contaminated soil, 160 tons of PCP-contaminated soil, 463 tons of TPH-contaminated soil, and 15,700,000 gallons of arsenic-contaminated groundwater. Treatment of arsenic-contaminated groundwater *in situ* by the PAZ is ongoing.

At this time, Site-related COCs exceeding screening levels are as follows:

- **Soil:** arsenic
- **Groundwater:** arsenic
- **Sediment:** arsenic, wood debris/TOC

In sediment, collocated non-Site-related COCs exceeding screening levels are lead, selenium, and cPAHs.

Potential migration of arsenic from upland groundwater to surface water is controlled by the PAZ and natural attenuation processes, and concentrations both upgradient and downgradient of the PAZ are declining. Arsenic concentrations in sediment porewater are below the screening level.

Soil containing concentrations of arsenic above the screening level are at depths greater than 15 feet bgs, below the standard POC for direct contact. Therefore, the direct contact pathway was not identified as a potential exposure pathway for contamination remaining at the Site. A summary of the CSM prior to the remedial actions, including contaminant migration and potential exposure pathways, is illustrated on Figure 7-2).

Potential direct exposure pathways identified in Section 5.2 for COCs remaining at the Site above screening levels after interim remedial actions include the following:

- **Groundwater: Direct human exposure via ingestion**. Exceedances of arsenic in groundwater remain at the Site. However, area residents use municipal water supplies and Site groundwater is not used for drinking purposes (see Section 3.3.2.2). In addition, restrictive environmental covenants have been placed on the

[25] One sample within the plume discharge area—BM-SED-16, with an arsenic concentration of 34 mg/kg—exceeded the sediment screening level; however, a bioassay at this location did not show any benthic toxicity. The average concentration within this area was calculated using the maximum of the three samples collected at BM-SED-16. Further evaluation of arsenic risk in sediment is provided in Section 7.3.

Barbee Property and a portion of the Quendall Property that includes the Site. These covenants prohibit the use of groundwater as a potable drinking water source and prohibits any activities that could disturb contaminated groundwater. Therefore, this exposure pathway is not currently complete.

In addition, indirect potential exposure pathways resulting from intermedia transport include:

- The soil-to-groundwater migration pathway. Arsenic exceedances in soil present an ongoing source of arsenic to groundwater.
- The groundwater-to-surface water migration pathway. Because of the proximity of the arsenic plume to Lake Washington, arsenic contamination in groundwater represents a potential migration threat to surface water. However, arsenic migration from the Barbee Property is currently controlled by the PAZ, and arsenic concentrations in sediment porewater are below the Site-specific natural background groundwater screening level.

Although arsenic concentrations in sediment porewater are below surface water screening levels, this condition may in part depend on the continued treatment of arsenic-impacted groundwater by the PAZ, at least until the concentrations have attenuated. Potential exposure pathways for groundwater contamination migrating to surface water include:

- Ecological exposure to aquatic organisms
- Human exposure via ingestion of water and aquatic organisms

Although potential exposure pathways in the upland area are currently controlled, arsenic concentrations exceed applicable screening levels in soil and groundwater and still represent potential future exposure pathways unless the existing controls are maintained, or additional measures are implemented. Potential remedial actions to address arsenic exceedances in soil and groundwater will be evaluated in the FS. Potential exposure pathways for COCs in sediment include:

- Ecological – benthic community exposure
- Ecological – wildlife exposure to bioaccumulative COCs in sediment via fish and shellfish consumption
- Human health – direct contact with sediment
- Human health – exposure of consumers to bioaccumulative COCs in sediment via fish and shellfish consumption

7.3 Sediment Risk Screening

A risk evaluation was conducted for benthic, human health direct contact, and human and ecological bioaccumulation to evaluate if COCs cause adverse risks at the Site based on current Site data.

Benthic risks. As described in Section 6.2, benthic risks were evaluated on a point-by-point basis to both physical and chemical SCO criteria and bioassay test results. Results are provided in Table 7-1 and summarized below in Section 7.3.1.

Human health direct contact and bioaccumulation risks. SWACs were calculated for surface sediment within the Sediment Boundary using interpolations of the bioaccumulative COCs (arsenic, cPAHs, lead, and selenium)[26]. The specific steps for SWAC estimates were as follows:

- Interpolations were performed using IDW or Theissen polygon methods (Section 6.2.3.3).
- SWACs were calculated by spatially averaging the interpolated data for the grid cells or polygons[27] within the defined areas of interest.

SWACs were calculated at two spatial scales showed on Figure 7-4 representing different exposure pathways:

- **Site-wide bioaccumulative SWACs** (based on the top 10 cm of sediment) for Site-related (arsenic) and non-Site-related (cPAHs, lead, and selenium) COCs were compared to human health and ecological seafood ingestion (bioaccumulative) SCO screening levels; CSL screening levels were only considered for constituents with SCO exceedances (Table 7-2).
- **Nearshore SWACs** (based on the top 45 cm of sediment) for arsenic and cPAHs were compared to human health direct contact (beach play) SMS screening levels or natural background (Table 7-3).

The nearshore area was delineated separately to evaluate nearshore beach play risks in the RI. It is about a 20-foot-wide swath of bank area accessible to humans, and about 920 linear feet and 16,420 square feet (0.38 acres). Due to its limited sample size, the Theissen polygon method was used to estimate the SWAC for arsenic and cPAHs. Polygons were established around each sampling location, halfway between adjacent sampling locations, and the concentration value was weighted by the area it represented. The outer boundary (20 feet from the shoreline) for the Theissen polygons was established based on the 2022 shoreline evaluation survey results, as summarized in Section 3.2.5. It is assumed that the beach area extends from the concrete dock, located in the center of the Property shoreline area, north to the Quendall Property.

The current conditions dataset was used for IDW interpolation Site-wide and Theissen polygons (nearshore only). As a necessary step in GIS, the IDW interpolation extends beyond the Sediment Boundary, but the SWAC is only calculated for the area within the Sediment Boundary.

The human health direct contact, tribal clamming, and net-fishing pathways were not considered in the risk assessment because the sediment type (primarily gravel) along the shoreline and the lack of nearshore beach area suggest incomplete pathways for those receptors.

[26] Data used in the risk screening are those historical (post-dredging) and current data located inside of the Sediment Boundary but outside of the 2002 dredging footprint.
[27] Grid cells from the interpolated surface were considered to be in an area of interest if more than 50 percent of the grid cell fell within the area of interest.

7.3.1 Summary of Current Sediment Risks

A summary of current benthic, human and ecological bioaccumulation, and human health direct contact risks is as follows:

- **Benthic:** There are no current Site risks to benthic organisms (Table 7-1). Arsenic exceeded the benthic SCO at one station in 2021 and 2022, and TOC and/or wood debris remaining after the remedial actions exceeded the Site-specific screening levels at two locations within the Sediment Boundary. However, all bioassay testing (current and historical) showed no significant toxicity associated with these COCs. These bioassay results override the exceedance of the physical and chemical SCO criteria, indicating there are no benthic risks.
- **Human health and ecological seafood ingestion (Site-wide bioaccumulative):** None of the Site-related (arsenic) or non-Site-related (lead, selenium) SWACs exceeded the bioaccumulative SCO, except cPAHs (Table 7-2). However, the cPAH SWAC was below the bioaccumulative CSL.
- **Human health direct contact (nearshore beach play):** The arsenic and cPAH nearshore SWACs, calculated over the 0.37-acre nearshore exposure area, were below the relevant screening levels (Table 7-3). Therefore, there are no significant current human health direct contact risks associated with arsenic and cPAHs.

7.3.2 Temporal Comparison of COC SWACs

Table 7-4 shows a comparison of the Site-wide COC SWACs based on the historical dataset (pre-dredging) versus SWACs based on the current conditions dataset (post-dredging). Before and after the 2002 dredging, the arsenic SWAC was below the benthic and bioaccumulative SCOs within the Sediment Boundary. The SWACs for lead, selenium, and total cPAH TEQ exceeded either the bioaccumulative SCO or CSL before dredging but decreased and were below the bioaccumulative SCO (lead) or CSL (selenium, total cPAH TEQ) after dredging (under current conditions). TOC and wood debris SWACs were above their respective benthic SCOs pre-dredging but decreased and were below the benthic SCOs after dredging.

7.3.3 Summary of Sediment Risk Screening

In summary, there is no current Site sediment risk as summarized in Table 7-5, and there are no remaining RI data gaps for Site sediment. The prior dredging/removal actions and shoreline habitat restoration project have reduced Site risks for arsenic, lead, selenium, TOC, and wood debris to acceptable levels.

8 Cleanup Requirements

This section is the beginning of the Feasibility Study (FS) and identifies the applicable or relevant and appropriate requirements (ARARs), remedial action objectives (RAOs), and preliminary cleanup levels used as the basis for developing and evaluating remedial alternatives, as follows:

- Section 8.1 identifies the ARARs that are most likely to have an influence on the identification and assembly of remedial alternatives to be evaluated in this FS.
- Section 8.2 discusses the preliminary cleanup standards and identifies the RAOs that describe what the proposed remedy is expected to accomplish.
- Section 8.3 establishes remediation levels to identify concentrations of hazardous substances at which different cleanup action components will be used.
- Section 8.4 identifies the areas of the Site that are targeted for remedial action.

8.1 Applicable or Relevant and Appropriate Requirements (ARARs)

Pursuant to authority granted by MTCA (Chapter 70A.305 RCW), Ecology adopted cleanup standards for remedial actions at sites where hazardous substances are present. The MTCA regulations define processes for identifying, investigating, and cleaning up these sites and set groundwater, soil, surface water, and air cleanup standards (Chapter 173-340 WAC.) The Washington State SMS (Chapter 173-204 WAC) defines the process for evaluating and cleaning up contaminated sediments.

Other potentially applicable regulatory requirements include:

- The federal Safe Drinking Water Act (42 United States Code [USC] 300f; 40 Code of Federal Regulations [CFR] Part 141)
- The federal Clean Water Act (33 USC Section 1251; 40 CFR Part 230)
- National Pollutant Discharge Elimination System Regulations (NPDES) (40 CFR 122; Chapter 90.48 RCW; Chapter 173-226 WAC)
- The Washington Water Pollution Control Act (Chapter 90.48 RCW; Chapter 173-201A WAC; Chapter 173-200 WAC)
- Washington State Water Quality Criteria for Aquatic Life and Human Health (173-201A WAC)
- Washington Toxics Rule (40 CFR 131.45)
- Washington State Department of Health Group A Public Water Supply Regulations (246-290 WAC)

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and All Appropriate Inquiries (AAI) (40 Code of Federal Regulations [CFR] Part 312)
- The Resource and Recovery Act (RCRA)
- Fish and Wildlife Coordination Act (16 USC 662&663; 40 CFR 6.302g)
- Endangered Species Act (16 USC 1531 et seq.; 50 CFR Part 17)
- River and Harbors Act (33 USC 401 et seq.; 33 CFR 320-330)
- Solid Waste Disposal Act (42 USC 6901-6917; 40 CFR 257-258)
- Federal and State Clean Air Acts (42 USC 7401 et seq.; 40 CFR 50; RCW 70.94; WAC 173-400, 403)
- The State Environmental Policy Act (SEPA) (RCW 43.21C; WAC 197-11)
- The Occupational Safety and Health Act (OSHA) (29 CFR 1910)
- General Occupational Health Standards (Chapter 296-62 WAC)
- Safety Standards for Construction Work (Chapter 296-155 WAC)
- Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC)
- City of Renton Shoreline Master Program (references Chapter 90.58 RCW; Chapter 173-27 WAC; City of Renton Ordinance #5633; Critical Area Regulations (RMC 4-3-050)
- City of Renton Municipal Code (RMC)

In addition, local municipalities may require permits for certain Site activities (e.g., King County and City of Renton permits for sewer discharges, City of Renton grading and shoreline permits, and City of Renton permits for street use.)

8.2 Remedial Action Objectives and Preliminary Cleanup Standards

Remedial action objectives (RAOs) for the Site are intended to comply with ARARs and protect human health and the environment. They are narrative statements about the goals of the cleanup. Cleanup standards under MTCA include a preliminary cleanup level (a concentration) for each COC and a POC (depth of exposure) at which the cleanup levels apply. The ultimate objective of Site remediation is to achieve cleanup standards within a reasonable restoration time frame.

Arsenic has been identified in soil and groundwater above potential cleanup levels at the Site. Potential exposure pathways are:

- **Groundwater**: Direct human exposure via ingestion

Under current Site conditions, contaminant concentrations in sediment porewater are below potential cleanup levels. However, this condition may, in part, depend on the

continued treatment of arsenic-contaminated groundwater by the PAZ. Potential exposure pathways for groundwater contamination migrating to surface water include:

- Ecological exposure to aquatic organisms
- Human exposure via ingestion of water and aquatic organisms

Based on these potential exposure pathways, the following RAOs were identified for the Site:

- Prevent direct contact to and ingestion of contaminated groundwater.
- Prevent migration of contaminated groundwater to Lake Washington.

Site COCs were identified in Section 5.2. Cleanup standards for soil, groundwater, and sediment with the Site boundary are described below.

8.2.1 Soil

Preliminary cleanup levels for soil consider protection of direct contact, protection of groundwater as drinking water, and protection of surface water and sediment. The preliminary cleanup levels are based on the lowest screening level of potentially complete pathways for each COC, adjusted to natural background or PQL, whichever is higher, if higher than the lowest screening level.

Preliminary Cleanup Levels. Preliminary cleanup levels for soil COCs are as follows (Table 5-6):

- **Arsenic:** 20 mg/kg, based on the MTCA Method A Cleanup Level for Unrestricted Use (Natural Background)
- **Zinc:** 85 mg/kg, based on natural background
- **PCP:** 2.5 mg/kg, based on direct contact
- **Sum of TPH-D and TPH-O**: 2,000 mg/kg, based on the MTCA Method A Cleanup Level for Unrestricted Use

Point of Compliance. The standard points of compliance for soil are as follows:

- **Soil *for protection of direct contact*.** From ground surface to a depth of 15 feet.
- **Soil *for protection of groundwater***. Throughout the Site.

Remedies that involve containment of hazardous substances may not meet cleanup levels for soil at the standard POC but may be determined by Ecology to comply with cleanup standards provided: (1) the selected remedy is permanent to the maximum extent practicable, (2) the cleanup action is protective of human health and the environment, and (3) appropriate institutional controls (ICs), including compliance monitoring and periodic reviews, are implemented (WAC 173-340-740(6)(f)).

8.2.2 Groundwater

Preliminary cleanup levels for groundwater consider protection of drinking water and protection of surface water and sediment. The preliminary cleanup levels are based on the

lowest screening level of potentially complete pathways for each COC, adjusted to natural background or PQL, whichever is higher, if higher than the lowest screening level.

Preliminary Cleanup Levels. Preliminary cleanup levels for groundwater COCs are as follows:

- **Arsenic:** 16 µg/L, based on Site-specific natural background (see Section 5.1 and Appendix G)
- **Zinc:** 100 µg/L, based on protection of surface water
- **TPH-D:** 500 µg/L, based on the MTCA Method A Cleanup Level for Unrestricted Use

Point of Compliance. The standard POC for groundwater is as follows:

- Extending vertically from the uppermost level of the saturated zone to the lowest depth potentially affected.

MTCA allows Ecology to approve a conditional POC for groundwater if it is not possible to achieve cleanup levels at the standard POC within a reasonable restoration time frame. Generally, the conditional POC is set at a location not to exceed the property boundary (WAC 173-340-720(8)(c)). However, at properties abutting or near surface water, a POC may be set within the surface water body as close as technically possible to the point or points where groundwater flows into the surface water under certain conditions. These conditions, and their applicability to the Site, are as follows:

- *Contaminated groundwater enters the surface water and will continue to enter the surface water even after implementation of the selected cleanup action.* This condition is met at the Site.[28]
- *Demonstrate it is not practicable to achieve cleanup levels at the standard POC within a reasonable restoration time frame.* Based on groundwater modeling, as described in Section 8.2.2.1 below, even the most permanent alternative that can practicably be implemented has a projected restoration time frame of greater than 100 years.
- *Use of a mixing zone to demonstrate compliance with surface water cleanup levels shall not be allowed.* The evaluation of compliance for the selected remedy will not include a mixing zone.
- *Treat groundwater discharges with all known, available, and reasonable methods (AKART) of treatment.* An AKART analysis of potential treatment methods is presented in Section 11. Only alternatives that satisfy the AKART analysis are retained for consideration.

[28] This requirement is still met when groundwater at the point of discharge is below cleanup levels, as clarified in Ecology guidance for developing conditional points of compliance (Ecology 2017): "Note that this provision does not define "contaminated ground water" as meaning an exceedance of cleanup levels."

- *Groundwater discharges must not result in violations of sediment quality values.* This condition is met at the Site, as described in Section 7.1.1.2.
- *Conduct groundwater and surface water monitoring.* The selected remedy will include a compliance monitoring plan, which will be provided in the draft CAP.
- *Provide notice to the natural resource trustees, the DNR, and the USACE.* This notice would be provided by Ecology concurrent with review of this RI/FS and the draft Cleanup Action Plan.

For a conditional POC to be approved, the affected property owners between the source of contamination and the surface water body must agree in writing to the use of the conditional POC. For the Site, this agreement has been documented by the Quendall Terminals environmental covenant. The proposed conditional POC for groundwater at the Site is the bottom of the bioactive zone, 10 cm bml in Lake Washington.

8.2.2.1 Restoration Time Frame at the Standard Point of Compliance

As described in Section 7.1.1 and documented in Appendix K, a MODFLOW/MT3D groundwater- and contaminant-transport model (Groundwater Model) was developed to simulate arsenic fate and transport at the Site. Upgradient of the PAZ, residual arsenic is being flushed out by clean groundwater flowing onto the Site. Downgradient of the PAZ, residual arsenic is being flushed out by clean groundwater treated by the PAZ. The Groundwater Model was used to predict the impact of flushing and attenuation on the groundwater plume for the five remedial alternatives.

In annual performance monitoring reports, the Groundwater Model was used to predict the length of time until attenuation processes restore groundwater to below the screening level at selected monitoring locations. In the 2022 Annual Report (Aspect, 2023), predictions ranged up to 36 years (at WP-8). Concentration trends at key monitoring points (WP-1A, WP-8, CMW-4S, and CMW-5) generally matched the pattern predicted by the Groundwater Model, but the empirical data trend for time to reach the screening level was longer at some points and shorter at others. This variability was attributed to a combination of Site heterogeneity and model simplifying assumptions, including uniform initial concentration, homogeneous soils, and equilibrium sorption.

For this RI/FS, the maximum time to achieve preliminary cleanup levels in groundwater at certain locations is useful for performing an AKART analysis for setting a conditional POC. For this purpose, the Groundwater Model was modified (Modified Groundwater Model) with more conservative assumptions to better reflect conditions observed at monitoring locations that exhibit a slower attenuation rate. Modifications are described in Appendix K, and include the following:

- Incorporating groundwater conditions north of the Site from the model used for the Quendall Site.
- Setting the arsenic K_d to 29 L/kg (see Section 7.1.1).
- Varying initial condition arsenic concentrations within the arsenic plume area by depth based on Site data.

The conservative assumption of K_d results in a model that better matches empirical data at some locations, but overpredicts restoration time frame at others. The Modified Groundwater Model also accurately predicts a temporary increase in groundwater concentrations at well CMW-6, which is consistent with empirical data, although the predicted duration of the effect does not match as well (see Appendix K).

To consistently estimate relative time frames for the purpose of comparing remedial alternatives, model predictions were adjusted to match empirical data at three locations:

- WP-8, representing the location downgradient of the PAZ and close to the shoreline on the Quendall Property that is expected to take the longest to achieve screening levels based on their location relative to the PAZ and remaining arsenic concentrations.
- EW-2 and EW-8, which contain the highest remaining arsenic concentrations detected upgradient of the PAZ.

The model was also used to estimate the time frame to achieve the preliminary cleanup level at CMW-1, located just south of the PAZ along the shoreline. Concentrations at this location increased after PAZ installation and have recently stabilized but have not yet exhibited a downward trend that can be matched to model predictions. Under current conditions (which include continued PAZ treatment and natural attenuation), the predicted time frames to achieve the preliminary cleanup level at these locations are approximately 80 years at WP-8, 90 years at CMW-01, 110 years at EW-8, and 220 years at EW-1.

As described in Appendix K, attenuation time frames were estimated for each of the five remedial alternatives described in Section 10 by applying assumptions for treatment effects based on proposed technology applications. Results are summarized in Table 8-1.

8.2.3 Sediment Cleanup Standards

Cleanup standards include a numeric cleanup level and point of compliance. Preliminary cleanup levels for sediment are established for Site-related COCs. For non-Site-related sediment COCs, screening levels are applied (cleanup levels are not developed but the same screening process is applied, see Section 8.2.4).

As described in the SMS, the preliminary sediment cleanup levels are set as the highest of the following three levels:

- The lowest risk-based concentration protective of benthic organisms, human health (direct contact, bioaccumulation, 10^{-5} risk), or ecological receptors (bioaccumulation)
- Natural background levels
- PQLs

This concentration is called the SCO. Sediment cleanup levels are initially established at the SCO and may be adjusted up to, but no higher than the CSL. The CSL is established as the highest of one of the following:

- The lowest risk-based concentration protective of benthic organisms, human health (direct contact, bioaccumulation, 10^{-5} risk), or ecological receptors (bioaccumulation
- Regional background, if it has been established
- PQLs

Adjustment of the SCO to the CSL can occur based on an evaluation of technical possibility and net adverse environmental impact (WAC 173-204-560[2][a][ii]). The SCUM guidance (Ecology, 2021) details how to determine whether it is technically possible to attain the SCO based on site-specific factors, including, but not limited to, the ability to:

- Achieve the SCO using available cleanup technologies, and
- Maintain the SCO after cleanup construction

8.2.3.1 Preliminary Cleanup Levels for Site-Related COCs

The preliminary cleanup levels for sediment Site-related COCs are as follows:

- **Arsenic:** 14 mg/kg (as points, benthic SCO) and 11 mg/kg (as SWACs, bioaccumulative SCO)
- **Wood debris:** 50 percent (as points, benthic site-specific)
- **TOC:** 13.5 percent (as points, benthic site-specific)

These cleanup levels consider all applicable exposure pathways and receptors. No cleanup level is necessary for the protection of benthic organisms because all Site data were below the benthic SCO.

8.2.3.2 Points of Compliance

The points of compliance (POCs) for sediment address multiple exposure pathways and receptors. The Site-wide POC depth is 10 cm bml for all Site-wide exposure pathways (benthic, bioaccumulative, human health direct contact net-fishing). The POC for nearshore sediments is the top 45 cm depth bml (beach play). The POC is also a spatial component. The POC is on a point basis for benthic protection and a SWAC basis for protection of human and ecological health. The cleanup levels must be met at these depths after the restoration time period (typically, 10 years after cleanup is allowable in the SMS).

8.2.4 Protectiveness of Screening Levels for Collocated Non-Site-related COCs

Cleanup levels have not been developed for non-Site-related COCs (cPAHs, lead, selenium) but any remedial action must ensure protectiveness and compliance with ARARs for all COCs present at the Site and collocated with Site-related COCs. The sediment screening levels used to evaluate non-Site-related COCs are as follows:

- **cPAH TEQ:** 21 µg/kg (as SWACs, bioaccumulative SCO)
- **Lead:** 21 mg/kg (as SWACs, bioaccumulative SCO)

- **Selenium:** 2 mg/kg (as SWACs, ambient Lake Washington)

To determine if the screening levels could be maintained after cleanup, ambient Lake Washington surface sediment data were reviewed. The technical possibility of maintaining the screening levels was evaluated against these data (filtered to exclude data along the shoreline) because they represent numerous ongoing and diffuse sources that are not under the authority or responsibility of potentially liable persons (PLPs) and cannot be reliably contained or managed.

This is particularly true for cPAHs in an urban city, such as Seattle. There is a correlation between increasing cPAH concentrations in sediment with increasing urbanization, likely from increased street runoff from parking lots, pavement sealant, and traffic emissions (USGS, 2000; Mauro et al., 2006; Van Metre et al., 2008). Statistical comparison of the ambient Lake Washington and Site cPAH concentration in surface sediment showed no significant differences between the two datasets (see Appendix L). Ambient concentrations of recent surface sediment samples collected in Lake Washington (shoreline areas were excluded) were significantly higher than the bioaccumulative SCO, based on natural background (21 µg/kg). Mean ambient concentrations (196 to 259 µg/kg) were similar to the regional background cPAH concentration (210 µg/kg) calculated by Ecology as the bioaccumulative CSL. These ambient concentrations represent the practicable limitation for cleanup. These results suggest the SCO could not be maintained after cleanup because of higher cPAHs in surrounding areas. Specifically, if the Site was cleaned up to the SCO, then over time, the cPAHs in sediment within the boundary would equilibrate to concentrations above the SCO. Thus, due to technical impracticality, the preliminary sediment cleanup level for cPAHs is adjusted upward from the bioaccumulative SCO to the bioaccumulative CSL (210 µg/kg).

A similar analysis was conducted for selenium, another bioaccumulative chemical. In the absence of a natural background concentration for selenium, the screening level is set as the available PQL. However, the PQL for selenium ranges between 0.1 and 1 mg/kg and is well below measured concentrations found within the Sediment Boundary. Therefore, a dataset of selenium concentrations in Lake Washington surface sediment was compiled to evaluate whether the SCO could be maintained after cleanup. Descriptive statistics were calculated (see Appendix H) and the 90th percentile of ambient Lake Washington selenium concentrations was determined (2 mg/kg). Similar to cPAH concentrations, selenium concentrations at the Site will equilibrate to those within the surrounding area, and the screening/compliance level cannot be maintained if set at the PQL. Thus, the screening level for selenium was adjusted upward to the 90th percentile of ambient Lake Washington selenium concentrations (2 mg/kg).

8.3 Remediation Levels

MTCA recognizes that a cleanup action may involve a combination of cleanup action components and provides that remediation levels (RELs) may be used to identify concentrations (or other methods of identification) of hazardous substances at which different cleanup action components will be used (WAC 173-340-355). RELs are concentration thresholds above which particular cleanup action components may be applied and are usually specific to a particular remediation technology.

This FS considers a range of alternatives that provide differing levels of active treatment. For the purposes of this FS, an REL was identified for arsenic in groundwater for some alternatives that target specific hotspots for active treatment. The REL was established based on being protective of the groundwater-to-surface water and groundwater-to-sediment pathways (i.e., a value that would not result in sediment accumulation above the bioaccumulative SCO of 11 mg/kg or concentrations in groundwater above the Site-specific background concentration of 16 µg/L at the bottom of the bioactive zone). The concentration protective of these pathways will vary based on location, as groundwater in deeper zones or farther away from Lake Washington will attenuate more. To be conservative, the REL was identified to be protective of these pathways in shallow groundwater at the shoreline.

The REL was conservatively identified as 150 µg/L, which corresponds to the concentration protective of benthic communities in Lake Washington. This value is protective of surface water based on existing shallow shoreline groundwater and sediment porewater concentrations, and is protective of sediment based on the sediment modeling described in Section 7.1.1.2 and based on Ecology's PCUL workbook value for protection of sediment at freshwater sites (320 µg/L; see Appendix F). Achieving this REL with active treatment is more practicable than achieving cleanup levels with active treatment, and achieving the REL would reduce the potential for needing contingency actions that may be triggered based on compliance monitoring data. Furthermore, protectiveness for the benthic exposure pathway would be measured on a point-by-point basis, so any exceedance of the benthic protection level could trigger additional action. Conversely, protectiveness for the human health pathway would be measured by calculating SWACs, which are less sensitive to a single point exceedance. Therefore, achieving concentrations in groundwater that are protective of benthic communities further reduces risk of future exceedances in the bioactive zone.

8.4 Areas Requiring Remedial Action

Based on the nature and extent of contamination at the Site described in Section 6, and the preliminary CSM discussed in Section 7, this section describes the estimated extents of contaminated soil, groundwater, and sediment that exceed preliminary cleanup levels and potential remediation levels under current conditions.

Soil and Groundwater. Based on the exposure pathway assessment (Section 7.2), concentrations of arsenic in soil and groundwater do not meet preliminary cleanup standards and require further remedial action. The Site-wide areas requiring remedial action are shown on Figure 8-1a. The area of the Quendall Property with the highest arsenic concentrations downgradient of the PAZ, which will be the focus of the majority of the active treatment components, is shown on Figure 8-1b.

Sediment. Multiple lines of evidence have shown that concentrations of Site-related COCs and collocated non-Site-related COCs in sediment currently meet cleanup requirements and do not require further remediation. Risk evaluations for benthic and human health receptors showed that the current sediment conditions are not posing risks (Section 6.2.3.2 and Section 7.3). The interim remedial action conducted in 1999 and 2002, and the habitat restoration conducted in 2005, constitute the final sediment remedy

under the SMS; Site-related COCs have been addressed by these remedial actions and non-Site-related COCs currently meet applicable screening levels. Thus, no further remedial actions are required.

9 Identification and Screening of Remedial Technologies

MTCA establishes a required framework for the selection of cleanup alternatives under WAC 173-340-360 and -370. The framework's criteria emphasize the adoption of alternatives that are permanent to the extent practicable, are protective of human health and the environment, are verifiable through monitoring, and achieve cleanup objectives in a reasonable time frame. Where multiple cleanup actions are considered, MTCA requires that a disproportionate cost analysis (DCA) be performed. The DCA is used to determine whether a cleanup action alternative uses permanent solutions to the maximum extent practicable and requires the comparison of the costs and benefits of the competing remedial alternatives.

Potential cleanup actions evaluated for the Site include different combinations of remedial technologies to address the potential exposure pathways and feasibility constraints. Individual remediation technologies are screened relative to each other based on their potential effectiveness, implementability, and cost. As described in Section 8.4, further remediation is needed to address arsenic in groundwater. Arsenic in soil is an ongoing source of arsenic to groundwater. Therefore, the retained remedial technologies address groundwater contamination, either directly through groundwater treatment or indirectly through soil treatment that reduces arsenic leaching.

This section identifies and screens remedial technologies that may be effective cleanup action components for the Site. The remedial technologies that are retained from this screening process are used to develop the cleanup alternatives described in Section 10. The evaluation of cleanup alternatives consistent with the MTCA criteria are presented in Section 11.

The screening evaluation is provided in Table 9-1. Applicable remediation technologies evaluated for the Site and the results of the screening evaluation are described in Section 9.1. The remedial technologies retained for further evaluation are as follows:

- ICs
- Monitored Natural Attenuation (MNA)
- *In Situ* Chemical Stabilization
- Groundwater Extraction and Treatment (Pump-and-Treat)
- *In Situ* Flushing
- Containment Wall
- *In Situ* Passive Attenuation Zone (PAZ)
- *In Situ* Solidification/Stabilization (ISS)
- Soil Excavation and Disposal

- Soil Excavation and *Ex Situ* Solidification/Stabilization

9.1 Technology Screening

Potential applicable remedial technologies for addressing arsenic in Site soil and groundwater were identified as follows:

- **ICs.** Measures to prevent exposure to arsenic at the Site, such as capping, vapor barriers, and deed restrictions.
- **MNA.** Monitoring the removal of arsenic from groundwater by natural processes, such as sorption.
- ***In Situ* Chemical Stabilization.** Injecting chemical additives into groundwater, to react with and immobilize arsenic.
- **Groundwater Extraction and Treatment (Pump-and-Treat).** Extracting groundwater from wells, treating to remove arsenic, and discharging treated groundwater to the sanitary sewer.
- ***In Situ* Flushing.** Groundwater pump-and-treat, combined with reinjection of treated groundwater into the affected area, to mobilize residual arsenic and enhance removal.
- **Containment Wall.** Installing an impermeable containment barrier (e.g., a slurry wall) around impacted groundwater to prevent contaminant migration.
- ***In Situ* Passive Attenuation Zone (PAZ).** Installing a permeable wall of reactive material in the aquifer that removes contaminants from groundwater flowing through the wall.
- ***In Situ* Solidification/Stabilization (ISS).** Mixing *in situ* chemical additives (e.g., cement) into the soil to immobilize arsenic in soil and groundwater.
- **Soil Excavation and Disposal.** Removal of contaminated soil, followed by off-Site disposal.
- **Soil Excavation and *Ex Situ* Solidification/Stabilization.** Removal of contaminated soil, followed by solidification using cement, and replacement as backfill at the Site.

The following technologies were not retained for this evaluation, including:

- ***In Situ* Flushing** was not retained because of the difficulty in ensuring containment of injected materials given heterogeneous Site soils and proximity to the lake.
- **Containment Wall** was not retained because to be effective it would need to extend onto the Property where the high density of buildings and utilities would prevent implementation
- **Soil Excavation and Disposal** was not retained because the cost is higher and the implementability lower than ISS, while the effectiveness would be similar.

- **Soil Excavation and *Ex Situ* Solidification/Stabilization** was not retained because the cost is higher and the implementability lower than ISS.

Technologies retained for this evaluation are as follows:

- ICs
- MNA
- *In Situ* Chemical Stabilization
- In Situ PAZ
- ISS
- Pump-and-Treat

Pump-and-Treat has previously been implemented at the Site, but it has not reduced, and may increase, the restoration time frame (Aspect, 2011). However, other options for treatment on the Barbee Property have limited implementability due to the housing development. Therefore, Pump-and-Treat has been retained for evaluating the potential benefit of treatment on the Barbee Property and as a contingency measure for hydraulic containment of the arsenic plume, if needed.

10 Description of Alternatives

In this section, the remedial technologies retained in Section 9 are assembled into five remedial alternatives for the Site. These alternatives incorporate a range of potential approaches, including differing levels of passive and active treatment. The majority of active treatment components target the area of the Quendall Property with the highest arsenic concentrations downgradient of the PAZ. Arsenic concentrations on the Barbee Property exceed the preliminary cleanup level, but the majority of the plume is captured and treated by the PAZ, and the dense development footprints of structures and utilities limit accessibility for implementation of additional active remedial actions. All alternatives include maintaining the PAZ, and all incorporate operation of the existing pump-and-treat system located in the rights-of-way as a component of the alternatives or contingency action.

The five alternatives consist of:

- Alternative 1 – MNA and ICs
- Alternative 2 – *In Situ* Chemical Reduction of the Arsenic Hot Spot on Quendall Property, MNA and ICs
- Alternative 3 – PAZ Extension on Quendall Property, MNA and ICs
- Alternative 4 – ISS of the Shallow Arsenic Plume on Quendall Property, MNA and ICs
- Alternative 5 – ISS of the Shallow and Deep Arsenic Plumes on Quendall Property, Pump-and-Treat on the Barbee Property, MNA and ICs

Elements common to all alternatives are described in Section 10.1. The remedial alternatives are further described in Sections 10.2 through 10.6, including conceptual design, implementation strategies, and estimated implementation cost. Cost estimates are FS-level accuracy (+50/-30 percent) and are calculated as net present value with a discount rate of 2.5 percent (OMB, 2023). Cost estimate details are presented in Appendix M.

10.1 Common Elements

This section describes considerations and assumptions that are common to all alternatives. Completed remedial actions and common remedial elements of the alternatives are shown on Figure 10-1.

10.1.1 Completed Remedial Actions

Completed remedial actions are described in Section 4.2 and include the following:

- Removal of 26,000 cubic yards of wood debris-contaminated sediments.
- Removal of 54,125 tons of arsenic- and/or zinc-contaminated soil.
- Removal of 623 tons of TPH- and PCP-impacted soil.

- Installing a 690-foot-long PAZ along the downgradient Barbee Property boundary to treat arsenic in groundwater.
- Installing a pump-and-treat system upgradient of the PAZ to remove additional arsenic mass from groundwater and enhance PAZ performance. The system operated from June 2009 to August 2011 and removed 15,700,000 gallons of groundwater containing an estimated 37 pounds of arsenic.
- Installing a network of monitoring wells and piezometers to evaluate PAZ and pump-and-treat system performance. The monitoring well and piezometer network was installed in August 2007, and the well points were installed near the shoreline in January 2009.

The PAZ continues to treat groundwater and is projected to operate into the foreseeable future. The PAZ was designed for a lifetime of 100 years but is likely to operate longer since that lifetime was conservatively based on a higher arsenic influent concentration than is currently observed.

Costs of the completed remedial actions are not included in the cost estimates for Alternative 1 through 5.

10.1.2 MNA

Arsenic attenuation is naturally occurring at the Site. As described in Section 8.2.2, residual arsenic upgradient of the PAZ is being flushed out by clean groundwater flowing onto the Site. Downgradient of the PAZ, residual arsenic is being flushed out by clean groundwater treated by the PAZ. The Groundwater Model was used as described in Section 8.2.2 to predict the rate of attenuation on the groundwater plume for the five remedial alternatives at different monitoring locations (results summarized in Table 8-1).

MNA consists of periodic groundwater monitoring to confirm continued attenuation of the arsenic plume, and is a component of all five remedial alternatives. Groundwater monitoring will be conducted until cleanup levels are achieved at the shoreline. The existing monitoring network will be utilized, with one additional downgradient well proposed at the shoreline to replace well point sampling locations, which are prone to damage from lake debris and boats. Compliance will be assessed by comparing concentrations at shoreline wells to historical data that were paired with porewater data (after excavation and PAZ installation). If shoreline concentrations remain at or below historical shoreline concentrations, concentrations at the proposed POC will be assumed to be less than cleanup levels. If concentrations increase, porewater concentrations would be re-assessed.

For the purposes of this FS, we have assumed the following monitoring program, consistent with the existing performance monitoring program:

- Sampling existing performance monitoring wells CMW-1, -2S, -2D, -3, -4S, -4D, -5, and -6.
- Sampling proposed performance monitoring well CMW-7.
- Sampling selected Quendall Property wells within the Barbee plume: BH-29A, BH-26B, and BH-31B.

- Sampling extraction wells EW-1 through EW-8.
- Monitoring water levels at wells listed above and at piezometers PZ-1 and PZ-2.

Samples will initially be collected on an annual basis and analyzed for dissolved arsenic.

The sampling frequency and wells to be monitored will be reduced over time in coordination with Ecology as concentrations reach cleanup levels and trends are further established.

For purposes of estimating alternative costs, the following assumptions were made:

- Sampling will be reduced to biennial monitoring at Year 5.
- Sampling will be reduced to only shoreline wells (CMW-1, -2S, -2D, -3, -4S, -4D, and CMW-7) every 5 years (aligned with periodic reviews) at Year 10.
- A monitoring duration of 90 years is assumed for all alternatives based on the projected time to achieve preliminary cleanup levels at the shoreline.
- One year of quarterly monitoring will be conducted at the end of the monitoring period, and monitoring wells would be decommissioned.

10.1.3 ICs

ICs are administrative mechanisms for ensuring the long-term performance of cleanup actions. ICs protect exposure pathways and prevent interference with the remedy. All alternatives include the following ICs for the Site:

- Retaining the existing environmental covenant on the Barbee Property that restricts groundwater use, disturbance of contaminated soil, interference with remedial elements including the PAZ, extraction wells, and monitoring wells, and maintaining the integrity of the pond liner.
- Retaining the existing environmental covenant on the upland portion of the Quendall Property that restricts groundwater use and the disturbance of the remedy.
- Notifications to natural resources trustees, DNR, and USACE. Public comment on this RI/FS will serve as public notice to the trustees.

10.2 Alternative 1 – Existing PAZ and MNA

This alternative involves continued PAZ operation and monitoring and MNA of arsenic contamination until cleanup levels are achieved. Based on existing data, the Site currently meets preliminary cleanup levels at the proposed conditional POC. To ensure continued compliance, this alternative includes ICs, limiting future uses, and contingency actions if conditions change. This alternative consists of the common elements described in Section 10.1 and shown on Figure 10-2. This alternative is predicted to achieve preliminary cleanup levels in groundwater within approximately 90 years along the Barbee Property shoreline, 80 years along the Quendall Property shoreline, and 220 years upgradient of the PAZ. Monitoring would be conducted until shoreline wells achieve preliminary cleanup levels. The estimated cost of this alternative is approximately $0.6 million (M).

Contingency Actions. Appropriate contingency actions, if needed, would depend on monitoring data, but may include:

- Resuming operation of the existing pump-and-treat system.
- Implementation of *in situ* chemical stabilization (ISCR) on the Quendall Property in the arsenic plume above RELs[29]. ISCR is the preferred form of *in situ* chemical stabilization discussed in more detail in Section 10.3.

10.3 Alternative 2 – *In Situ* Chemical Stabilization

This alternative involves injecting chemical amendments downgradient of the PAZ to immobilize arsenic in soil and groundwater. The goal would be to substantially reduce the restoration time frame to achieve cleanup levels on the Quendall Property, although it may not achieve these levels before the Quendall Property is remediated and redeveloped. This alternative would target the arsenic plume hot spot above the REL of 150 µg/L protective of benthic communities (Section 8.3). The selected technology for *in situ* chemical stabilization is ISCR.

This alternative is shown on Figure 10-3 and includes:

- Treatability and pilot testing of ISCR, using injection of chemical amendments to precipitate arsenic (e.g., a zero valent iron slurry) to confirm ability to distribute amendments in the subsurface and achieve the REL.
- Installing a grid network of temporary injection points using direct-push technology within the arsenic plume above RELs and downgradient of the PAZ. For the purpose of cost estimating, this FS assumes a 20-foot setback from Lake Washington to protect water quality.
- Injection of chemical amendments to precipitate arsenic into the contaminated soil. For the purpose of this FS, we have assumed zerovalent iron (ZVI) will be injected to achieve 0.25 percent mass in soil.
- Performance monitoring of the remedy, which is assumed for the purpose of this FS to include quarterly monitoring of arsenic and geochemical parameters at wells in and around the treatment area for up to 2 years after injections.
- Continued monitoring of Site groundwater until cleanup levels are achieved across the Site.

We have assumed that one injection event would be sufficient to achieve the groundwater REL.

This alternative is predicted to achieve preliminary cleanup levels in groundwater within approximately 90 years along the Barbee Property shoreline, 10 years along the Quendall Property shoreline, and 220 years upgradient of the PAZ. Monitoring would be conducted

[29] Treatment in this area, and along the Quendall Property shoreline, is considered a feasible contingency action even after the Quendall Property is redeveloped because the area within 100 feet is identified as a habitat restoration area with no development planned.

until shoreline wells achieve preliminary cleanup levels. The estimated cost of this alternative is approximately $1.9 M.

Contingency Actions. If pilot testing of ISCR cannot achieve even and effective distribution of the reagent and reach RELs in the target area, then ISS would be used as the remedial technology for this alternative. Effectiveness of ISS is not affected by the Site geochemistry and would be successful regardless of soil heterogeneity. See Section 10.5 for additional description of ISS.

10.4 Alternative 3 – PAZ Extension

This alternative involves extending the PAZ north along the shoreline to reduce arsenic concentrations on the Quendall Property in offshore groundwater. The PAZ consists of a mixture of clean soil and iron filings that remove arsenic from groundwater via sorption and/or precipitation. The goal would be to achieve cleanup levels at the shoreline before the Quendall Property is remediated and redeveloped.[30] This alternative spans the length of the shallow arsenic plume above cleanup levels on the Quendall Property along the Lake Washington shoreline, as shown on Figure 10-4.

In addition to the common elements described in Section 10.1, this alternative includes:

- Extending the current PAZ north along the shoreline onto the Quendall Property.
- Excavating a trench to the maximum depth of arsenic exceeding the cleanup level (approximately 25 feet deep). Shoring (e.g., sheet pile or bioslurry trench) would be required to maintain sidewalls to allow placement of the backfill material. Based on prior PAZ installation, we have assumed for cost estimating purposes that a bioslurry trench would be used. The assumed thickness is 5 feet.
- Backfilling with the amendment mixture. For purposes of this FS, a 10 percent ZVI-in-sand mixture is assumed.[31]
- Performance monitoring of the remedy, which is assumed for the purpose of this FS to include quarterly monitoring of arsenic and geochemical parameters at wells in and around the PAZ extension for up to 2 years after injections.

This alternative is predicted to achieve preliminary cleanup levels in groundwater within approximately 90 years along the Barbee Property shoreline, 20 years along the Quendall Property shoreline, and 220 years upgradient of the PAZ. Monitoring would be conducted until shoreline wells achieve preliminary cleanup levels. The estimated cost of this alternative is approximately $2.2 M.

Contingency Actions. This alternative involves active treatment along the shoreline that addresses the greatest exposure risk at the Site. Accessing other areas for *in situ* treatment

[30] The Barbee Property remediation must be consistent with the Quendall Property development. It is possible the PAZ extension would need to be relocated or modified to accommodate geotechnical work on the Quendall Property.

[31] The existing PAZ consists of a 3 percent ZVI at depths to 15 feet, and 29 percent ZVI at depths greater than 15 feet; however, the shallow zone was constructed wider than typical installations. We anticipate that a narrower trench of higher iron content will be adequately efficient for installation.

are limited or are unlikely to be necessary based on Site conditions. If monitoring data indicate unacceptable risk, the contingency action for this alternative is as follows:

- Resume operation of the existing pump-and-treat system. This would reduce plume migration towards Lake Washington, providing containment and removal of additional arsenic upgradient of the PAZ.

10.5 Alternative 4 – ISS of Shallow Plume

This alternative involves adding amendments downgradient of the PAZ to stabilize arsenic in soil and prevent desorption of arsenic from impacted soil that would result in elevated arsenic concentrations in groundwater. This alternative would target all accessible soil (soil on the Quendall Property) in which shallow groundwater exceeds the cleanup level.

This alternative is shown on Figure 10-5 and involves:

- Selection of an amendment appropriate for *in situ* arsenic stabilization. The most common amendment is a mixture of cement and blast furnace slag, which is a possible amendment that would be used to address coal tar- and creosote-impacted soils on the Quendall Property. Treatability and/or pilot testing would be conducted to select the appropriate mixture (likely consisting of a 60/40 slag/cement ratio) that reduces leachability and does not remobilize arsenic due to high pH.
- Addition of amendments by injection into contaminated soil as a slurry and mixing with a large-diameter auger, to the maximum depth of shallow groundwater contamination (30 feet).
- Performance monitoring of the remedy, which is assumed for the purpose of this FS to include quarterly monitoring of arsenic and geochemical parameters at wells in and around the treatment area for up to 2 years after injections.

ISS results in an increase in soil volume due to the addition and hydration of cement. Based on the assumed reagent mixture, a 25 percent increase in soil volume is conservatively assumed. This would result in an increase in grade of approximately 8 feet; however, excess soil may be spread over untreated areas to reduce this amount.

This alternative is predicted to achieve preliminary cleanup levels in groundwater within approximately 90 years along the Barbee Property shoreline, 80 years along the Quendall Property shoreline, and 220 years upgradient of the PAZ. Monitoring would be conducted until shoreline wells achieve preliminary cleanup levels. The estimated cost of this alternative is approximately $5.6 M.

Contingency Actions. This alternative provides active treatment for the portion of the arsenic plume posing the greatest Site exposure risk. Accessing other areas of the Site (offshore or within the Barbee development) for *in situ* treatment are limited and are unlikely to be necessary based on Site conditions. If monitoring data indicate unacceptable risk, the contingency action for this alternative is to:

- Resume operation of the existing pump-and-treat system. This would reduce plume migration towards Lake Washington, providing containment and removal of additional arsenic upgradient of the PAZ.

10.6 Alternative 5 – ISS of Shallow and Deep Plumes

This alternative is an expansion of Alternative 4 and would target all accessible soil (soil on the Quendall Property) where shallow and deep groundwater exceeds the cleanup level. This alternative also provides additional treatment of the plume on the Barbee Property via operation of the existing pump-and-treat system. The objective of pump-and-treat would be to remove additional arsenic mass to the extent practicable. For the purpose of this FS, it is assumed the system would operate for 5 years before reaching asymptotic removal of arsenic.

This alternative would be implemented in the same manner as Alternative 4, except solidification would be over the area shown on Figure 10-6 to a maximum estimated depth of 40 feet. This alternative is predicted to achieve preliminary cleanup levels in groundwater within approximately 90 years along the Barbee Property shoreline[32], 120 years along the Quendall Property shoreline, and 220 years upgradient of the PAZ. The estimated cost of this alternative is approximately $11 M.

Contingency Actions. This alternative provides active treatment for the portion of the arsenic plume posing the greatest exposure risk at the Site. Accessing other areas for *in situ* treatment is limited or unlikely to be necessary based on Site conditions. If monitoring data indicate unacceptable risk, the contingency action for this alternative is to:

- Resume operation of the existing pump-and-treat system. This would reduce plume migration towards Lake Washington, providing containment and removal of additional arsenic upgradient of the PAZ.

[32] Restoration time frames were estimated without simulating pump-and-treat operation. Based on modeling analysis performed on earlier pump-and-treat operation, pump-and-treat is not expected to significantly reduce the restoration time frame (see Section 9.1) compared to natural attenuation.

11 Remedial Alternative Evaluation

This section presents an evaluation of each cleanup alternative with respect to MTCA criteria to support selection of a cleanup action. The criteria and methods for evaluation are described in Section 11.1, followed by an evaluation of the alternatives with respect to those requirements in Sections 11.2, 11.3, and 11.4.

11.1 Feasibility Study Evaluation Criteria

This section presents the criteria and methods by which the cleanup alternatives will be evaluated. Those criteria include MTCA requirements, MTCA selection criteria, and the criteria evaluated in the disproportionate cost analysis (DCA). In addition, an AKART analysis is conducted to support establishing a proposed conditional POC, as described in Section 8.2.

11.1.1 MTCA Requirements

Cleanup actions selected under MTCA must meet 10 requirements identified in WAC 173-340-360(3)(a). All cleanup actions must:

- Protect human health and the environment, including likely vulnerable populations and overburdened communities
- Comply with cleanup standards
- Comply with applicable state and federal laws
- Prevent or minimize present and future releases and migration of hazardous substances in the environment
- Provide resilience to climate change impacts that have a high likelihood of occurring and severely compromising its long-term effectiveness
- Provide for compliance monitoring
- Not rely primarily on institutional controls and monitoring at a site, or portion thereof, if it is technically possible to implement a more permanent action
- Not rely primarily on dilution and dispersion unless the incremental costs of any active remedial measures over the costs of dilution and dispersion grossly exceed the incremental degree of benefits of active remedial measures over the benefits of dilution and dispersion
- Provide for a reasonable time frame
- Use permanent solutions to the maximum extent practicable

Cleanup actions must also meet action-specific and media-specific requirements as applicable. Action-specific requirements, identified in WAC 173-340-360(3)(b), potentially applicable to the Site include:

- Use of remediation levels in accordance with WAC 173-340-355

- Use of institutional controls in accordance with WAC 173-340-440
- Provision of financial assurances in accordance with WAC 173-340-440(11)
- Provision for periodic reviews in accordance with WAC 173-340-420(2)

Media-specific requirements, identified in WAC 173-340-360(3)(c), potentially applicable to the Site include:

- A soil cleanup action must treat, remove, or contain contaminated soils that qualify as a residential area based on current site use.
- A groundwater cleanup action must be permanent if such an action is practicable or Ecology determines such an action is in the public interest.
- A nonpermanent groundwater cleanup action must contain contaminated groundwater to the maximum extent practicable to prevent lateral and vertical expansion of the groundwater volume affected by the hazardous substances and to prevent the migration of the hazardous substances.

For Ecology-supervised remedial actions, Ecology will also consider the following when selecting a cleanup action:

- Public concerns, including the concerns of likely vulnerable populations and overburdened communities, identified through public outreach and comments on the RI, FS, and CAP.
- Indian tribes' rights and interests, through meaningful engagement and development of a site tribal engagement plan with tribes that may be adversely affected by the site.

11.1.2 MTCA Disproportionate Cost Analysis

A DCA is conducted to determine whether a cleanup action uses permanent solutions to the maximum extent practicable by comparing the relative benefits and costs of cleanup alternatives. Six criteria are considered in the evaluation, as specified in WAC 173-340-360(5)(d):

- **Protectiveness:** Overall protectiveness of human health and the environment, including the degree to which existing Site risks are reduced, time required to reduce the risks and attain cleanup standards, on-Site and off-Site risks during implementation, and improvement in overall environmental quality.
- **Permanence:** Degree to which the alternative reduces the toxicity, mobility, or volume of hazardous substances, including the adequacy of destroying hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of treatment, and the characteristics and quantity of the treatment residuals.
- **Cost:** Remedy design, construction, and long-term operation and maintenance (O&M) costs to implement the alternative.
- **Long-term effectiveness:** Degree of certainty that the alternative will successfully and reliably address contamination that exceeds applicable cleanup

levels until cleanup levels are attained, the resilience of the alternative to climate change impacts, the magnitude of the residual risk with the alternative in place, and the effectiveness of controls to manage treatment residue and remaining wastes.

- **Management of Implementation Risks:** The risks to human health and the environment during construction and implementation of the alternative, and the effectiveness of measures that will be taken to manage such risks.
- **Implementability:** The technical difficulty of designing and constructing the remedy; the availability of necessary off-Site facilities, services, and materials; administrative and regulatory requirements; scheduling, size, and complexity of the alternative; monitoring requirements; access for construction, operations, and monitoring; and integration with existing facility operations and other current or potential remedial actions.

The DCA is based on a comparative evaluation of an alternative's cost against the environmental benefits represented by the other five criteria. As per WAC 173-340-360(5)(c)(iv), cost is disproportionate to benefits if the incremental cost of an alternative over that of a lower-cost alternative exceeds the incremental degree of benefits achieved by the alternative over that of the lower-cost alternative.

11.1.3 AKART Analysis

All alternatives identify a proposed conditional POC for groundwater 10 cm bml, as described in Section 8.2.2. MTCA requires a demonstration that the selected alternative treats groundwater discharges with AKART. Because the FS alternatives are focused on groundwater treatment, the DCA to evaluate the FS alternatives can be used as the AKART analysis. Therefore, alternatives that pass the DCA are considered to meet AKART.

11.2 Evaluation of Alternatives Relative to MTCA Requirements

11.2.1 Protection of Human Health and the Environment

All alternatives would provide protection of human health and the environment by addressing the exposure pathway of ingestion of drinking water and preventing discharge of arsenic to Lake Washington above surface water protection criteria. This includes protection of vulnerable populations and overburdened communities, as identified in Section 2.5, that are potentially affected by the Site. In addition to the significant interim actions already completed, each alternative employs: (1) treatment of arsenic in groundwater with the PAZ; (2) MNA of groundwater contamination outside of the PAZ, with groundwater compliance monitoring; and (3) ICs. In addition, Alternatives 2 through 5 include additional active treatment of arsenic-contaminated groundwater to achieve groundwater cleanup standards.

11.2.2 Compliance with Cleanup Standards

All alternatives will rely on natural attenuation to achieve groundwater cleanup standards. All alternatives include the potential for groundwater cleanup levels to be exceeded for

an extended period of time. These exceedances will require containment measures (ICs) during the restoration time frame. Alternatives 2 through 5 include additional active groundwater remediation to achieve groundwater cleanup standards.

11.2.3 Compliance with Applicable State and Federal Laws

Through identification of ARARs (Section 8.1) and compliance with the MTCA regulation, Alternatives 1 through 5 would all comply with applicable state and federal laws.

11.2.4 Prevent or Minimize Present and Future Releases and Migration of Hazardous Substances in the Environment

Present or future releases of hazardous substances are not anticipated based on residential Site use. All alternatives provide measures to control migration of hazardous substances via implementation of interim actions already completed, treatment of arsenic in groundwater with the PAZ, and MNA of groundwater contamination outside the PAZ.

11.2.5 Provide Resilience to Climate Change

Climate change is not expected to significantly affect any of the alternatives considered in this FS. Potential climate change impacts to the Site, such as flooding from severe storm events, are limited because the water levels in Lake Washington are controlled at the Hiram Chittendem Locks, as described in Section 3.3.2.

11.2.6 Compliance Monitoring

Under MTCA, compliance monitoring encompasses the following types of monitoring:

- **Protection monitoring** confirms that human health and the environment are adequately protected during construction and the O&M period of a cleanup action.
- **Performance monitoring** confirms that the cleanup action has attained cleanup levels and/or other performance standards, such as construction quality control measurements or monitoring necessary to demonstrate compliance with a permit.
- **Confirmation monitoring** confirms the long-term effectiveness of the cleanup action once cleanup levels and/or other performance standards have been attained.

Each alternative allows for compliance monitoring. Health and safety protocols outlined in a Site-specific health and safety plan (required in all alternatives) would provide protection monitoring. All alternatives incorporate performance monitoring for treatment actions. Periodic groundwater sampling and analysis would provide both performance and confirmation monitoring for all alternatives.

11.2.7 Not Rely Primarily on Institutional Controls and Monitoring

None of the alternatives rely primarily on institutional controls. All alternatives include significant treatment and removal actions already completed and further groundwater treatment with the PAZ and MNA. The practicability of implementing a more permanent cleanup action is evaluated in Section 11.3.

11.2.8 Not Rely Primarily on Dilution or Dispersion

None of the alternatives rely primarily on dilution or dispersion. All alternatives include significant treatment and removal actions already completed and further groundwater treatment with the PAZ and MNA. MNA at the Site includes mechanisms other than dilution and dispersion, including immobilization of arsenic via sorption and precipitation.

11.2.9 Provision for a Reasonable Restoration Time Frame

As described in Section 8.2.2, a conditional POC is proposed for groundwater at 10 cm bml. Arsenic concentrations at this proposed conditional POC are currently below the preliminary cleanup level. Arsenic concentrations in groundwater are expected to further decline under all alternatives Therefore, the restoration time frame for all alternatives is zero years, and all alternatives meet this requirement.

11.2.10 Use Permanent Solutions to the Maximum Extent Practicable

This criterion is evaluated via the DCA process in Section 11.3.

11.2.11 Action-specific Requirements

For the alternatives that use remediation levels (Section 8.3), the procedures outlined in accordance with WAC 173-340-355 have been followed. All of the alternatives use institutional controls (WAC 173-340-440), require financial assurances (WAC 173-340-440(11)), and include provisions for periodic reviews (WAC 173-340-420(2)).

11.2.12 Media-specific Requirements

Since the current land use at the Site is residential, the soil cleanup interim actions removed and contained all contaminated soils. Since groundwater cleanup levels cannot be met at the standard point of compliance, the remedial alternatives will contain contaminated groundwater to the maximum extent practicable.

11.2.13 Public Concerns and Tribal Rights and Interests

Public concerns will be addressed through public comment. Tribal rights and interests will be addressed through tribal engagement. The cleanup levels that apply to each alternative are protective of the most vulnerable members of the population. The institutional controls used in each alternative are protective of vulnerable populations and overburdened communities.

11.2.14 Conclusions Regarding Compliance with MTCA Requirements

Based on the above evaluation, Alternatives 1 through 5 comply with the first nine MTCA general criteria. Therefore, all five alternatives are carried forward to the next stage of evaluation to evaluate the tenth general criterion, use of permanent solutions to the maximum extent practicable. Additionally, action-specific and media-specific requirements are met for each of the alternatives. Public concerns and tribal rights and interests will be fully addressed through public comment and tribal engagement.

11.3 Disproportionate Cost Analysis

As described in Section 11.1.3, a DCA is performed to evaluate whether a cleanup action uses permanent solutions to the maximum extent practicable. The DCA quantifies the environmental benefits of each remedial alternative, and then compares alternative benefits versus costs. Alternatives are ranked from most to least permanent, and the most permanent alternative is the baseline alternative against which other alternatives are compared. Costs are disproportionate to benefits if the incremental cost of a more permanent alternative over that of a lower-cost alternative exceeds the incremental benefits achieved by the alternative over that of the lower-cost alternative. Alternatives that exhibit disproportionate costs are considered "impracticable" under MTCA.

The DCA is performed in the following sections and summarized in Table 11-1. Environmental benefit is quantified by first rating the alternatives with respect to five of the six criteria discussed in Section 11.1.3.[33] Rating values are assigned on a scale of 1 to 10, where 1 indicates the criterion is satisfied to a very low degree, and 10 indicates the criterion is satisfied to a very high degree. Since Ecology does not consider the criteria to be of equal importance, each criterion is assigned a "weighting factor." Weighting factors were assigned as follows:

- Overall protectiveness: 30 percent
- Permanence: 20 percent
- Long-term effectiveness: 25 percent
- Management of Implementation Risks: 15 percent
- Implementability: 10 percent

A MTCA benefits ranking is then obtained for each alternative by multiplying the five rating values by their corresponding weighting factors and summing the weighted values. Finally, the benefits ranking of each alternative is divided by the alternative's estimated cost to obtain a benefit/cost ratio, which is a relative measure of the cost effectiveness of the alternative.

The benefit scoring for the five criteria includes consideration of public concerns. Public concerns and tribal interests will be identified through public and tribal engagement, including soliciting public and tribal comment on key documents, such as this RI/FS. Therefore, the benefit scoring may be updated after public and tribal review of the RI/FS.

11.3.1 Overall Protectiveness

All remedial alternatives would be protective of human health and the environment.

With the completed remedial actions described in Section 4.2, Site exposure risks are currently low. There are limited exposure pathways and COCs. The major exposure pathway of concern is protection of drinking water, which can reliably be addressed with ICs. Protection of surface water is a concern as well, but currently concentrations of

[33] Cost is not considered in quantifying environmental benefit.

arsenic are below cleanup levels at the proposed conditional POC (mudline). Concentrations of arsenic are continuing to decline across the Site. The reliability of Alternatives 2 through 5 are greater, because they provide additional treatment to further reduce arsenic concentrations in groundwater. The differentiating factors between the alternatives with respect to overall protectiveness are location and the degree to which active treatment reduces arsenic concentrations. Alternatives with active treatment reduce the risk of future exceedances at the proposed groundwater conditional POC and the potential triggering of contingency actions, and are likely to have fewer public concerns regarding protectiveness than less aggressive alternatives. Alternatives were rated as follows:

- **Alternative 1** relies on MNA and treatment with the existing PAZ. Protection of groundwater ingestion will rely on ICs for an extended period of time based on the expected duration of MNA. Elevated groundwater concentrations will remain at the Site for an extended time. This alternative is rated moderate (5).
- **Alternative 2** focuses on treating the extent of arsenic above the 150 µg/L remediation level, which is based on protection of benthic organisms. This alternative will treat arsenic in groundwater faster than MNA alone. This alternative is rated moderate to high (7).
- **Alternative 3** will actively treat groundwater along the shoreline via the extended PAZ. Higher concentrations of arsenic will remain in Site groundwater in the upland, but active treatment along the shoreline will achieve groundwater cleanup levels prior to discharge to Lake Washington more quickly than MNA. Higher concentrations will remain in the upland, but drinking water restrictions are in place. This alternative is rated moderate to high (7).
- **Alternative 4** and **Alternative 5** will actively treat more groundwater at the Site than Alternative 1, 2, or 3, but concentrations above the cleanup level will remain on the Barbee Property for an extended time. Alternative 5 will treat the most groundwater out of any alternative and is rated high (9). Alternative 4 is rated slightly lower, with a rating of (8).

11.3.2 Permanence

In general, all alternatives are considered to have a relatively high permanence because the vast majority of Site contamination has been removed by interim actions, and natural attenuation and continued treatment with the existing PAZ will permanently reduce toxicity, mobility, and volume of remaining contamination. Alternatives 2 through 5 are rated higher than Alternative 1 because active remediation will immobilize arsenic in remaining hotspots to a greater degree than MNA alone. Alternatives 2 and 3 provide additional chemical immobilization, similar to the existing PAZ, of arsenic remaining on the Quendall Property and were rated high (8). Alternatives 4 and 5 address a large area of arsenic on the Quendall Property and have the highest permanence rating (9) because ISS (in which arsenic is both chemically bound and physically contained within a solidified, low-permeability material) is considered more permanent than immobilization with ISCR or the PAZ, which are more affected by Site geochemistry.

11.3.3 Long-Term Effectiveness

All alternatives have at least a moderate long-term effectiveness because interim actions have already achieved cleanup standards. None of the alternatives are expected to be significantly impacted in their effectiveness by climate change, as described in Section 11.2.5.

Alternative 1 has a moderate degree of long-term effectiveness because it relies on MNA and the existing PAZ to maintain groundwater cleanup levels, whereas all other alternatives include active remediation on the Quendall Property to address the remaining arsenic hotspots that are not directly addressed by the PAZ. There is a moderate degree of uncertainty that Alternative 1 will be successful given the length of time contamination is expected to persist at the Site, but ICs should be effective at reducing the risk and contingency actions can be implemented if warranted. Alternative 1 is rated moderate (5).

Alternatives 2 through 5 will provide additional confidence that cleanup standards will be maintained, and the Site arsenic plume will continue to attenuate. Alternative 2 is ranked moderate (6) because ISCR will require pilot testing to confirm ability to distribute reagent via injection and reagent performance.

The PAZ is a proven and reliable technology at the Site. Although groundwater will remain on Site above cleanup levels, the PAZ will treat groundwater prior to discharge to the lake. Alternative 3 is rated moderate to high (7).

Alternatives 4 and 5 have high long-term effectiveness. ISS is a proven technology for arsenic independent of soil heterogeneity and will reliably immobilize arsenic. Treatability testing will be required for design, but ISS provides a high degree of certainty that this alternative will be successful. Alternative 5 does not provide much additional certainty than Alternative 4 because arsenic in the deeper groundwater is relatively low concentration and farther away from Lake Washington. Therefore, Alternatives 4 and 5 are both rated high (8).

11.3.4 Management of Implementation Risks

For all alternatives, the risks to workers and the public during remedy implementation, including risks to overburdened or disadvantaged communities potentially affected by the Site (see Section 2.5), can generally be managed using appropriate best management practices. Alternatives that include more extensive and/or longer-term construction generally have a greater risk for worker safety and impacts to the community and surrounding environment from erosion, dust, noise, chemical reagent spills, and traffic. Some construction/implementation techniques entail greater risks than others (for example, high-pressure injections or heavy construction involving cranes and larger equipment). Therefore, construction-intensive alternatives are rated slightly lower than more passive alternatives.

Alternatives were rated as follows:

- **Alternative 1** involves limited activities and is rated high (9).
- **Alternative 2** involves low to moderate short-term risk from drilling and injection activities. Any potential water quality effects of the ISCR reagent can be

safely managed through engineering design, and the chemical reagents are safe to handle. This alternative is rated high (8).

- **Alternative 3** involves moderate short-term risk due to the deep trenching in close proximity to the shoreline of Lake Washington. The reactive material in the PAZ is safe to handle and will not create any potential water quality issues, based on performance monitoring of the existing PAZ. This alternative is rated moderate to high (7).
- **Alternatives 4 and 5** involve low to moderate short-term risk due to the heavy construction activities for ISS, consisting of deep soil mixing that can be controlled using standard construction site health and safety practices. Localized pH effects could result from ISS treatment, but water quality impacts are not anticipated. The risks from this alternative are slightly higher than Alternatives 1 and 2 due to the greater extent of active earthwork in close proximity to the residential development. Alternative 5, which is rated moderate (6), involves more extensive treatment and has slightly greater risks than Alternative 4, which is rated moderate to high (7).

11.3.5 Implementability

In general, all alternatives are technically implementable as they involve active remediation on the Quendall Property, which is currently vacant. However, the Site cleanup action will need to be compatible with future activities on the Quendall Property including Quendall Site remediation and Quendall Property development. Although limited remedial actions for the Quendall Site are contemplated within the Barbee affected area (primarily capping and habitat restoration), redevelopment elements within the area could include buildings and associated subsurface elements, such as pilings or ground improvement. The Site remedy will need to consider the timing and scope of the development, and modifications to the design may be needed to not interfere with the development and/or ensure the Site remedy is effective. The alternatives were ranked as follows:

- **Alternative 1** has high technical and administrative implementability. The monitoring well network is generally compatible with future development, and adjusting the location of or reinstalling wells can be done, if needed. Environmental covenants are in place on the Barbee Property and Quendall Property. Access agreements for long-term monitoring are already in place. In addition, this alternative is compatible with potential future remediation and development activities on the Quendall Property. Alternative 1 is rated high (9).
- **Alternative 2** is also highly implementable. Chemical reagents for ISCR are commonly available and implementation uses standard construction equipment. This alternative is compatible with potential future remediation and development activities on Quendall Property, although coordination with development design will be required. Alternative 2 is rated high (8).
- **Alternative 3** is moderately implementable. Although building a PAZ is feasible, the deep trenching along the shoreline of Lake Washington and the existing residences will require careful planning and engineering design. This alternative

may need to be modified depending on subsurface elements of Quendall Property development. Alternative 3 is rated moderate (6).

- **Alternative 4** is highly implementable. The additives for ISS are commonly available and this technology uses standard construction equipment to implement. Alternative 4 covers a greater area than Alternative 2 and will require more coordination with Quendall Property remediation and development activities, particularly for managing increased soil volumes from ISS. Alternative 5 covers an even greater area than Alternative 4. Alternative 4 is rated high (7).
- **Alternative 5** is similar to Alternative 4, but covers an even greater area and will generate a large volume of excess material. Alternative 5 is rated moderate (6).

11.3.6 Remedial Alternative Evaluation Conclusions

All five of the alternatives evaluated in the FS meet the MTCA requirements. Results of the DCA are summarized in Table 11-1 and on Figure 11-1 and indicate that Alternative 1 has the highest benefit/cost ratio. Alternative 5 delivers the highest level of environmental benefit. Alternatives 4 and 5 are the most permanent alternatives, but the costs of these alternatives are disproportionate to the incremental environmental benefit when compared to other alternatives. Alternative 1 provides treatment to the maximum extent practicable based on the results of the DCA, and is identified as the preferred Site remedy.

12 Summary and Conclusions

12.1 Summary

The Site is located on the eastern shoreline of Lake Washington in Renton, Washington. Former lumber mill operations on the Barbee Property resulted in impacts to soil, groundwater, and sediments on the Barbee Property, on a portion of the Quendall Property adjacent to the north, and on state-owned aquatic lands of Lake Washington adjacent to the west.

Previous remedial activities included the excavation and removal of wood debris-contaminated sediments, the excavation and removal of arsenic-, zinc-, TPH- and PCP-impacted soil, installation of a pump-and-treat system to remove and treat arsenic in groundwater, installation of a PAZ that provides ongoing arsenic treatment in groundwater, and installation of a monitoring well and piezometer network for performance monitoring.

The objective of this RI/FS was to evaluate the nature and extent of Site subsurface environmental impacts from historical activities and develop a plan for remediation. Based on the results of this RI/FS, the COCs and media of concern consist of the following:

- **Groundwater:** arsenic, zinc, and TPH-D
- **Soil:** arsenic, zinc, PCP, TPH-D, and TPH-O
- **Sediment:** arsenic, lead, selenium, cPAH TEQ, wood debris, and TOC

After the extensive interim actions described above, the COCs exceeding screening levels, include arsenic in soil, groundwater, and sediment, as well as wood debris, TOC, cPAH TEQ, lead, and selenium in sediment. The sediment risk screening evaluation determined that the sediment dredging and removal actions in 2002 and 2003 have reduced Site risks to acceptable levels. These interim remedial actions serve as the final sediment remedy under the SMS, and no additional remedial actions for sediment are required.

Arsenic in soil and groundwater is the remaining COC at the Site. The primary exposure pathway is direct human exposure via ingestion of arsenic in groundwater, with arsenic in soil as an ongoing source of arsenic leaching to groundwater.

The source area on the Site was removed as part of the 2006 remedial excavation, and the PAZ treats upland groundwater as it migrates toward surface water. Groundwater concentrations are decreasing, both upgradient and downgradient of the PAZ, due to natural attenuation processes.

The extent of arsenic in shallow and deep groundwater has been defined at the Site. The extent of arsenic exceeding the preliminary cleanup level, and the magnitude of exceedance, is greatest in shallow groundwater. There is also arsenic above preliminary

cleanup levels in deeper groundwater, but to a smaller extent. The majority of arsenic contamination in groundwater is captured by the PAZ; the primary area outside the PAZ capture zone is located downgradient of the former source area within the northwestern portion of the plume, where it extends on the Quendall Property.

Potentially applicable remedial technologies for addressing arsenic in Site groundwater were screened and assembled into five remedial alternatives in the FS. These alternatives were evaluated with respect to MTCA requirements, and a DCA was conducted to guide alternative selection. Based on the DCA, Alternative 1 provides the highest benefit-to-cost ratio for the Site.

12.2 Conclusions

The RI has adequately characterized the nature and extent of contamination at the Site. Prior remedial actions have removed or treated the vast majority of contamination at the Site. The FS has evaluated five alternatives to support selection of a final cleanup action. All five of the alternatives evaluated in the FS meet the MTCA requirements and are protective of human health and the environment, including vulnerable populations and overburdened communities potentially affected by the Site. Based on the results of the FS, the proposed remedy that meets the requirements of MTCA is Alternative 1, with the highest benefit-to-cost ratio for the Site. Alternative 1 provides treatment to the maximum extent practicable based on the results of the DCA.

The elements of the selected remedial alternative include continued operation and monitoring of the PAZ, MNA, and ICs, which include environmental covenants, and a proposed conditional POC for groundwater prior to the point of discharge into Lake Washington. A detailed description of the selected remedial alternative and a compliance monitoring plan will be presented in the Cleanup Action Plan.

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14 Limitations

Work for this project was performed for Barbee Mill Co., Inc. (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

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TABLES

Table 4-1. Summary of Analytical Data by Investigation, Medium, and Analyte Group

DRAFT

Project No. 050004, Barbee Mill Site, Renton, WA

	Soil	Groundwater	Porewater	Sediment
Retec Site Investigation, 1996-1997				
BTEX	X	-	-	-
Metals	X	X	-	X
PAHs	X	X	-	X
PCBs	X	-	-	-
Phenols	-	X	-	-
TPH-D	X	X	-	-
TPH-G	X	X	-	-
TPH-O	-	X	-	-
VOCs	X	X	-	-
Conventionals	-	-	-	X
Lloyd/HartCrowser Sediment Investigation, 1999				
Metals	-	-	-	X
PAHs	-	-	-	X
Wood Waste	-	-	-	X
HartCrowser IRAP Investigation, 1998-1999				
BTEX	X	X	-	-
Metals	X	X	-	-
PCBs	X	X	-	-
Phenols	X	X	-	-
TPH-D	X	X	-	-
TPH-G	X	X	-	-
TPH-O	X	X	-	-
VOCs	-	X	-	-
Anchor Sediment Investigation, 2002				
Metals	-	-	-	X
Wood Waste	-	-	-	X
Conventionals	-	-	-	X
Anchor Sediment Removal, 2003				
Wood Waste	-	-	-	X
Conventionals	-	-	-	X
Aspect Geochemical Study, 2005				
Metals	X	X	X	-
Urban Redevelopment Assessment, 2006				
BTEX	X	-	-	-
Metals	X	-	-	-
TPH-D	X	-	-	-
TPH-G	X	-	-	-
TPH-O	X	-	-	-
Phenols	X	-	-	-
PAHs	-	X	-	-
Aspect Pan Abode Area Characterization, 2006				
Phenols	X	X	-	-
TPH-D	X	X	-	-
TPH-O	X	X	-	-
Aspect Shoreline Investigation, 2006				
PAHs	X	-	-	-
Aspect Excavation of Arsenic Contaminated Soil, 2006				
Metals	X	-	-	-
Aspect Groundwater Remediation Design Investigations, 2006				
Metals	-	X	X	-
Aspect PAZ Pilot Test, 2006				
Metals	-	X	X	-

Table 4-1. Summary of Analytical Data by Investigation, Medium, and Analyte Group DRAFT

Project No. 050004, Barbee Mill Site, Renton, WA

	Soil	Groundwater	Porewater	Sediment
Aspect Excavations of TPH and PCP Contaminated Soil, 2006				
BTEX	X	-	-	-
Phenols	X	-	-	-
TPH-D	X	-	-	-
TPH-G	X	-	-	-
TPH-O	X	-	-	-
Aspect and Anchor Quendall Site RI, 2009				
Metals	-	X	X	X
Aspect PAZ Performance Monitoring, 2006-2010				
Metals	-	X	X	-
TPH-D	-	X	-	-
TPH-O	-	X	-	-
Aspect Data Gaps Investigation, 2018				
Metals	X	X	-	X
Aspect RI Work Plan, 2021				
Metals	-	X	-	X
PAHs	-	X	-	-
Geosyntec RI Work Plan, 2021-2022				
Bioassay	-	-	-	X
Metals	-	-	X	X
PAHs	-	-	-	X
Wood Waste	-	-	-	X
Aspect PAZ Performance Monitoring, 2010-Present				
Metals	-	X	-	-

Notes

Dates provided in table are dates of sample collection.

Table 4-2. Monitoring Well Construction Details

DRAFT

Project No. 050004, Barbee Mill Site, Renton, WA

Well Name	Completion Date	Northing	Easting	Top of Casing Elevation (feet)	Well Casing Diameter (inches)	Well Casing Material	Drilled Depth (feet BGS)	Screened Depth (feet BTOC)
CMW-1	8/23/2007	196384	1301554	22.75	2	PVC	12.75	7.7 to 12.5
CMW-2S	8/23/2007	196558	1301556	22.27	2	PVC	12.55	7.7 to 12.3
CMW-2D	8/22/2007	196559	1301555	22.2	2	PVC	21.6	16.55 to 21.35
CMW-3	8/22/2007	196713	1301564	22.41	2	PVC	12.5	7.7 to 12.25
CMW-4S	8/22/2007	196784	1301631	27.44	2	PVC	16.6	11.55 to 16.35
CMW-4D	8/22/2007	196783	1301632	27.92	2	PVC	26	20.95 to 25.75
CMW-5	8/22/2007	196778	1301751	31.07	2	PVC	16.6	11.55 to 16.35
CMW-6	8/22/2007	196774	1301893	31.03	2	PVC	18.75	12.5 to 18.75
EW-1	5/14/2007	196483	1301713	26.81	4	Steel	20	9.33 to 18.66
EW-2	5/15/2007	196535	1301707	26.67	4	Steel	19	8.88 to 18.21
EW-3	5/15/2007	196588	1301713	26.77	4	Steel	20	9.88 to 19.21
EW-4	5/15/2007	196628	1301751	27.65	4	Steel	19	9.3 to 18.63
EW-5	5/15/2007	196645	1301804	28.34	4	Steel	19	9.3 to 18.63
EW-6	5/16/2007	196644	1301863	28.61	4	Steel	19	10.3 to 19.63
EW-7	5/16/2007	196642	1301947	28.66	4	Steel	19	10.3 to 19.63
EW-8	5/16/2007	196734	1301728	28.88	4	Steel	20	10.3 to 19.63
PZ-1	11/6/2007	196258	1301881	27.78	0.75	PVC	20	15 to 20
PZ-2	11/6/2007	196630	1302251	27.87	0.75	PVC	20	15 to 20
WP-1A	1/6/2009	196818	1301594	19.45	1.5	Steel	3.5	1.5 to 3.5
WP-8	1/6/2009	196899	1301627	19.48	1.5	Steel	3.5	1.5 to 3.5
BH-21A	12/27/1988	197000	1301897	26.16	2	Steel	20	9 to 19
BH-21B	12/27/1988	196998	1301902	25.88	2	PVC	54.5	41.5 to 51.5
BH-26A	8/9/1990	196790	1302144	28.98	4	Steel	12	7 to 12
BH-26B	8/6/1990	196790	1302151	26.62	4	Steel	48.5	25 to 36
BH-29A	7/8/2009	196895	1301740	27.64	2	PVC	19	8.5 to 18.5
BH-29B	7/8/2009	196890	1301737	27.8	2	PVC	50	39.4 to 49.63
BH-31B	9/8/2021	196869	1302043	27.24	2	PVC	40	30 to 40

Notes:
Horizontal datum is NAD83.
Elevation datum is NAVD88.
BGS - below ground surface
BTOC - below top of casing

Table 5-1. Contaminants of Potential Concern (Unsaturated Soil)

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Number of Samples Analyzed	Number of Detected Samples	Preliminary Screening Level (mg/kg)	Maximum Detected Concentration (mg/kg)	Location of Maximum Detection	Number of Detections Exceeding Preliminary SL	Maximum Reporting Limit (mg/kg)	Number of Non-Detections with Reporting Limits Exceeding Preliminary SL	Frequency of Exceedance of Preliminary SL[(a)]	COPC[(b)]
BTEX										
Benzene	12	0	0.0024	--	--	0	0.067	12	100%	Yes
Toluene	12	1	0.37	0.03	TP-3 UST BF	0	0.067	0	0%	No
Ethylbenzene	12	3	0.1	0.1	TP-3 UST BF	0	0.067	0	0%	No
Total Xylenes	12	2	0.51	0.11	TP-3 UST BF	0	0.067	0	0%	No
Metals										
Antimony	10	3	5.1	9	RSB-05	3	6	3	60%	Yes
Arsenic	84	71	20	430	VV6	28	6.6	0	33%	Yes
Barium	1	1	820	40.9	TP-7	0	--	0	0%	No
Beryllium	10	10	63	0.3	RSB-05	0	--	0	0%	No
Cadmium	12	2	0.77	0.41	HC-49	0	1	1	8%	No
Chromium	12	12	1500	50.3	RSB-05	0	--	0	0%	No
Copper	11	11	36	26	RSB-05	0	--	0	0%	No
Lead	12	12	250	25	RSB-06	0	--	0	0%	No
Mercury	11	1	0.07	0.08	RSB-07	1	0.12	1	18%	Yes
Nickel	11	11	68	55	RSB-05	0	--	0	0%	No
Selenium	11	2	0.52	6	RSB-05	2	6	9	100%	Yes
Silver	12	0	0.55	--	--	0	1	3	25%	No
Thallium	10	0	0.088	--	--	0	6	10	100%	Yes
Zinc	25	24	130	500	ZZ5	5	40.4	0	23%	Yes
Other SVOCs										
2,3,4,5-Tetrachlorophenol	10	1	--	0.0032	RSB-08	0	0.075	0	0%	No
2,3,4-Trichlorophenol	10	0	--	--	--	0	0.075	0	0%	No
2,3,5,6-Tetrachlorophenol	10	0	--	--	--	0	0.075	0	0%	No
2,3,6-Trichlorophenol	10	0	--	--	--	0	0.075	0	0%	No
2,4,5-Trichlorophenol	10	0	11	--	--	0	0.075	0	0%	No
2,4,6-Trichlorophenol	10	0	0.0029	--	--	0	0.075	10	100%	Yes
Dibenzofuran	10	1	0.81	0.35	RSB-02	0	0.085	0	0%	No
Pentachlorophenol	20	6	3.2E-05	17	TP-4-SL	6	0.075	14	100%	Yes
Phenol	2	0	0.76	--	--	0	15	1	50%	No
PAHs										
2-Methylnaphthalene	10	1	1.7	0.18	RSB-02	0	0.085	0	0%	No
Acenaphthene	12	2	3.1	0.49	RSB-02	0	0.085	0	0%	No
Acenaphthylene	12	0	--	--	--	0	0.086	0	0%	No
Anthracene	12	1	47	0.34	RSB-02	0	0.085	0	0%	No
Benzo(g,h,i)perylene	12	0	--	--	--	0	0.086	0	0%	No
Fluoranthene	12	3	0.02	1.2	RSB-02	3	0.083	8	92%	Yes
Fluorene	12	2	1.6	0.61	RSB-02	0	0.085	0	0%	No
Naphthalene	12	2	4.5	0.19	RSB-02	0	0.085	0	0%	No
Phenanthrene	12	3	--	3	RSB-02	0	0.083	0	0%	No
Pyrene	12	5	0.02	0.57	RSB-02	4	0.083	7	92%	Yes
Benz(a)anthracene	12	2	--	0.12	RSB-02	0	0.085	0	0%	No
Benzo(a)pyrene	12	3	0.00031	0.09429	TP-8S	3	0.086	9	100%	Yes
Benzo(b)fluoranthene	12	2	--	0.1	RSB-02	0	0.085	0	0%	No
Benzo(k)fluoranthene	12	0	--	--	--	0	0.086	0	0%	No
Chrysene	12	4	--	0.14	RSB-02	0	0.083	0	0%	No
Dibenzo(a,h)anthracene	12	0	--	--	--	0	0.086	0	0%	No
Indeno(1,2,3-cd)pyrene	12	0	--	--	--	0	0.086	0	0%	No
Total PAHs (ND=0)	12	5	--	6.94	RSB-02	0	0.083	0	0%	No
Total cPAHs TEQ (ND = 1/2 RDL)	12	4	0.084	0.11408	TP-8S	2	0.062665	0	17%	Yes

Table 5-1. Contaminants of Potential Concern (Unsaturated Soil)

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Number of Samples Analyzed	Number of Detected Samples	Preliminary Screening Level (mg/kg)	Maximum Detected Concentration (mg/kg)	Location of Maximum Detection	Number of Detections Exceeding Preliminary SL	Maximum Reporting Limit (mg/kg)	Number of Non-Detections with Reporting Limits Exceeding Preliminary SL	Frequency of Exceedance of Preliminary SL[(a)]	COPC[(b)]
PCB Aroclors										
Aroclor 1016	11	0	--	--	--	0	0.36	0	0%	No
Aroclor 1221	1	0	--	--	--	0	0.1	0	0%	No
Aroclor 1232	1	0	--	--	--	0	0.1	0	0%	No
Aroclor 1242	11	0	--	--	--	0	0.36	0	0%	No
Aroclor 1248	11	0	--	--	--	0	0.36	0	0%	No
Aroclor 1254	11	0	--	--	--	0	0.36	0	0%	No
Aroclor 1260	11	0	--	--	--	0	0.36	0	0%	No
Aroclor 1262	1	0	--	--	--	0	0.1	0	0%	No
Total PCBs (Sum of Aroclors)	11	0	1.1E-05	--	--	0	0.36	11	100%	Yes
TPHs										
Gasoline Range Organics	13	2	100	51	RSB-02	0	6.7	0	0%	No
Diesel Range Organics	24	8	2000	690	RSB-02	0	100	0	0%	No
Motor Oil Range Organics	25	10	2000	510	TP-8S	0	250	0	0%	No
Diesel and Oil Extended Range O	25	10	2000	1100	RSB-02	0	250	0	0%	No
VOCs										
m,p-Xylenes	12	2	--	0.31	TP-3 UST BF	0	0.067	0	0%	No
o-Xylene	11	1	--	0.029	HC-49	0	0.067	0	0%	No

Notes:

(a) Includes both detected concentrations and, for nondetected results, reporting limits.

(b) Entry is Yes if one or more detected results exceed SL or if chemical is never detected and all RLs exceed SL. Otherwise, entry is No.

COPC - chemical of potential concern

SL - screening level

Table 5-2. Contaminants of Potential Concern (Saturated Soil)

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Number of Samples Analyzed	Number of Detected Samples	Preliminary Screening Level (mg/kg)	Maximum Detected Concentration (mg/kg)	Location of Maximum Detection	Number of Detections Exceeding Preliminary SL	Maximum Reporting Limit (mg/kg)	Number of Non-Detections with Reporting Limits Exceeding Preliminary SL	Frequency of Exceedance of Preliminary SL[(a)]	COPC[(b)]
BTEX										
Benzene	18	0	0.00015	--	--	0	0.081	18	100%	Yes
Toluene	18	0	0.023	--	--	0	0.081	14	78%	No
Ethylbenzene	18	1	0.0059	0.049	HC-39	1	0.081	17	100%	Yes
Total Xylenes	18	1	0.03	0.053	HC-39	1	0.064	16	94%	Yes
Conventionals										
Chromium Reducible Sulfide	8	7	--	62.6	AP-4	0	80	0	0%	No
Sulfide	8	5	--	0.5	AP-1	0	1.4	0	0%	No
Total Organic Carbon (%)	8	7	--	7.09	AP-4	0	--	0	0%	No
Total Solids	8	8	--	87.2	AP-4	0	--	0	0%	No
Metals										
Aluminum	8	4	33000	22500	AP-4	0	14600	0	0%	No
Antimony	6	2	0.25	10	RSB-02	2	7	4	100%	Yes
Arsenic	961	874	20	2600	ZZ6	323	10	0	34%	Yes
Barium	15	15	41	83	HC-50	6	--	0	40%	Yes
Beryllium	6	6	3.2	0.3	RSB-01	0	--	0	0%	No
Cadmium	39	7	0.77	0.5	HC-43	0	1	2	5%	No
Chromium	39	39	74	79	HC-48	1	--	0	3%	Yes
Copper	37	37	36	450	HC-53	12	--	0	32%	Yes
Iron	8	8	36000	23900	AP-4	0	--	0	0%	No
Lead	39	35	21	48	HC-48	1	2.1	0	3%	Yes
Manganese	8	8	1100	411	AP-4	0	--	0	0%	No
Mercury	37	7	0.07	1.6	HC-42	7	0.14	26	89%	Yes
Nickel	37	37	38	60	HC-48	1	--	0	3%	Yes
Selenium	22	2	0.026	13	RSB-02	2	7	20	100%	Yes
Silver	39	0	0.028	--	--	0	1	39	100%	Yes
Thallium	6	0	0.0044	--	--	0	10	6	100%	Yes
Zinc	255	255	85	1600	C5	45	--	0	18%	Yes
Other SVOCs										
2,3,4,5-Tetrachlorophenol	6	0	--	--	--	0	0.096	0	0%	No
2,3,4-Trichlorophenol	6	0	--	--	--	0	0.096	0	0%	No
2,3,5,6-Tetrachlorophenol	6	0	--	--	--	0	0.096	0	0%	No
2,3,6-Trichlorophenol	6	0	--	--	--	0	0.096	0	0%	No
2,4,5-Trichlorophenol	18	0	0.57	--	--	0	0.096	0	0%	No
2,4,6-Trichlorophenol	18	0	0.00017	--	--	0	0.096	18	100%	Yes
2,4-Dichlorophenol	12	0	0.0043	--	--	0	0.052	12	100%	Yes
Dibenzofuran	6	0	0.041	--	--	0	0.11	6	100%	Yes
Pentachlorophenol	45	14	1.8E-06	220	HSE-B-7	14	0.3	31	100%	Yes
Phenol	3	0	0.047	--	--	0	0.3	3	100%	Yes
Total Tetrachlorophenols	12	3	--	0.15	HC-42	0	0.013	0	0%	No

Table 5-2. Contaminants of Potential Concern (Saturated Soil)

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Number of Samples Analyzed	Number of Detected Samples	Preliminary Screening Level (mg/kg)	Maximum Detected Concentration (mg/kg)	Location of Maximum Detection	Number of Detections Exceeding Preliminary SL	Maximum Reporting Limit (mg/kg)	Number of Non-Detections with Reporting Limits Exceeding Preliminary SL	Frequency of Exceedance of Preliminary SL[a]	COPC[b]
PAHs										
1-Methylnaphthalene	22	5	0.0042	0.1	SH9	5	0.056	17	100%	Yes
2-Methylnaphthalene	28	4	0.089	0.13	SH9	1	0.11	2	11%	Yes
Acenaphthene	29	4	0.16	0.12	SH5	0	0.11	0	0%	No
Acenaphthylene	29	0	--	--	--	0	0.11	0	0%	No
Anthracene	29	4	2.4	0.035	SH5	0	0.11	0	0%	No
Benzo(g,h,i)perylene	29	17	--	0.12	RSB-02	0	0.1	0	0%	No
Fluoranthene	29	16	0.001	0.34	SH5	16	0.1	13	100%	Yes
Fluorene	29	7	0.08	0.084	SH5	1	0.11	3	14%	Yes
Naphthalene	29	6	0.24	0.2	RSB-02	0	0.1	0	0%	No
Phenanthrene	29	18	--	0.35	SH5	0	0.1	0	0%	No
Pyrene	29	21	0.001	0.3	RSB-01	21	0.1	8	100%	Yes
Benz(a)anthracene	29	13	--	0.11	SH5	0	0.11	0	0%	No
Benzo(a)pyrene	29	25	1.6E-05	0.17	RSB-02	25	0.1	4	100%	Yes
Benzo(b)fluoranthene	29	20	--	0.24	RSB-02	0	0.1	0	0%	No
Benzo(k)fluoranthene	29	10	--	1.2	RSB-01	0	0.11	0	0%	No
Chrysene	29	21	--	0.4	SH9	0	0.1	0	0%	No
Dibenzo(a,h)anthracene	29	5	--	0.024	SH9	0	0.11	0	0%	No
Indeno(1,2,3-cd)pyrene	29	10	--	0.084	RSB-01	0	0.11	0	0%	No
Total PAHs (ND=0)	31	29	--	2.515	RSB-01	0	0.1	0	0%	No
Total cPAHs TEQ (ND = 1/2 RDL)	31	27	0.0042	0.2879	RSB-01	27	0.0755	4	100%	Yes
PCBAro										
Aroclor 1016	8	0	--	--	--	0	0.1	0	0%	No
Aroclor 1221	2	0	--	--	--	0	0.1	0	0%	No
Aroclor 1232	2	0	--	--	--	0	0.1	0	0%	No
Aroclor 1242	8	0	--	--	--	0	0.1	0	0%	No
Aroclor 1248	8	0	--	--	--	0	0.1	0	0%	No
Aroclor 1254	8	0	--	--	--	0	0.1	0	0%	No
Aroclor 1260	8	0	--	--	--	0	0.1	0	0%	No
Total PCBs (Sum of Aroclors)	8	0	5.5E-07	--	--	0	0.1	8	100%	Yes
TPHs										
Gasoline Range Organics	33	0	100	--	--	0	8.2	0	0%	No
Diesel Range Organics	50	18	2000	4800	TP-1	1	58	0	2%	Yes
Motor Oil Range Organics	50	23	2000	4800	TP-1	1	250	0	2%	Yes
Diesel and Oil Extended Range Or	50	25	2000	9600	TP-1	1	250	0	2%	Yes
VOCs										
m,p-Xylenes	18	1	--	0.053	HC-39	0	0.081	0	0%	No
o-Xylene	9	0	--	--	--	0	0.081	0	0%	No

Notes:

(a) Includes both detected concentrations and, for nondetected results, reporting limits.

(b) Entry is Yes if one or more detected results exceed SL or if chemical is never detected and all RLs exceed SL. Otherwise, entry is No.

COPC - chemical of potential concern

SL - screening level

Table 5-3. Contaminants of Potential Concern (Groundwater)

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Number of Samples Analyzed	Number of Detected Samples	Preliminary Screening Level (ug/L)	Maximum Detected Concentration (ug/L)	Location of Maximum Detection	Number of Detections Exceeding Preliminary SL	Maximum Reporting Limit (ug/L)	Number of Non-Detections with Reporting Limits Exceeding Preliminary SL	Frequency of Exceedance of Preliminary SL[a]	COPC[b]
BTEX										
Benzene	13	0	0.44	--	--	0	1	13	100%	Yes
Toluene	13	1	53	1.1	RMW-05	0	1.8	0	0%	No
Ethylbenzene	13	0	12	--	--	0	1	0	0%	No
Total Xylenes	13	2	57	1.8	RMW-04	0	1	0	0%	No
Conventionals										
Alkalinity, Total	22	22	--	190000000	PMW-1	0	--	0	0%	No
Biochemical Oxygen Demand	8	5	--	7000	RMW-04	0	4	0	0%	No
Chloride	8	8	--	14000	WP-1B	0	--	0	0%	No
Nitrate as Nitrogen	8	8	10000	700	HCMW-02	0	--	0	0%	No
Nitrite as Nitrogen	8	3	1000	10	RMW-04	0	10	0	0%	No
Phosphate	8	8	--	950	HCMW-05S	0	--	0	0%	No
Sulfate	8	1	250000	5400	WP-1B	0	200	0	0%	No
Sulfide	8	7	2	40	RMW-04	7	50	1	100%	Yes
Total Organic Carbon	8	8	--	65900	RMW-01	0	--	0	0%	No
Metals										
Antimony (Dissolved)	13	0	5.6	--	--	0	50	5	38%	No
Antimony (Total)	13	0	5.6	--	--	0	50	5	38%	No
Arsenic (Dissolved)	798	759	16	52000	HCMW-02	563	50	8	70%	Yes
Arsenic (Total)	42	35	16	2680	RMW-03	31	50	4	83%	Yes
Barium (Dissolved)	8	3	1000	39	CMW-2S	0	25	0	0%	No
Barium (Total)	8	6	1000	44	CMW-1	0	28	0	0%	No
Beryllium (Dissolved)	5	0	4	--	--	0	1	0	0%	No
Beryllium (Total)	5	0	4	--	--	0	1	0	0%	No
Cadmium (Dissolved)	16	0	0.72	--	--	0	5	16	100%	Yes
Cadmium (Total)	5	0	0.72	--	--	0	2	5	100%	Yes
Calcium (Dissolved)	9	9	--	155000	RMW-01	0	--	0	0%	No
Chromium (Dissolved)	16	0	74	--	--	0	10	0	0%	No
Chromium (Total)	5	3	74	13	RMW-01	0	5	0	0%	No
Copper (Dissolved)	69	3	11	9.9	HC-46	0	20	1	1%	No
Copper (Total)	5	3	11	15	RMW-03	2	2	0	40%	Yes
Iron (Dissolved)	564	542	140000	140000	EW-5	0	56	0	0%	No
Iron (Total)	16	15	140000	91000	EW-3	0	56	0	0%	No
Lead (Dissolved)	65	1	2.1	1.4	CMW-5	0	20	4	6%	No
Lead (Total)	5	0	2.1	--	--	0	20	5	100%	Yes
Magnesium (Dissolved)	9	9	--	84800	RMW-01	0	--	0	0%	No
Manganese (Dissolved)	19	19	6500	9780	RMW-01	1	--	0	5%	Yes
Mercury (Dissolved)	24	0	0.012	--	--	0	0.50	24	100%	Yes
Mercury (Total)	13	0	0.012	--	--	0	0.50	13	100%	Yes
Nickel (Dissolved)	16	4	52	14	HC-40	0	50	0	0%	No
Nickel (Total)	5	3	52	30	RMW-01	0	10	0	0%	No
Potassium (Dissolved)	9	8	--	5910	WP-1B	0	1000	0	0%	No
Selenium (Dissolved)	13	1	5	60	RMW-01	1	50	3	31%	Yes
Selenium (Total)	13	2	5	90	RMW-01	2	50	11	100%	Yes

Table 5-3. Contaminants of Potential Concern (Groundwater)

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Number of Samples Analyzed	Number of Detected Samples	Preliminary Screening Level (ug/L)	Maximum Detected Concentration (ug/L)	Location of Maximum Detection	Number of Detections Exceeding Preliminary SL	Maximum Reporting Limit (ug/L)	Number of Non-Detections with Reporting Limits Exceeding Preliminary SL	Frequency of Exceedance of Preliminary SL[a]	COPC[b]
Metals (continued)										
Silicon (Dissolved)	9	9	--	29800	RMW-01	0	--	0	0%	No
Silver (Dissolved)	16	0	3.2	--	--	0	50	12	75%	No
Silver (Total)	5	0	3.2	--	--	0	3	0	0%	No
Sodium (Dissolved)	9	9	--	48900	RMW-01	0	--	0	0%	No
Thallium (Dissolved)	5	0	0.062	--	--	0	50	5	100%	Yes
Thallium (Total)	5	0	0.062	--	--	0	50	5	100%	Yes
Zinc (Dissolved)	58	13	100	150	HC-39	2	25	0	3%	Yes
Zinc (Total)	5	5	100	31	RMW-02	0	--	0	0%	No
Arsenic III	8	8	16	35100	HCMW-02	4	--	0	50%	Yes
Arsenic, Inorganic	8	8	16	37035	HCMW-02	4	--	0	50%	Yes
Other SVOCs										
2,3,4,5-Tetrachlorophenol	5	0	--	--	--	0	0.25	0	0%	No
2,3,4-Trichlorophenol	5	0	--	--	--	0	0.25	0	0%	No
2,3,5,6-Tetrachlorophenol	5	0	--	--	--	0	0.25	0	0%	No
2,3,6-Trichlorophenol	5	0	--	--	--	0	0.25	0	0%	No
2,4,5-Trichlorophenol	11	0	300	--	--	0	0.25	0	0%	No
2,4,6-Trichlorophenol	11	0	0.25	--	--	0	0.25	0	0%	No
2,4-Dichlorophenol	6	0	10	--	--	0	0.25	0	0%	No
Dibenzofuran	5	0	4.3	--	--	0	1	0	0%	No
Hexachlorobutadiene	7	0	0.01	--	--	0	5	7	100%	Yes
Pentachlorophenol	12	1	0.002	0.06	HC-42	1	0.25	11	100%	Yes
Total Tetrachlorophenols	6	0	--	--	--	0	0.1	0	0%	No
PAHs										
1-Methylnaphthalene	8	0	--	--	--	0	0.11	0	0%	No
2-Methylnaphthalene	13	0	32	--	--	0	1	0	0%	No
Acenaphthene	14	2	30	0.33	EW-8	0	1	0	0%	No
Acenaphthylene	14	0	--	--	--	0	1	0	0%	No
Anthracene	14	1	100	0.14	EW-8	0	1	0	0%	No
Benzo(g,h,i)perylene	14	0	--	--	--	0	1	0	0%	No
Fluoranthene	14	2	0.02	0.37	EW-8	2	1	12	100%	Yes
Fluorene	14	1	10	0.16	EW-8	0	1	0	0%	No
Naphthalene	16	0	8.9	--	--	0	5	0	0%	No
Phenanthrene	14	1	--	0.51	EW-8	0	1	0	0%	No
Pyrene	14	2	0.015	0.42	TP1-SEEP-1996	2	1	12	100%	Yes
Benz(a)anthracene	14	1	0.00016	0.037	EW-8	1	1	13	100%	Yes
Benzo(a)pyrene	14	0	1.6E-05	--	--	0	1	14	100%	Yes
Benzo(b)fluoranthene	14	1	0.00016	0.012	EW-8	1	1	13	100%	Yes
Benzo(j,k)fluoranthene	8	0	--	--	--	0	0.011	0	0%	No
Benzo(k)fluoranthene	6	0	0.0016	--	--	0	1	6	100%	Yes
Chrysene	14	1	0.0098	0.032	EW-8	1	1	13	100%	Yes
Dibenzo(a,h)anthracene	14	0	1.6E-05	--	--	0	1	14	100%	Yes
Indeno(1,2,3-cd)pyrene	14	0	0.00016	--	--	0	1	14	100%	Yes
Total cPAHs TEQ (ND = 1/2 RDL)	14	2	0.0043	0.01237	EW-8	2	0.755	20	157%	Yes

Table 5-3. Contaminants of Potential Concern (Groundwater)

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Number of Samples Analyzed	Number of Detected Samples	Preliminary Screening Level (ug/L)	Maximum Detected Concentration (ug/L)	Location of Maximum Detection	Number of Detections Exceeding Preliminary SL	Maximum Reporting Limit (ug/L)	Number of Non-Detections with Reporting Limits Exceeding Preliminary SL	Frequency of Exceedance of Preliminary SL[a]	COPC[b]
PCB Aroclors										
Aroclor 1016	1	0	--	--	--	0	0.02	0	0%	No
Aroclor 1221	1	0	--	--	--	0	0.05	0	0%	No
Aroclor 1232	1	0	--	--	--	0	0.05	0	0%	No
Aroclor 1242	1	0	--	--	--	0	0.02	0	0%	No
Aroclor 1248	1	0	--	--	--	0	0.02	0	0%	No
Aroclor 1254	1	0	--	--	--	0	0.02	0	0%	No
Aroclor 1260	1	0	--	--	--	0	0.02	0	0%	No
Total PCBs (Sum of Aroclors)	1	0	7E-06	--	--	0	0.05	1	100%	Yes
TPHs										
Gasoline Range Organics	13	2	800	320	RMW-04	0	250	0	0%	No
Diesel Range Organics	32	4	500	1600	RMW-04	3	260	0	9%	Yes
Motor Oil Range Organics	30	0	500	--	--	0	750	8	27%	No
Diesel and Oil Extended Range O	36	4	500	1600	RMW-04	3	750	6	25%	Yes
VOCs										
1,1,1,2-Tetrachloroethane	7	0	1.7	--	--	0	1	0	0%	No
1,1,1-Trichloroethane	7	0	200	--	--	0	1	0	0%	No
1,1,2 - Trichlorotrifluoroethane	5	0	170	--	--	0	2	0	0%	No
1,1,2,2-Tetrachloroethane	7	0	0.1	--	--	0	1	7	100%	Yes
1,1,2-Trichloroethane	7	0	0.35	--	--	0	1	7	100%	Yes
1,1-Dichloroethane	7	0	7.7	--	--	0	1	0	0%	No
1,1-Dichloroethene	7	0	7	--	--	0	1	0	0%	No
1,1-Dichloropropene	5	0	--	--	--	0	1	0	0%	No
1,2,3-Trichlorobenzene	7	0	6.4	--	--	0	5	0	0%	No
1,2,3-Trichloropropane	7	0	0.00038	--	--	0	1	7	100%	Yes
1,2,4-Trichlorobenzene	7	0	0.036	--	--	0	5	7	100%	Yes
1,2,4-Trimethylbenzene	7	1	80	1.1	RMW-04	0	1	0	0%	No
1,2-Dibromo-3-chloropropane	7	0	0.042	--	--	0	5	7	100%	Yes
1,2-Dibromoethane (EDB) (8260)	7	0	0.05	--	--	0	1	7	100%	Yes
1,2-Dichlorobenzene	7	0	600	--	--	0	2	0	0%	No
1,2-Dichloroethane (EDC)	7	0	3.5	--	--	0	1	0	0%	No
1,2-Dichloropropane	7	0	0.71	--	--	0	1	7	100%	Yes
1,3,5-Trimethylbenzene	7	1	80	1.6	RMW-04	0	1	0	0%	No
1,3-Dichlorobenzene	7	0	2	--	--	0	2	0	0%	No
1,3-Dichloropropane	7	0	160	--	--	0	1	0	0%	No
1,4-Dichloro-2-Butene	5	0	--	--	--	0	5	0	0%	No
1,4-Dichlorobenzene	7	0	5	--	--	0	2	0	0%	No
2,2-Dichloropropane	7	0	--	--	--	0	1	0	0%	No
2-Butanone	7	3	4800	42	RMW-04	0	10	0	0%	No
2-Chloroethyl Vinyl Ether	5	0	--	--	--	0	5	0	0%	No
2-Chlorotoluene	7	0	160	--	--	0	1	0	0%	No
2-Hexanone	7	0	40	--	--	0	10	0	0%	No
4-Chlorotoluene	7	0	160	--	--	0	1	0	0%	No
4-Methyl-2-pentanone	7	0	640	--	--	0	10	0	0%	No
Acetone	7	3	7200	15	RMW-03	0	10	0	0%	No

Table 5-3. Contaminants of Potential Concern (Groundwater)

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Number of Samples Analyzed	Number of Detected Samples	Preliminary Screening Level (ug/L)	Maximum Detected Concentration (ug/L)	Location of Maximum Detection	Number of Detections Exceeding Preliminary SL	Maximum Reporting Limit (ug/L)	Number of Non-Detections with Reporting Limits Exceeding Preliminary SL	Frequency of Exceedance of Preliminary SL[(a)]	COPC[(b)]
VOCs (continued)										
Acrolein	5	0	1	--	--	0	50	5	100%	Yes
Acrylonitrile	5	0	0.019	--	--	0	5	5	100%	Yes
Bromobenzene	7	0	64	--	--	0	1	0	0%	No
Bromochloromethane	7	0	--	--	--	0	1	0	0%	No
Bromodichloromethane	7	0	0.73	--	--	0	1	7	100%	Yes
Bromoethane	5	0	--	--	--	0	2	0	0%	No
Bromoform	7	0	4.6	--	--	0	3	0	0%	No
Bromomethane	7	0	11	--	--	0	2	0	0%	No
Carbon Disulfide	7	0	800	--	--	0	10	0	0%	No
Carbon Tetrachloride	7	0	0.2	--	--	0	1	7	100%	Yes
Chlorobenzene	7	0	100	--	--	0	1	0	0%	No
Chloroethane	7	0	15000	--	--	0	2	0	0%	No
Chloroform	7	0	1.2	--	--	0	1	0	0%	No
Chloromethane	7	0	150	--	--	0	5	0	0%	No
cis-1,2-Dichloroethene (DCE)	7	0	16	--	--	0	1	0	0%	No
cis-1,3-Dichloropropene	7	0	0.22	--	--	0	3	7	100%	Yes
Dibromochloromethane	7	0	0.6	--	--	0	2	7	100%	Yes
Dibromomethane	7	0	80	--	--	0	1	0	0%	No
Dichlorodifluoromethane	2	0	4.2	--	--	0	1	0	0%	No
Isopropylbenzene	7	1	800	3.8	RMW-04	0	1	0	0%	No
m,p-Xylenes	13	2	--	1.8	RMW-04	0	1	0	0%	No
Methylene Chloride	7	0	5	--	--	0	5	0	0%	No
Methyliodide	5	0	--	--	--	0	1	0	0%	No
n-Butylbenzene	7	0	400	--	--	0	1	0	0%	No
n-Propylbenzene	7	1	800	5	RMW-04	0	1	0	0%	No
o-Xylene	13	0	--	--	--	0	1	0	0%	No
p-Isopropyltoluene	7	0	--	--	--	0	2	0	0%	No
sec-Butylbenzene	7	0	800	--	--	0	1	0	0%	No
Styrene	7	0	100	--	--	0	1	0	0%	No
tert-Butylbenzene	7	0	800	--	--	0	1	0	0%	No
Tetrachloroethene (PCE)	7	0	2.4	--	--	0	1	0	0%	No
trans-1,2-Dichloroethene	7	0	77	--	--	0	1	0	0%	No
trans-1,3-Dichloropropene	7	0	0.22	--	--	0	3	7	100%	Yes
Trichloroethene (TCE)	7	0	0.3	--	--	0	1	7	100%	Yes
Trichlorofluoromethane	7	0	120	--	--	0	2	0	0%	No
Vinyl Acetate	2	0	7800	--	--	0	10	0	0%	No
Vinyl Chloride	7	0	0.02	--	--	0	2	7	100%	Yes

Notes:
(a) Includes both detected concentrations and, for nondetected results, reporting limits.
(b) Entry is Yes if one or more detected results exceed SL or if chemical is never detected and all RLs exceed SL. Otherwise, entry is No.
COPC - chemical of potential concern
SL - screening level

Table 5-4. Identification of Upland COCs

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	COPC in Unsaturated Zone Soil	COPC in Saturated Zone Soil	COPC in Groundwater	COPCs in Soil Only				Other Considerations	Soil COC	Groundwater COC
				Direct Contact SL (mg/kg)	Number of Samples Analyzed	Number of Detections Exceeding Direct Contact SL	Frequency of Exceedance of Direct Contact SL[(a)]			
BTEX										
Benzene	Yes	Yes	Yes	18	30	0	0%	Not detected in groundwater above current PQL.	No	No
Ethylbenzene	No	Yes	No	8000	30	0	0%	--	No	No
Total Xylenes	No	Yes	No	16000	30	0	0%	--	No	No
Conventionals										
Sulfide	N/A	No	Yes	--	8	0	0%	Elevated in groundwater due to naturally reducing conditions in peat. No Site source.	No	No
Metals										
Antimony	Yes	Yes	No	32	16	0	0%	Not detected in groundwater above current PQL.	No	No
Arsenic	Yes	Yes	Yes	0.67	1045	920	100%	--	Yes	Yes
Barium	No	Yes	No	16000	16	0	0%	--	No	No
Cadmium	No	No	Yes	80	51	0	0%	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
Chromium	No	Yes	No	--	51	0	0%	--	No	No
Copper	No	Yes	Yes	3200	48	0	0%	No exceedances in unsaturated soil, suggesting there wasn't a source from surface operations. Higher concentrations in saturated soil, may be influenced by redox conditions. Limited number of exceedances in groundwater (<3%), and low concentrations of exceedances.	No	No
Iron	N/A	No	Yes	56000	8	0	0%	Elevated in groundwater due to naturally reducing conditions in peat. No historical Site source. Component of PAZ, but only exceedances were prior to PAZ or upgradient of PAZ.	No	No
Lead	No	Yes	Yes	250	51	0	0%	--	No	No
Manganese	N/A	No	Yes	3736	8	0	0%	Elevated in groundwater due to naturally reducing conditions in peat. No Site source.	No	No
Mercury	Yes	Yes	Yes	24	48	0	0%	Not detected in groundwater above current PQL.	No	No
Nickel	No	Yes	No	1600	48	0	0%	--	No	No
Selenium	Yes	Yes	Yes	400	33	0	0%	Not detected in groundwater above current PQL.	No	No
Silver	No	Yes	No	400	51	0	0%	--	No	No
Thallium	Yes	Yes	Yes	0.8	16	0	100%	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
Zinc	Yes	Yes	Yes	24000	280	0	0%	--	Yes	Yes

Table 5-4. Identification of Upland COCs

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	COPC in Unsaturated Zone Soil	COPC in Saturated Zone Soil	COPC in Groundwater	COPCs in Soil Only				Other Considerations	Soil COC	Groundwater COC
				Direct Contact SL (mg/kg)	Number of Samples Analyzed	Number of Detections Exceeding Direct Contact SL	Frequency of Exceedance of Direct Contact SL [(a)]			
Other SVOCs										
2,4,6-Trichlorophenol	Yes	Yes	No	80	28	0	0%	--	No	No
2,4-Dichlorophenol	N/A	Yes	No	240	12	0	0%	--	No	No
Dibenzofuran	No	Yes	No	80	16	0	0%	--	No	No
Hexachlorobutadiene	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
Pentachlorophenol	Yes	Yes	Yes	2.5	65	4	7%	No groundwater detections above PQL.	Yes	No
Phenol	No	Yes	N/A	24000	5	0	0%	--	No	No
PAHs										
1-Methylnaphthalene	N/A	Yes	No	34	22	0	0%	--	No	No
2-Methylnaphthalene	No	Yes	No	320	28	0	0%	--	No	No
Fluoranthene	Yes	Yes	Yes	3200	41	0	0%	Detected in groundwater above protection of sediment and surface water screening levels, but not near shoreline. Groundwater concentrations below drinking water screening levels. Soil concentrations are in compliance with direct contact screening level based on MTCA 3-part rule.	No	No
Fluorene	No	Yes	No	3200	41	0	0%	--	No	No
Pyrene	Yes	Yes	Yes	2400	41	0	0%	Detected in groundwater above protection of sediment and surface water screening levels, but not near shoreline. Groundwater concentrations below drinking water screening levels. Soil concentrations are in compliance with direct contact screening level based on MTCA 3-part rule.	No	No
Benz(a)anthracene	No	No	Yes	--	41	0	0%	Detected in groundwater above protection of sediment and surface water screening levels, but not near shoreline. Groundwater concentrations below drinking water screening levels. Soil concentrations are in compliance with direct contact screening level based on MTCA 3-part rule.	No	No
Benzo(a)pyrene	Yes	Yes	Yes	0.19	41	0	0%		No	No
Benzo(b)fluoranthene	No	No	Yes	--	41	0	0%		No	No
Benzo(k)fluoranthene	No	No	Yes	--	41	0	0%		No	No
Chrysene	No	No	Yes	--	41	0	0%		No	No
Dibenzo(a,h)anthracene	No	No	Yes	--	41	0	0%		No	No
Indeno(1,2,3-cd)pyrene	No	No	Yes	--	41	0	0%		No	No
Total cPAHs TEQ (ND = 1/2 RDL)	Yes	Yes	Yes	0.19	43	2	5%		No	No

Table 5-4. Identification of Upland COCs

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	COPC in Unsaturated Zone Soil	COPC in Saturated Zone Soil	COPC in Groundwater	COPCs in Soil Only				Other Considerations	Soil COC	Groundwater COC
				Direct Contact SL (mg/kg)	Number of Samples Analyzed	Number of Detections Exceeding Direct Contact SL	Frequency of Exceedance of Direct Contact SL [(a)]			
PCB Aroclors										
Total PCBs (Sum of Aroclors)	Yes	Yes	Yes	1	19	0	0%	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
TPHs										
Diesel+Motor Oil Range Organics	No	Yes	Yes	--	75	0	0%	No direct contact screening level available. One soil sample exceeds the MTCA Method A cleanup level.	Yes	Yes
Other VOCs										
1,1,2,2-Tetrachloroethane	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
1,1,2-Trichloroethane	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
1,2,3-Trichloropropane	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
1,2,4-Trichlorobenzene	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
1,2-Dibromo-3-chloropropane	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
1,2-Dibromoethane (EDB)	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
1,2-Dichloropropane	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
Acrolein	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
Acrylonitrile	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No

Table 5-4. Identification of Upland COCs

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	COPC in Unsaturated Zone Soil	COPC in Saturated Zone Soil	COPC in Groundwater	COPCs in Soil Only				Other Considerations	Soil COC	Groundwater COC
				Direct Contact SL (mg/kg)	Number of Samples Analyzed	Number of Detections Exceeding Direct Contact SL	Frequency of Exceedance of Direct Contact SL [(a)]			
Other VOCs (continued)										
Bromodichloromethane	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
Carbon Tetrachloride	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
cis-1,3-Dichloropropene	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
Dibromochloromethane	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
trans-1,3-Dichloropropene	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
Trichloroethene (TCE)	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No
Vinyl Chloride	N/A	N/A	Yes	--	--	--	--	Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list.	No	No

Note:
N/A - data not available
(a) Includes both detected concentrations and, for nondetected results, reporting limits. Includes both saturated and unsaturated zones.
COPC - contaminant of potential concern
GW - groundwater
PAZ - passive attenuation zone
RL - reporting level
SL - screening level

Table 5-5. Summary of Soil and Groundwater COCs and Screening Levels

DRAFT

Project No. 050004, Barbee Mill Site, Renton, WA

Contaminant of Concern	Soil Screening Level (in mg/kg)				Groundwater Screening Level (in ug/L)	
	Unsaturated Soil	Basis	Saturated Soil	Basis		Basis
Arsenic	20	A	20	A	16	NB
Zinc	120	SW	85	NB	100	SW
Pentachlorophenol	2.5	DC	2.5	DC	--	
Sum of TPH-D + TPH-O	2,000	A	2,000	A	--	
TPH-D	2,000	A	2,000	A	500	A
Compliance Basis:	**Point**		**Point**		**Point**	

Note:

'-- not a COC for that medium

Acronym:

A= MTCA Method A Cleanup Level for unrestricted use
NB = Natural Background
DC = direct contact
PQL = Practical Quantitation Limit
SW = Protection of Surface Water
TPH-D = Diesel-Range Total Petroleum Hydrocarbons
TPH-O = Oil-Range Total Petroleum Hydrocarbons

Table 5-6. Sediment Screening Levels

Project No. PNG0869, Barbee Mill Site, Renton, WA

Analyte	Bio Accumulative	Site Related?	Site-wide Freshwater Surface Sediments Screening Levels									Nearshore Surface Sediments Screening Levels			
			Protection of Benthic[a]			Protection of Human Health[b]				Other Dataset[d]	Selected SL for Determining Site-wide COPCs	Protection of Human Health		Other Dataset[d]	Selected SL for Determining Nearshore COPCs
						Human Health Direct Contact		Human and Ecological Ingestion Pathways				Human Health Direct Contact	Background		
			Benthic SCO	Benthic CSL	Site-Specific	Tribal Clamming	Net-fishing	Bioaccumulative SCO[c] (Natural Background)	Bioaccumulative CSL[c] (Regional Background)			Beach Play	Bioaccumulative SCO/CSL[c] (Natural/Regional Background)		
Conventionals in %															
Wood Debris	No	Yes	--	--	50	--	--	--	--	--	50	--	--	--	--
Total organic carbon	No	Yes	--	--	13.5	--	--	--	--	--	13.5	--	--	--	--
Metals in mg/kg															
Arsenic	Yes	Yes	14	120	--	0.82	1.9	11	24[e]	--	11	2.1[f]	11 / 24[e]	--	2.1[f]/11
Lead	Yes	No	360	> 1300	--	--	--	21	--	--	21	--	21 / --	--	--
Manganese	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	Yes	No	11	> 20	--	11,406	23,004	--	--	2.0	2.0	3,338	--	2.0	--
Zinc	No	No	3,200	> 4200	--	684,375	1,380,252	93	--	--	3,200	200,305	93 / --	--	--
Polycyclic Aromatic Hydrocarbons in ug/kg															
Naphthalene	No	No	--	--	--	9,737,000	24,463,000	--	--	--	9,737,000	1,785,000	--	--	--
Acenaphthene	No	No	--	--	--	29,211,000	73,389,000	--	--	--	29,211,000	5,354,920	--	--	--
Acenaphthylene	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	No	No	--	--	--	19,474,000	48,926,000	--	--	--	19,474,000	3,570,000	--	--	--
Phenanthrene	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	No	No	--	--	--	146,058,000	366,946,000	--	--	--	146,058,000	26,775,000	--	--	--
Fluoranthene	Yes	No	--	--	--	19,474,000	48,926,000	--	--	--	19,474,000	3,570,000	--	--	--
Pyrene	Yes	No	--	--	--	14,606,000	36,695,000	--	--	--	14,606,000	2,678,000	--	--	--
Benz(a)anthracene	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(j)fluoranthene	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Benzofluoranthenes	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	No	No	--	--	--	490	1,220	--	--	--	490	170	--	--	--
Indeno(1,2,3-cd)pyrene	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	No	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	Yes	No	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PAHs	No	No	17,000	30,000	--	--	--	--	--	--	17,000	--	--	--	--
Total cPAHs TEQ (ND = 1/2 RL	Yes	No	--	--	--	490	1,220	21	210	--	21 / 210	170	21 / 210	--	170/210

Footnotes:

a. Values from Table 8-1 SCUM (Ecology, 2021).
b. Values either retrieved from Table 9-3 of SCUM (Ecology, 2021), or estimated using the Appendix K spreadsheet (Ecology, 2020). See Table 3b for beach-play specific SLs.
c. Natural and Regional background values from Table 10-1 and Table 10-2 of SCUM (Ecology, 2021).
d. Preliminary Lake Washington ambient concentration estimated as the 90th percentile using a dataset compiled from the King County Lakes Sediment Monitoring Program (EIM study ID: KingLakeSeds) as described in Appendix G.
e. Preliminary regional background value based on discussion with Ecology and analyses performed for the Gas Works Park site.
f. Beach play direct contact screening level was recalculated using a 2023 updated version of SCUM Appendix K. The natural background is retained as screening level, however the risk-based thresholds is retained for COC identification.

Acronyms:

-- = Not available or not applicable
% = percentage
COPC = contaminant of potential concern
COC = Contaminant of Concern
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
CSL = cleanup screening level
DMMP = Dredged Materials Management Program
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
RL = Reporting Limit
SCO = sediment cleanup objective
SCUM = Sediment Cleanup Users Manual
TEQ = Toxicity equivalent quotients

Table 5-7. Identification of Site-Wide Sediment Contaminants of Concern

Project No. PNG0869, Barbee Mill Site, Renton, WA

Analyte	Screening Level	Regional/ Ambient Background	No. of Samples Analyzed	No. of Samples Detected	Maximum Detected Concentration[a]	No. of Detects > SL[b]	No. of Nondetects > SL	Reporting Limits Exceeding SL	FOE[d]	Used Historically at the Site	Upland COC	Exceeds SLs[e]	Exceeds Background?	Retained as Site-wide COC
Conventionals in %														
Wood Debris	50	--	75	66	100	21	0	0	28%	Yes	No	**Yes**	--	**Yes**
Total organic carbon	13.5	--	69	69	47.5	20	0	0	29%	Yes	No	**Yes**	--	**Yes**
Metals in mg/kg														
Arsenic	11	24	56	31	34.4	4	5	5	16%	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Lead	21	21	56	56	51.3	21	0	0	38%	No	No	**Yes**	**Yes**	**Yes**
Manganese	--	--	28	28	383	0	0	0	0%	No	No	No	--	No
Selenium	2	2	47	15	1.86	0	18	21	38%	No	No	**Yes**	**Yes**	**Yes**
Zinc	3200	--	47	47	1580	0	0	0	0%	Yes	Yes	No	--	No
Polycyclic Aromatic Hydrocarbons in ug/kg														
Naphthalene	13,000,000	--	47	28	390	0	0	0	0%	No	No	No	--	No
Acenaphthene	39,000,000	--	49	26	192	0	0	0	0%	No	No	No	--	No
Acenaphthylene	--	--	49	25	110	0	0	0	0%	No	No	No	--	No
Fluorene	26,000,000	--	48	25	440	0	0	0	0%	No	No	No	--	No
Phenanthrene	--	--	49	31	1900	0	0	0	0%	No	No	No	--	No
Anthracene	200,000,000	--	48	31	1400	0	0	0	0%	No	No	No	--	No
Fluoranthene	26,000,000	--	47	31	2100	0	0	0	0%	No	No	No	--	No
Pyrene	20,000,000	--	49	32	3100	0	0	0	0%	No	No	No	--	No
Benz(a)anthracene	--	--	45	29	850	0	0	0	0%	No	No	No	--	No
Chrysene	--	--	47	37	4000	0	0	0	0%	No	No	No	--	No
Benzo(b)fluoranthene	--	--	49	33	2300	0	0	0	0%	No	No	No	--	No
Benzo(k)fluoranthene	--	--	48	36	1700	0	0	0	0%	No	No	No	--	No
Benzo(j)fluoranthene	--	--	27	27	186	0	0	0	0%	--	--	No	--	No
Total Benzofluoranthenes	--	--	27	27	932	0	0	0	0%	--	--	No	--	No
Benzo(a)pyrene	200,000	--	48	38	1700	0	0	0	0%	No	No	No	--	No
Indeno(1,2,3-cd)pyrene	--	--	45	31	500	0	0	0	0%	No	No	No	--	No
Dibenzo(a,h)anthracene	--	--	47	31	490	0	0	0	0%	No	No	No	--	No
Benzo(g,h,i)perylene	--	--	48	33	750	0	0	0	0%	No	No	No	--	No
Total PAHs	17,000	--	55	46	6817	0	0	0	0%	No	No	No	--	No
Total cPAHs TEQ (ND = 1/2 RL)	21	210	46	33	674	33	12	12	98%	No	No	**Yes**	**Yes**	**Yes**

Footnotes:

a. In historical and current surface sediment collected between 1997 and 2022 within the Barbee Mill Sediment Investigations. Historical RIFS Quendall Terminal data not included. Maximum value reported at 2021/22 locations where duplicates were collected (BM-SED-03 and PER-SED-21) and at 2022 re-occupied station (BM-SED-16).

b. All surface sediment samples were included.

c. Included assessment of wood debris performed on dry basis.

d. FOE includes detected and non-detected results.

e. Exceedances of either detected results, non-detected results, or reporting limits (where non-detected exceed).

Acronyms:

-- = Not available or not applicable
% = percentage
COC = Contaminant of Concern
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
FOE = frequency of exceedance
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
PAH = Polycyclic Aromatic Hydrocarbons
RL = Reporting Limit
SL = screening level
TEQ = Toxicity equivalent quotients

Table 5-8. Identification of Nearshore Sediment Contaminants of Concern

Project No. PNG0869, Barbee Mill Site, Renton, WA

Analyte	Direct Contact SL/ Natural Background	No. of Samples Analyzed	No. of Samples Detected	Maximum Detected Concentration[a]	No. of Detected Results Exceeding SL	No. of Nondetected Results Exceeding SL	FOE	Used Historically at the Site	Upland COC	Exceeds Direct Contact SLs	Retained as Site-wide COC	Complete Exposure Pathway?	Exceeds Background?	Retained as Nearshore COC
Conventionals in %														
Wood Debris[b]	50	--	--	--	--	--	--	Yes	No	--	Yes	--	--	--
Total organic carbon	13.5	3	3	--	0	0	0%	No	No	No	Yes	--	--	--
Metals in mg/kg														
Arsenic	2.1/11	3	3	6.6	3 / 0	0	100% / 0%	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**
Lead	--	3	3	--	0	0	0%	No	No	No	Yes	Yes		No
Manganese	--	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Selenium	3,300	3	3	--	0	0	0%	No	No	No	Yes	Yes		No
Zinc	200,000	3	3	--	0	0	0%	Yes	Yes	No	No	Yes	--	No
Polycyclic Aromatic Hydrocarbons in ug/kg														
Naphthalene	10,200,000	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Acenaphthene	30,600,000	3	2	--	0	0	0%	No	No	No	No	Yes	--	No
Acenaphthylene	--	3	2	--	0	0	0%	No	No	No	No	Yes	--	No
Fluorene	20,400,000	3	2	--	0	0	0%	No	No	No	No	Yes	--	No
Phenanthrene	--	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Anthracene	150,000,000	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Fluoranthene	20,400,000	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Pyrene	150,000,000	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Benz(a)anthracene	--	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Chrysene	--	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Benzo(b)fluoranthene	--	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Benzo(k)fluoranthene	--	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Benzo(j)fluoranthene	--	3	3	--	0	0	0%	--	--	--	--	--	--	--
Total Benzofluoranthenes	--	3	3	--	0	0	0%	--	--	--	--	--	--	--
Benzo(a)pyrene	150,000	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Indeno(1,2,3-cd)pyrene	--	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Dibenzo(a,h)anthracene	--	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Benzo(g,h,i)perylene	--	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Total PAHs	--	3	3	--	0	0	0%	No	No	No	No	Yes	--	No
Total cPAHs TEQ (ND = 1/2 RL)	170/21	3	3	155	0	0	0%	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**

Footnotes:

a. Nearshore surface sediment were collected in 2021-2022.

b. Assessment of wood debris was not performed in nearshore sediments.

Acronyms:

-- = Not available or not applicable
% = percentage
COPC = contaminant of potential concern
COC = Contaminant of Concern
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
CSL = cleanup screening level
DMMP = Dredged Materials Management Program
FOE = frequency of exceedance
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
RL = Reporting Limit
SCO = sediment cleanup objective
SCUM = Sediment Cleanup Users Manual
SL = Screening Level
TEQ = Toxicity equivalent quotients

Table 5-9. Summary of Sediment COCs and Screening Levels Adjusted for Natural Background

DRAFT

Project No. PNG0869, Barbee Mill Site, Renton, WA

Retained Contaminants of Concern	Site-related in Sediment	Site-Wide Sediment						Nearshore Sediment[a]	
		Benthic SCO		*HH Direct Contact*		*Bioaccumulative SCO*		*HH Direct Contact*	
		SL	*Basis*	*SL*	*Basis*	*SL*	*Basis*	*SL*	*Basis*
Conventionals in %									
Wood Debris[b]	Y	50	SP	--	--	--	--	--	--
Total organic carbon	Y	13.5	SP	--	--	--	--	--	--
Metals in mg/kg									
Arsenic	Y	14	Benthic SCO	11	NB	11 / 24	NB / RB	11	NB
Lead	N	360	Benthic SCO	--	--	21	NB	--	--
Selenium	N	11	Benthic SCO	--	--	2	AB	--	--
Polycyclic Aromatic Hydrocarbons in ug/kg									
Total cPAHs TEQ (ND = 1/2 RL)	N	--	--	--	--	21 / 210	NB / RB	170	DC - BP

Footnotes:

a. Nearshore surface sediment were collected in 2021-2022.

b. Assessment of wood debris was not performed in nearshore sediments.

Acronyms:

-- = Not available or not applicable

% = percentage

AB = Ambient Concentration

COC = Contaminant of Concern

cPAHs = Carcinogenic polycyclic aromatic hydrocarbons

DC - BP = Direct Contact - Beach Play scenario

HH = Human Health

ug/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

NB = Natural Background

ND = Non Detected

RB = Regional Background

RL = Reporting Limit

SCO = sediment cleanup objective

SL = screening levels

SP = Site-specific screening values

TEQ = Toxicity equivalent quotients

Table 6-1a. Soil, Groundwater, and Porewater Summary Statistics (All Data)

DRAFT

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Total Number of Samples Analyzed	Total Number of Detected Samples	Samples Exceeding Screening Levels	Maximum Detected Concentration
Soil				
Arsenic	1,045	945	361	2,600 mg/kg
Zinc	280	279	51	1,600 mg/kg
Pentachlorophenol	65	20	4	220 mg/kg
Diesel + Oil Extended Range Organics	75	35	1	9,600 mg/kg
Groundwater				
Arsenic	840	794	594	52,000 ug/L
Zinc	63	18	2	150 ug/L
Diesel + Oil Extended Range Organics	36	4	2	1,600 ug/L
Porewater				
Arsenic	28	19	4	1,400 ug/L

Notes:

Soil results are screened against unsaturated or saturated final screening levels.

Groundwater and porewater results are screened against final groundwater screening levels.

Samples exceeding screening level only includes detected samples.

mg/kg = milligrams per kilogram

ug/L = micrograms per liter

Table 6-1b. Soil, Groundwater, and Porewater Summary Statistics (Current Conditions Dataset)

DRAFT

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Total Number of Samples Analyzed	Total Number of Detected Samples	Samples Exceeding Screening Levels	Maximum Detected Concentration
Soil				
Arsenic	459	426	9	88 mg/kg
Zinc	90	90	2	1,000 mg/kg
Pentachlorophenol	26	10	0	2.4 mg/kg
Diesel + Oil Extended Range Organics	35	5	0	510 mg/kg
Groundwater				
Arsenic	656	622	483	1,900 ug/L
Zinc	42	4	0	14 ug/L
Diesel + Oil Extended Range Organics	22	0	0	--
Porewater				
Arsenic	19	12	1	17 ug/L

Notes

Soil results are screened against unsaturated or saturated final screening levels, for dates 1/1/2006 to date (since soil removal actions).

Overexcavated soil samples excluded.

Groundwater and porewater results are screened against final groundwater screening levels for dates 5/1/2007 to date (since installation of the PAZ).

Samples exceeding screening level only includes detected samples.

mg/kg = milligrams per kilogram

ug/L = micrograms per liter

Table 6-2a Sediment Data Summary Statistics - Historical Dataset

Project No. PNG0869, Barbee Mill Site, Renton, WA

Analyte	n	No. of Detects	No. of ND	FOD	% ND	Unit	Statistics for Data Set with NDs using Kaplan Meier Method					Statistics using Detected Data Only							
							Min RL	Max RL	KM Mean	KM SD	KM CV	Minimum	Mean	Median	90 %ile	Maximum	Variance	SD	CV
Conventionals																			
Wood Debris	40	33	7	82.5%	17.5%	%	5	5	39.5	1032	0.813	5	46.82	35	80	100	974.7	31.22	0.667
Total Organic Carbon	41	41	0	100%	0%	%	N/A	N/A	11.66	68.5	0.71	2.3	11.66	9.1	20.9	46	68.5	8.277	0.71
Metals																			
Arsenic	28	3	25	11%	89%	mg/kg	7	20	5.871	29.93	0.932	4.4	18.13	20	20	30	166.5	12.9	0.711
Lead	28	28	0	100%	0%	mg/kg	N/A	N/A	22.61	184.8	0.601	5	22.61	16.5	43.9	50	184.8	13.6	0.601
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	19	0	19	0%	100%	mg/kg	1	20	N/A	N/A	N/A	N/A	N/A	N/A	20	N/A	N/A	N/A	N/A
Zinc	19	19	0	100%	0%	mg/kg	N/A	N/A	193.4	115069	1.754	34	193.4	123	195.4	1580	115069	339.2	1.754
Polycyclic Aromatic Hydrocarbons																			
Naphthalene	22	6	16	27%	73%	µg/kg	99	4000	111.7	8870	0.843	51	194.3	190	518	390	17727	133.1	0.685
Acenaphthene	22	1	21	5%	95%	µg/kg	99	4000	70	0	N/A	70	70	70	518	70	N/A	N/A	N/A
Acenaphthylene	22	1	21	5%	95%	µg/kg	99	4000	104.9	205.8	0.137	140	140	140	518	140	N/A	N/A	N/A
Fluorene	22	6	16	27%	73%	µg/kg	99	4000	137.7	10019	0.727	80	233.3	205	521	440	18787	137.1	0.587
Phenanthrene	22	4	18	18%	82%	µg/kg	99	4000	337.3	263905	1.523	800	1325	1300	1400	1900	209167	457.3	0.345
Anthracene	22	5	17	23%	77%	µg/kg	99	4000	181.3	107207	1.806	39	609.8	500	1324	1400	245685	495.7	0.813
Fluoranthene	22	6	16	27%	73%	µg/kg	99	4000	424.5	493341	1.655	110	1218	1340	2080	2300	1007777	1004	0.824
Pyrene	22	5	17	23%	77%	µg/kg	99	4000	563.9	856576	1.641	530	2046	2200	2380	3100	890080	943.4	0.461
Benz(a)anthracene	19	3	16	16%	84%	µg/kg	99	4000	135.2	34528	1.374	76	402	280	960	850	160932	401.2	0.998
Chrysene	22	12	10	55%	45%	µg/kg	100	4000	500.6	712274	1.686	88	784	445	1400	4000	1204916	1098	1.4
Benzo(b)fluoranthene	22	6	16	27%	73%	µg/kg	100	4000	321.7	244078	1.536	160	840	675	1336	2300	558600	747.4	0.89
Benzo(k)fluoranthene	22	10	12	45%	55%	µg/kg	100	4000	370.4	217234	1.258	120	649	485	1460	1700	340654	583.7	0.899
Benzo(j)fluoranthene	--	`	--	--	--	µg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Benzofluoranthenes	--	--	--	--	--	µg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	22	12	10	55%	45%	µg/kg	100	4000	501.9	276812	1.048	140	782.5	815	1570	1700	326220	571.2	0.73
Indeno(1,2,3-cd)pyrene	19	5	14	26%	74%	µg/kg	100	4000	168.9	20181	0.841	93	320.6	390	704	500	36707	191.6	0.598
Dibenzo(a,h)anthracene	22	6	16	27%	73%	µg/kg	99	4000	132.5	11297	0.802	80	222.3	175	526	490	26233	162	0.728
Benzo(g,h,i)perylene	22	7	15	32%	68%	µg/kg	100	4000	213.5	50430	1.052	69	458.4	560	684	690	56211	237.1	0.517
Total PAHs	28	19	9	68%	32%	mg/kg	0.1	4	2.309	9.301	1.321	0.5	3.179	1.97	4.534	13.7	11.77	3.43	1.079
Total cPAHs TEQ (ND = 0)	19	6	13	32%	68%	mg/kg	0.1	4	0.211	0.0961	1.471	0.0497	0.453	0.228	1.192	1.14	0.21	0.458	1.011
Total cPAHs TEQ (ND = 1/2 RDL)	19	3	16	16%	84%	mg/kg	0.0755	3.02	0.111	0.00244	0.445	0.154	0.181	0.175	1.078	0.213	8.94E-04	0.0299	0.166

Notes:

1. Historical and current surface sediment collected between 1997 and 2022. Historical RIFS Quendall Terminal data not included.
2. All data statistics calculated by using ProUCL 5.2 according to the technical users guidance.

Acronyms:

-- = Not available or not applicable
% = percentage
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
CV = coefficient of variation
FOD = frequency of detection
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
KM = Kaplan Meier
ND = Non Detected
PAHs = Polycyclic aromatic hydrocarbons
PQL = practical quantitation limit
RL = Reporting Limit
SD = standard deviation
SMS = Sediment management standards
TEQ = Toxicity equivalent quotient

Table 6-2b Sediment Data Summary Statistics - RI Current Conditions Dataset

Project No. PNG0869, Barbee Mill Site, Renton, WA

Analyte	n	No. of Detects	No. of ND	FOD	% ND	Unit	Statistics for Data Set with NDs using Kaplan Meier Method					Statistics using Detected Data Only							
							Min MDL	Max MDL	KM Mean	KM SD	KM CV	Minimum	Mean	Median	90 %ile	Maximum	Variance	SD	CV
Conventionals																			
Wood Debris	40	38	2	95%	5%	%	5	7.5	25.7	24.5	0.95	1	26.8	19.1	64.3	95	621	24.9	0.93
Total Organic Carbon	39	39	0	100%	0%	%	N/A	N/A	10.3	9.4	0.91	0.14	10.3	8.55	18.1	47.5	88	9.4	0.91
Metals																			
Arsenic	34	31	3	91%	9%	mg/kg	8	20	6.68	5.3	0.79	2.61	6.8	5.82	9.76	34.4	31	5.58	0.821
Lead	30	30	0	100%	0%	mg/kg	N/A	N/A	16.6	10.6	0.64	2.61	16.6	15.8	27.7	51.3	113	10.6	0.638
Manganese	30	29	1	97%	3%	mg/kg	10	10	238	82.6	0.35	138	246	237	342	383	5389	73.4	0.298
Selenium	29	16	13	55%	45%	mg/kg	0.2	1.2	0.68	0.47	0.69	0.27	0.99	1.05	1.12	1.86	0.18	0.42	0.43
Zinc	35	34	1	97%	3%	mg/kg	280	280	110	44	0.4	25.5	110	116.5	143	223	1985	45	0.40
Polycyclic Aromatic Hydrocarbons																			
Naphthalene	32	27	5	84%	16%	µg/kg	3.8	280	40	69.3	1.7	1.46	45	23.8	122	390	5642	75.1	1.67
Acenaphthene	32	26	6	81%	19%	µg/kg	0.57	280	22.2	36.0	1.6	0.79	25	12.7	142	192	1475	38.4	1.54
Acenaphthylene	32	24	8	75%	25%	µg/kg	1.1	280	16.8	25.4	1.5	1.99	20	13.9	130	140	752	27.4	1.37
Fluorene	32	23	9	72%	28%	µg/kg	0.63	280	39	72	1.8	1.38	50	14.3	154	340	7010	84	1.66
Phenanthrene	32	31	1	97%	3%	µg/kg	280	280	240	409	1.7	3.01	245	76.5	778	1900	177447	421	1.72
Anthracene	32	31	1	97%	3%	µg/kg	280	280	128	273	2.1	0.92	130	30.1	426	1400	79229	282	2.16
Fluoranthene	32	31	1	97%	3%	µg/kg	280	280	371	598	1.6	2.85	379	146	1095	2300	379473	616	1.63
Pyrene	32	31	1	97%	3%	µg/kg	280	280	433	690	1.6	2.73	443	188	904	3100	504108	710	1.60
Benz(a)anthracene	29	28	1	97%	3%	µg/kg	280	280	98	82	0.83	1.84	99	82.4	221	361	7018	84	0.85
Chrysene	32	31	1	97%	3%	µg/kg	280	280	382	720	1.9	4.12	391	170	812	4000	549670	741	1.90
Benzo(b)fluoranthene	32	31	1	97%	3%	µg/kg	280	280	284	408	1.4	3.62	290	186	569	2300	176633	420	1.45
Benzo(k)fluoranthene	32	32	0	100%	0%	µg/kg	N/A	N/A	190	337	1.8	1.87	190	96.8	288	1700	113849	337	1.78
Benzo(j)fluoranthene	29	28	1	97%	3%	µg/kg	280	280	67	53.3	0.80	1.26	67	55.9	159	186	2948	54.3	0.81
Total Benzofluoranthenes	29	28	1	97%	3%	µg/kg	280	280	313	245	0.79	7.09	320	293	716	932	62801	251	0.783
Benzo(a)pyrene	32	31	1	97%	3%	µg/kg	280	280	270	342	1.3	2.83	275	154	482	1600	123916	352	1.280
Indeno(1,2,3-cd)pyrene	29	29	0	100%	0%	µg/kg	N/A	N/A	133	108	0.81	2.53	133	124	259	433	11627	108	0.812
Dibenzo(a,h)anthracene	32	31	1	97%	3%	µg/kg	0.28	0.28	70	97.6	1.4	1.48	72.2	46.1	128	490	9990	100	1.38
Benzo(g,h,i)perylene	32	31	1	97%	3%	µg/kg	0.21	0.21	205	171	0.84	4.45	212	177	462	630	29880	173	0.816
Total PAHs	28	28	0	100%	0%	µg/kg	N/A	N/A	1828	1559	0.85	35.7	1828	1494	3751	6817	2431489	1559	0.85
Total cPAHs TEQ (ND = 0)	28	28	0	100%	0%	µg/kg	N/A	N/A	237	180	0.76	4.2	237	207	463	674	32417	180	0.759
Total cPAHs TEQ (ND = 1/2 R	28	28	0	100%	0%	µg/kg	N/A	N/A	237	180	0.76	4.2	237	207	463	674	32417	180	0.759

Notes:

1. The RI current conditions dataset includes 2021/2022 results and data collected between 1997 and 2022 within the Barbee Mill Site Sediment boundary (but outside of the dredged area).
2. All data statistics calculated by using ProUCL 5.2 according to the technical users guidance.

Acronyms:

-- = Not available or not applicable
% = percentage
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
CV = coefficient of variation
FOD = frequency of detection
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
KM = Kaplan Meier
ND = Non Detected
PAHs = Polycyclic aromatic hydrocarbons
PQL = practical quantitation limit
MDL = Method Detection Limit
SD = standard deviation
SMS = Sediment management standards
TEQ = Toxicity equivalent quotient

Table 6-3. Subsurface Sediment Data Compared to Screening Levels

Project No. PNG0869, Barbee Mill Site, Renton, WA

Analyte	Screening Level	Location	B-01	B-01	B-01	B-02	B-02	B-03	B-03	B-03	B-04	B-04	B-04	B-05
		Collection Date	09/14/2018	09/14/2018	09/14/2018	09/13/2018	09/13/2018	09/13/2018	09/13/2018	09/13/2018	09/12/2018	09/12/2018	09/12/2018	09/12/2018
		Sample ID	B01-12.0-13.0	B01-19.0-20.0	B01-23.0-24.0	B02-21.0-22.0	B02-26.0-27.0	B03-8.0-9.0	B03-21.0-23.0[c]	B03-25.0-26.0	B04-18.0-19.0	B04-20.0-21.0	B04-24.0-25.0	B05-16.0-17.0
		Sample Type[a]	Offshore Boring	Offshore Boring	Offshore Boring	Offshore Boring	Offshore Boring	Offshore Boring	Offshore Boring	Offshore Boring	Offshore Boring	Offshore Boring	Offshore Boring	Offshore Boring
		Sample Depth bml[b]	0-1 ft	7-8 ft	11-12 ft	12-13ft	17-18 ft	2-3 ft	3-5 ft	19-20 ft	10-11 ft	12-13 ft	16-17 ft	1-2 ft
Conventionals in %														
Wood Debris	50		--	--	--	--	--	--	--	--	--	--	--	--
Total organic carbon	13.5		--	--	--	--	--	--	--	--	--	--	--	--
Metals in mg/kg														
Arsenic	11		3.9	2.7	1.3	1.8	1.2	2.3	1.8	1.6	3.2	5.1	1.7	4.3
Lead	21		--	--	--	--	--	--	--	--	--	--	--	--
Selenium	2		--	--	--	--	--	--	--	--	--	--	--	--
Zinc	3200		--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons in ug/kg														
Naphthalene	13000000		--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	39000000		--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--		--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	26000000		--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--		--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	200000000		--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	26000000		--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	20000000		--	--	--	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	--		--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--		--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	--		--	--	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	--		--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	200000		--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	--		--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	--		--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	--		--	--	--	--	--	--	--	--	--	--	--	--
Total PAHs	17000		--	--	--	--	--	--	--	--	--	--	--	--
Total cPAHs TEQ (ND = 0)	21		--	--	--	--	--	--	--	--	--	--	--	--
Total cPAHs TEQ (ND = 1/2 RL)	21		--	--	--	--	--	--	--	--	--	--	--	--

Blue shaded bold text indicates detected exceedance
Blue shaded italic text indicates non detected exceedance

Footnotes:

a. Offshore borings were collected using a direct push rig deployed from a barge. Sediment cores were collected using a vibracore.

b. Offshore soil boring sample depth converted to ex-situ depth without correcting for compaction.

c. Sample B-03-21.0-23.0 was mislabeled. Actual sample depth is 9.0 to 11.0 ft.

Acronyms:

-- = Not available or not applicable
% = percentage
bml = below mudline
cm = centimeters
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
ft = feet
ID = Identification
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
PAHs = Polycyclic aromatic hydrocarbons
RL = Reporting Limit
TEQ = Toxicity equivalent quotient

Table 6-3. Subsurface Sediment Data Compared to Screening Levels

Project No. PNG0869, Barbee Mill Site, Renton, WA

Analyte	Screening Level	Location	B-05	B-05	VB-1	VB-2	VB-3	VB-4
		Collection Date	09/12/2018	09/12/2018	01/24/1997	01/24/1997	01/24/1997	01/24/1997
		Sample ID	B05-21.0-22.0	B05-26.0-26.5	VB-1-35-65	VB-2_35454	VB-3_35454	VB-4-10-20
		Sample Type[a]	Offshore Boring	Offshore Boring	Sediment Core	Sediment Core	Sediment Core	Sediment Core
		Sample Depth bml[b]	10-11 ft	15-15.5 ft	35 - 65 cm	10 - 19 cm	9 - 39 cm	10 - 20 cm
Conventionals in %								
Wood Debris	50		--	--	--	--	--	--
Total organic carbon	13.5		--	--	3.4	3.7	5	1.3
Metals in mg/kg								
Arsenic	11		1.5	1	< 10 U	< 10 U	< 10 U	< 8.0 U
Lead	21		--	--	16	**23**	12	8
Selenium	2		--	--	*< 10 U*	*< 10 U*	*< 10 U*	*< 8.0 U*
Zinc	3200		--	--	57.4	70.2	52	111
Polycyclic Aromatic Hydrocarbons in ug/kg								
Naphthalene	13000000		--	--	< 140 U	< 160 U	< 160 U	< 97 U
Acenaphthene	39000000		--	--	< 140 U	< 160 U	< 160 U	< 97 U
Acenaphthylene	--		--	--	< 140 U	< 160 U	< 160 U	< 97 U
Fluorene	26000000		--	--	< 140 U	< 160 U	< 160 U	< 97 U
Phenanthrene	--		--	--	600	< 160 U	200	< 97 U
Anthracene	200000000		--	--	< 140 U	< 160 U	< 160 U	< 97 U
Fluoranthene	26000000		--	--	290	< 160 U	160	< 97 U
Pyrene	20000000		--	--	440	230	510	120
Benz(a)anthracene	--		--	--	< 140 U	< 160 U	< 160 U	< 97 U
Chrysene	--		--	--	< 140 U	160	< 160 U	< 97 U
Benzo(b)fluoranthene	--		--	--	< 140 U	170	< 160 U	< 97 U
Benzo(k)fluoranthene	--		--	--	< 140 U	< 160 U	< 160 U	< 97 U
Benzo(a)pyrene	200000		--	--	< 140 U	230	< 160 U	130
Indeno(1,2,3-cd)pyrene	--		--	--	< 140 U	180	< 160 U	< 97 U
Dibenzo(a,h)anthracene	--		--	--	< 140 U	< 160 U	< 160 U	< 97 U
Benzo(g,h,i)perylene	--		--	--	< 140 U	220	< 160 U	110
Total PAHs	17000		--	--	2300	2100	2000	1000
Total cPAHs TEQ (ND = 0)	21		--	--	*< 140 U*	**267**	*< 160 U*	**130**
Total cPAHs TEQ (ND = 1/2 RL)	21		--	--	*< 106 U*	**291**	*< 121 U*	**155**

Blue shaded bold text indicates detected exceedance
Blue shaded italic text indicates non detected exceedance

Footnotes:

a. Offshore borings were collected using a direct push rig deployed from a barge. Sediment cores were collected using a vibracore.

b. Offshore soil boring sample depth converted to ex-situ depth without correcting for compaction.

c. Sample B-03-21.0-23.0 was mislabeled. Actual sample depth is 9.0 to 11.0 ft.

Acronyms:

-- = Not available or not applicable
% = percentage
bml = below mudline
cm = centimeters
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
ft = feet
ID = Identification
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
PAHs = Polycyclic aromatic hydrocarbons
RL = Reporting Limit
TEQ = Toxicity equivalent quotient

Table 6-4. Bioassay Testing Results

DRAFT

Project No. PNG0869, Barbee Mill Site, Renton, WA

2022 Barbee Mill Sample	Midge 10-Day Survival and Growth	Amphipod 10-day Survival	Amphipod 28-Day Survival and Growth
Reference - BG-12	M_R = 11.3% G_R = 2.29 mg/ind	M_R = 0%	M_R = 2.5% G_R = 0.576 mg/ind
BM-SED-16-Rd2	M_T = 13.8% G_T= 2.33 mg/ind	M_T = 3.8%	M_T = 1.3% G_T = 0.737 mg/ind
Benthic SCO / CSL Evaluation			
Survival / growth statistically different than reference BG-12 (p<0.05)?	No / No	Yes / --	No / No
Fail SCO - Survival Criteria? (Yes / No) M_T - M_R > 20% (midge 10-d) > 15% (amphipod 10-d) > 10% (amphipod 28-d)	**No** (M_T - M_R = 2.5%)	**No** (M_T - M_R = 3.8%)	**No** (M_T - M_R = -1.2%)
Fail SCO - Growth Criteria? (Yes/No) (MIG_T ÷ MIG_R) <0.8 (midge 10-d) <0.75 (amphipod 28-d)	**No** (MIG_T/MIG_R = 1.0)	--	**No** (MIG_T/MIG_R = 1.3)
Fail CSL - Survival Criteria? (Yes/No) M_T - M_R > 30% (midge 10-d) > 25% (amphipod 10-d) > 25% (amphipod 28-d)	**No** (M_T - M_R = 2.5%)	**No** (M_T - M_R = 3.8%)	**No** (M_T - M_R = -1.2%)
Fail CSL - Growth Criteria? (Yes/No) (MIG_T ÷ MIG_R) <0.7 (midge 10-d) <0.6 (amphipod 28-d)	**No** (MIG_T/MIG_R = 1.0)	--	**No** (MIG_T/MIG_R = 1.3)
Pass SCO[a] / CSL[b]?	**Pass / Pass**	**Pass / Pass**	**Pass / Pass**

Footnotes

a. Fail SCO: If statistically lower than reference (BG-12) and Fails SCO survival and/or growth criteria

b. Fail CSL: If statistically lower than reference (BG-12) and Fails CSL survival and/or growth criteria

Acronyms:

-- = Not available or not applicable
CSL = cleanup screening level
G = Growth
M = Mortality
MIG = Mean Individual Growth (mg/individual as dry weight)
R = Reference
S = Survival
SCO = Sediment Cleanup Objectives
T = Treatment

Table 6-5. Benthic Risk Evaluation

DRAFT

Project No. PNG0869, Barbee Mill Site, Renton, WA

			Sample ID (Current RI Dataset)[a]	BM-SED-01	BM-SED-02	BM-SED-03	BM-SED-03-DUP	BM-SED-04	BM-SED-05	BM-SED-06	BM-SED-07	BM-SED-08	BM-SED-09	BM-SED-10
			Group	On-site	On-site	On-site	QA/QC	On-site	On-site	On-site	On-site	On-site	On-site	On-site
			Depth Interval (cm)	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
			Collection Date	8/26/2021	8/26/2021	8/26/2021	8/26/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021
Benthic Contaminants of Concern[b]	**Unit**	**Benthic SCO[c]**	**Benthic CSL[c]**											
Total Organic Carbon	%	13.5	13.5	**14.4**	8.55	5.86	5.59	3.8	5.85	2.29	3.07	2.38	5.09	4.9
Wood Debris[d]	%	50	50	7.5 U	5 U	16	8	26	8	10	12	19	5	4
Arsenic	mg/kg	14	120	6.02	6.41	5.82	5.98	4.49	4.4	2.69	2.61	2.65	4.01	5.37
Lead	mg/kg	360	> 1300	20.1	18.7	19.2	18.8	14.7	15	6.49	6.55	8.75	12.5	14.6
Selenium	mg/kg	11	> 20	1.41 J	1.2 U	0.87 J	0.83 J	0.41 U	0.56 J	0.32 U	0.35 U	0.35 U	0.72 U	0.69 U
2022 Bioassay Results	--	Pass/Fail	Pass/Fail	--	--	--	--	--	--	--	--	--	--	--

Blue shaded bold text indicates exceedance of benthic SCO

Red shaded bold text indicates exceedance of benthic CSL

Footnotes:

a. Risk evaluation based on RI current conditions dataset. Method detection limit shown for non detected results.

b. Reported benthic contaminants of concern include site-specific compounds (total organic carbon, wood debris, and arsenic) and non-site specific compounds (lead and selenium). PAH were not considered a risk for benthic organisms and are not reported.

c. Benthic SCO and CSL are based on Table 8-1 of SCUM (Ecology, 2021). Site-specific cleanup level reported for wood debris and TOC.

d. Wood debris represent field visual estimate obtained evaluating dry sediment samples as collected.

Acronyms:

-- = Archived or not available
% = percentage
BM = Barbee Mill
cm = centimeters
CSL = Cleanup Screening Level
J = Analyte detected below reporting limit, reported value is an estimate
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
NS = nearshore
PAH = polycyclic aromatic hydrocarbons
PER = perimeter
RL = Reporting Limit
SCO = Sediment Cleanup Objectives
SED = Sediment
TOC = Total Organic Carbon
U = Result was non detected. The reporting limit is reported.

Table 6-5. Benthic Risk Evaluation

Project No. PNG0869, Barbee Mill Site, Renton, WA

			Sample ID (Current RI Dataset)[a]	BM-SED-11	BM-SED-12	BM-SED-13	BM-SED-14	BM-SED-15	BM-SED-16	BM-SED-16	BM-SED-17	PER-SED-18	PER-SED-19	PER-SED-20
			Group	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	Perimeter	Perimeter	Perimeter
			Depth Interval (cm)	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
			Collection Date	8/26/2021	8/26/2021	8/26/2021	8/26/2021	8/26/2021	8/27/2021	21/7/2022	8/27/2021	8/24/2021	8/24/2021	8/24/2021
Benthic Contaminants of Concern[b]	**Unit**	**Benthic SCO[c]**	**Benthic CSL[c]**											
Total Organic Carbon	%	13.5	13.5	7.56	9.34	3.21 J	**35.4**	**47.5**	2.82	6.36	1.35	8.35	**19.5**	**15.1**
Wood Debris[d]	%	50	50	1	7	11	**72.5**	**95**	10	25	15	11	**69**	48
Arsenic	mg/kg	14	120	6.99	6.46	4.94 J	**12**	8.82	**20.1**	**34.4 J+**	4.63	9.21	9.09	6.96
Lead	mg/kg	360	> 1300	20.7	27.4	5.8	24.2	10.7	6.9	17.2	3.9	22.6	22.2	26.0
Selenium	mg/kg	11	> 20	0.9 U	1.2 J	0.34 J	0.89 U	0.67 U	0.32 U	0.36 U	0.2 U	1.9 J	1.0 J	1.1 J
2022 Bioassay Results	--	Pass/Fail	Pass/Fail	--	--	--	--	--	resampled	Pass/Pass	--	--	--	--

Blue shaded bold text indicates exceedance of benthic SCO
Red shaded bold text indicates exceedance of benthic CSL

Footnotes:
a. Risk evaluation based on RI current conditions dataset. Method detection limit shown for non detected results.
b. Reported benthic contaminants of concern include site-specific compounds (total organic carbon, wood debris, and arsenic) and non-site specific compounds (lead and selenium). PAH were not considered a risk for benthic organisms and are not reported.
c. Benthic SCO and CSL are based on Table 8-1 of SCUM (Ecology, 2021). Site-specific cleanup level reported for wood debris and TOC.
d. Wood debris represent field visual estimate obtained evaluating dry sediment samples as collected.

Acronyms:
-- = Archived or not available
% = percentage
BM = Barbee Mill
cm = centimeters
CSL = Cleanup Screening Level
J = Analyte detected below reporting limit, reported value is an estimate
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
NS = nearshore
PAH = polycyclic aromatic hydrocarbons
PER = perimeter
RL = Reporting Limit
SCO = Sediment Cleanup Objectives
SED = Sediment
TOC = Total Organic Carbon
U = Result was non detected. The reporting limit is reported.

Table 6-5. Benthic Risk Evaluation

Project No. PNG0869, Barbee Mill Site, Renton, WA

Benthic Contaminants of Concern[b]	Unit	Benthic SCO[c]	Benthic CSL[c]	Sample ID (Current RI Dataset)[a]	PER-SED-21	PER-SED-21-DUP	PER-SED-22	PER-SED-23	PER-SED-24	PER-SED-25	PER-SED-26	PER-SED-27	PER-SED-28	PER-SED-29	PER-SED-30
				Group	Perimeter	QA/QC	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter
				Depth Interval (cm)	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
				Collection Date	8/24/2021	8/24/2021	8/24/2021	8/23/2021	8/23/2021	8/23/2021	8/23/2021	8/23/2021	8/23/2021	8/23/2021	8/24/2021
Total Organic Carbon	%	13.5	13.5		10.1	8.79	11.1	9.89	4.3	4.88	4.17	--	--	--	--
Wood Debris[d]	%	50	50		21	**53**	8	21	6	7	4	4	28	25	7
Arsenic	mg/kg	14	120		8.77	8.57	7	6.52	5.82	5.59	4.17	--	--	--	--
Lead	mg/kg	360	> 1300		51.3	48.5	30.5	31.3	22.4	16.6	11.9	--	--	--	--
Selenium	mg/kg	11	> 20		1.0 J	0.6 UJ	1.1 J	0.8 U	1.1 J	1.1 J	1.0 **J**	--	--	--	--
2022 Bioassay Results	--	Pass/Fail	Pass/Fail		--	--	--	--	--	--	--	--	--	--	--

Blue shaded bold text indicates exceedance of benthic SCO
Red shaded bold text indicates exceedance of benthic CSL

Footnotes:
a. Risk evaluation based on RI current conditions dataset. Method detection limit shown for non detected results.
b. Reported benthic contaminants of concern include site-specific compounds (total organic carbon, wood debris, and arsenic) and non-site specific compounds (lead and selenium). PAH were not considered a risk for benthic organisms and are not reported.
c. Benthic SCO and CSL are based on Table 8-1 of SCUM (Ecology, 2021). Site-specific cleanup level reported for wood debris and TOC.
d. Wood debris represent field visual estimate obtained evaluating dry sediment samples as collected.

Acronyms:
-- = Archived or not available
% = percentage
BM = Barbee Mill
cm = centimeters
CSL = Cleanup Screening Level
J = Analyte detected below reporting limit, reported value is an estimate
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
NS = nearshore
PAH = polycyclic aromatic hydrocarbons
PER = perimeter
RL = Reporting Limit
SCO = Sediment Cleanup Objectives
SED = Sediment
TOC = Total Organic Carbon
U = Result was non detected. The reporting limit is reported.

Table 6-5. Benthic Risk Evaluation

Project No. PNG0869, Barbee Mill Site, Renton, WA

			Sample ID (Current RI Dataset)[a]	PER-SED-31	PER-SED-32	PER-SED-33	NS01-C1	NS-01-SS	NS-02-SS	WD-01	WD-01-SS	WD-02
			Group	Perimeter	Perimeter	Perimeter	Historical	Historical	Historical	Historical	Historical	Historical
			Depth Interval (cm)	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
			Collection Date	8/24/2021	8/24/2021	8/24/2021	09/01/2009	09/01/2009	09/01/2009	09/01/2009	09/01/2009	09/01/2009
Benthic Contaminants of Concern[b]	**Unit**	**Benthic SCO[c]**	**Benthic CSL[c]**									
Total Organic Carbon	%	13.5	13.5	--	--	--	--	--	--	--	--	--
Wood Debris[d]	%	50	50	**64**	**64**	19	--	--	--	--	--	--
Arsenic	mg/kg	14	120	**--**	**--**	**--**	7.4	< 20 U	< 20 U	**16**	< 8.0 U	3.2
Lead	mg/kg	360	> 1300	**--**	**--**	**--**	**--**	--	--	**--**	--	**--**
Selenium	mg/kg	11	> 20	**--**	**--**	**--**	**--**	--	--	**--**	--	**--**
2022 Bioassay Results	--	Pass/Fail	Pass/Fail	--	--	--	--	--	--	--	--	--

Blue shaded bold text indicates exceedance of benthic SCO
Red shaded bold text indicates exceedance of benthic CSL

Footnotes:
a. Risk evaluation based on RI current conditions dataset. Method detection limit shown for non detected results.
b. Reported benthic contaminants of concern include site-specific compounds (total organic carbon, wood debris, and arsenic) and non-site specific compounds (lead and selenium). PAH were not considered a risk for benthic organisms and are not reported.
c. Benthic SCO and CSL are based on Table 8-1 of SCUM (Ecology, 2021). Site-specific cleanup level reported for wood debris and TOC.
d. Wood debris represent field visual estimate obtained evaluating dry sediment samples as collected.

Acronyms:
-- = Archived or not available
% = percentage
BM = Barbee Mill
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CSL = Cleanup Screening Level
J = Analyte detected below reporting limit, reported value is an estimate
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
NS = nearshore
PAH = polycyclic aromatic hydrocarbons
PER = perimeter
RL = Reporting Limit
SCO = Sediment Cleanup Objectives
SED = Sediment
TOC = Total Organic Carbon
U = Result was non detected. The reporting limit is reported.

Table 7-1. Benthic Risk Evaluation Summary

DRAFT

Project No. PNG0869, Barbee Mill Site, Renton, WA

Benthic Contaminant of Concern[a]	Unit	Benthic SCO[b]	Benthic CSL[b]	# of Results Exceeding Benthic SCO	# of Results Exceeding Benthic CSL	Bioassay Override (historical or current data)[c]
Wood Debris	%	50	-	6	--	Yes
Total organic carbon	%	13.5	-	5	--	Yes
Arsenic	mg/kg	14	120	2	0	Yes
Lead	mg/kg	360	> 1300	0	--	N/A
Selenium	mg/kg	11	> 20	0	--	N/A

Footnotes:

a. Risk Evaluation based on RI current conditions dataset, including surface sediment samples collected offshore in 2021-2022. Method detection limit shown for non detected results. Reported benthic contaminants of concern include Site-specific compounds (total organic carbon, wood debris, and arsenic) and non-Site specific compounds (lead and selenium). PAH were not considered a risk for benthic organisms and are not reported.

b. Benthic SCO and CSL are based on Table 8-1 of SCUM (Ecology, 2021). Site-specific cleanup level reported for wood debris and TOC.

c. Bioassays conducted as part of the Quendall Terminals RI in 2009 showed no toxicity associated with elevated TOC and wood debris and therefore bioassays override the numeric Site-specific cleanup requirements across the entire area. The recent bioassay (2022) to assess the arsenic benthic SCO exceedance at BM-SED-16 demonstrated no benthic toxicity for three species and two tests (acute and chronic).

Acronyms:

-- = Not available or not applicable
% = percentage
CSL = cleanup screening level
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
PAH = polycyclic aromatic hydrocarbons
RL = Reporting Limit
SCO - sediment cleanup objective
TOC = Total Organic Carbon

Table 7-2. Human Health and Ecological (Bioaccumulative) Sediment Risk Evaluation

DRAFT

Project No. PNG0869, Barbee Mill Site, Renton, WA

Bioaccumulative Contaminants of Concern[a]	Unit	Bioaccumulative SCO[b]	Bioaccumulative CSL[c]	Post-2002 Dredge (Current RI Dataset) SWAC[d]
Arsenic	mg/kg	11	24	5.58
Lead	mg/kg	21	--	14.4
Selenium	mg/kg	--	2[e]	0.85
Total cPAHs TEQ (ND = 1/2 RL)[f]	µg/kg	21	210	**199**

Blue shaded bold text indicates exceedance of SCO
Red shaded bold text indicates exceedance of CSL

Footnotes:

a. Reported bioaccumulative contaminants of concern include site-specific compounds (arsenic) and non-site specific compounds (lead, selenium, and cPAHs).
b. Bioaccumulative SCO based on Natural Background from Table 10-1 of SCUM (Ecology, 2021).
c. Bioaccumulative CSL based on regional background from Table 10-2 of SCUM (Ecology, 2021).
d. SWAC estimated by using Inverse Distance Weighting interpolation. Interpolation performed as described in the SRI Work Plan (exponent of 3.5, maximum neighbors of 4, and variable search radius) by using a dataset representative of post-dredging conditions. The dataset includes results from surface sediment samples collected during the 2009 and 2021/2022 investigations.
e. Value reported for Selenium represents the 90th percentile for the lake Washington dataset as described in Appendix I.
f. cPAHs include: Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor (Ecology, 2019) by the detected concentration.

Acronyms:

-- = Not available or not applicable
% = percentage
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
CSL = cleanup screening level
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
RL = Reporting Limit
SCO = Sediment Cleanup Objectives
TEQ = Toxic Equivalent
SMA = Sediment Management Area
SWAC = Surface Weighted Average Concentration

Table 7-3. Human Health Nearshore Sediment Risk Evaluation

Project No. PNG0869, Barbee Mill Site, Renton, WA

Direct Contact Contaminants of Concern[a]	Unit	Direct Contact SCO[b]	Direct Contact CSL[c]	Nearshore SMA SWAC[d,e]
Site-Specific COC				
Arsenic	mg/kg	11	24	**4.66**
Non Site-Specific COC				
Total cPAHs TEQ (ND = 1/2 RL)[f]	µg/kg	170	210	**85.1**

Footnotes:

a. Risk Evaluation based on RI current conditions dataset. Reported direct contact contaminants of concern include arsenic (site-specific compound) and cPAHs (non-site specific compounds). Other compounds were not considered a risk for human health through a direct contact pathway and are not reported.

b. Direct contact SCO represent risk based value obtained using Appendix K, SCUM (Ecology, 2021).

c. Direct contact CSL represent regional background from SCUM Table 10-2 (Ecology, 2021).

d. Nearshore SMAs were estimated assuming a 20ft wide beach area based on the maximum beach width visually assessed during the shoreline survey performed in 2022.

e. Due to small sample size, the nearshore SWAC was estimated using the Theissen polygon approach and the RI current conditions dataset representative of post-dredging conditions. The dataset includes results from surface sediment samples collected during the 2009 and 2021/2022 investigations.

e. cPAHs include: Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor (Ecology, 2019) by the detected concentration.

Acronyms:

-- = Not available or not applicable
% = percentage
cPAH = Carcinogenic polycyclic aromatic hydrocarbons
CSL = Cleanup Screening Level
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
RL = Reporting Limit
SCO = Sediment Cleanup Objectives
TEQ = Toxic Equivalent
SMA = Sediment Management Area
SWAC = Surface Weighted Average Concentration

Table 7-4. Site-wide Sediment Temporal Comparison

DRAFT

Project No. PNG0869, Barbee Mill Site, Renton, WA

Contaminant of Concern	Unit	SCO[a]	CSL[b]	Site-Specific Cleanup Level	Pre-2002 Dredge (Historical Data) SWAC[c]	Post-2002 Dredge (Current RI Data) SWAC
Bioaccumulative COCs						
Arsenic	mg/kg	11	24	11	6.09	5.58
Lead	mg/kg	21	--	21	**22.9**	14.4
Selenium	mg/kg	--	2[d]	2	**12.40**	0.85
Total cPAHs TEQ (ND = 1/2 RL)[e]	µg/kg	21	210	210	**523**	**199**
Benthic COCs						
Arsenic	mg/kg	14	120	14	--	---
Total Organic Carbon	%	13.5	--	13.5	**15.4**	6.9
Wood Debris[f]	%	50	--	50	**51.7**	19

Blue shaded bold text indicates exceedance of SCO
Red shaded bold text indicates exceedance of CSL

Footnotes:

a. Bioaccumulative SCO based on Natural Background from Table 10-1 of SCUM (Ecology, 2021). Benthic SCO based on Table 8-1 of SCUM (Ecology, 2021). Site-specific cleanup level reported for wood debris and TOC.
b. Bioaccumulative CSL based on regional background from Table 10-2 of SCUM (Ecology, 2021). Benthic CSL based on Table 8-1 of SCUM (Ecology, 2021).
c. SWAC estimated by using Inverse Distance Weighting interpolation. Interpolation performed as described in the SRI Work Plan (exponent of 3.5, maximum neighbors of 4, and variable search radius) by using a dataset representative of post-dredging conditions. The dataset includes results from surface sediment samples collected during the 2009 and 2021/2022 investigations.
d. Value reported for Selenium represents the 90th percentile for the lake Washington dataset as described in Appendix I.
e. cPAHs include: Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor (Ecology, 2019) by the detected concentration.
f. Wood debris represent field visual estimate obtained evaluating dry sediment samples as collected.

Acronyms:

-- = Not available or not applicable
% = percentage
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
CSL = cleanup screening level
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
RL = Reporting Limit
SCO = Sediment Cleanup Objectives
TEQ = Toxic Equivalent
TOC = Total Organic Carbon
SMA = Sediment Management Area
SWAC = Surface Weighted Average Concentration

Table 7-5. Summary of Current Sediment Risks

Project No. PNG0869, Barbee Mill Site, Renton, WA

Contaminant of Concern	Benthic Risks	Human Health and Ecological Bioaccumulative Risks (site-wide)	Human Health Direct Contact Risk - Beach Play (nearshore)[b]
Wood Debris[a]	None[a]	None	--
Total organic carbon[a]	None[a]	None	--
Arsenic[a]	None[a]	None	None
Lead	None	None	--
Selenium	None	None	--
Total cPAHs TEQ (ND = 1/2 RL)	---	None	None

Footnotes:

a. No unacceptable risks based on bioassay override.

b. Assumes 20 ft width of beach along the shoreline.

Acronyms:

-- = Not available or not applicable

cPAHs = Carcinogenic polycyclic aromatic hydrocarbons

ND = Non Detected

RL = Reporting Limit

TEQ = Toxic Equivalent

Table 8-1. Attenuation Time Frame

Project No. 050004, Barbee Mill Site, Renton, WA

Well Number	Alternative 1	Alternative2	Alternative 3	Alternative 4	Alternative 5
CMW-1	90	88	88	89	104
EW-1	192	188	186	178	175
EW-8	106	106	104	152	149
WP-8	83	11	21	75	121

Note: All time frames are shown in years

Table 9-1. Remedial Technology Screening

Project No. 050004, Barbee Mill Site, Renton, Washington

Remedial Technologies	Preliminary Technology Screening				
	Description	**Potential Effectiveness**	**Implementability**	**Relative Cost**	**Screening Result**
Institutional Controls	Measures undertaken to limit or prohibit activities that may interfere with the integrity of the cleanup action or that may result in exposure to hazardous substances at a site. Typically needed for remedies that include hazardous substances remaining at concentrations that exceed applicable cleanup levels and for use of conditional points of compliance. Most commonly, ICs are recorded as Restrictive Environmental Covenants with the property deed.	**High** Effective for protection of exposure pathways through administrative or engineering controls.	**High** Readily implementable with minimal initial investment.	**Low**	**Retained**
Ex Situ					
Soil Excavation and Offsite Disposal	Impacted soil is excavated and transported off site for disposal.	**High** Provides permanent protection through removal of impacted soils from the Site. Removal of impacted soils would also provide protection for groundwater exposure pathways by reducing the source of arsenic in groundwater.	**Low** Considerations include the shallow depths to water, permeable soils, dewatering and shoring required, and surface obstructions. Highly invasive technique that creates significant disturbance of the affected area. Most of the affected Site area not accessible due to buildings and utilities.	**High**	**Not Retained**
Soil Excavation and *Ex Situ* Solidification/Stabilization	Soil exceeding cleanup or remediation levels is excavated and treated via solidification or stabilization.	**High** Provides permanent protection through removal of impacted soils from the Site. Removal of impacted soils would also provide protection for groundwater exposure pathways by reducing the source of arsenic in groundwater.	**Low** Considerations include the shallow depths to water, permeable soils, dewatering and shoring required, and surface obstructions. Highly invasive technique that creates significant disturbance of the affected area. Most of the affected Site area not accessible due to buildings and utilities.	**High**	**Not Retained**
Groundwater Extraction and Treatment (Pump-and-Treat)	Impacted groundwater is extracted to establish a hydraulic depression that prevents downgradient groundwater migration and removes contaminant mass. Extracted contaminated groundwater is typically treated and discharged; some systems recirculate the treated water.	**Low** Provides protection for groundwater exposure pathways through the extraction and *ex situ* treatment of constituents in groundwater. The existing pump-and-treat system at the Site proved to have limited effectiveness at significantly removing mass or reducing the restoration timeframe.	**High** There is an existing pump-and-treat system at the Site. Will require maintaining a sewer discharge permit and ongoing maintenance to keep the system running.	**Medium**	**Retained**
***In Situ* Containment Technologies**					
Containment Wall	Places a physical barrier, such as a soil/bentonite slurry wall, to control the movement of groundwater.	**Low** Provides protection through installation of a structural barrier to reduce off-property migration of contaminated groundwater, but does not reduce arsenic concentrations. Groundwater movement is slowed but moves around and beneath barriers, and could spread the plume footprint.	**Low** Not implementable over most of the affected shoreline due to high density of buildings, utilities and other obstructions; if applied only where access allows, contaminated groundwater would flow around the wall.	**High**	**Not Retained**
***In Situ* Treatment Technologies**					
In Situ Chemical Stabilization	Addition of chemical additives into groundwater, to react with and mobilize contaminants. Introduction of additives can be accomplished using direct push injection or injection wells.	**Moderate** Treats groundwater by the introduction of reductants such as zero valent iron to immobilize arsenic, which has been proven to work at the Site in the PAZ. Effectiveness requires reliable and predictable distribution of reductants to contaminants, which will require pilot testing.	**Moderate** Implementable on the Quendall Property. Soils are conducive to implementation by direct push injections.	**Moderate**	**Retained**
In Situ Solidification/Stabilization (ISS)	Physically binds or encloses contaminants within a stabilized mass (solidification) and/or induces chemical reactions between the stabilizing agent and the contaminants to reduce their mobility (stabilization). Requires access for physical mixing of soils (e.g., using large-diameter augers). Metals are immobilized, not removed or destroyed.	**High** Reliable technology to reduce contaminant concentrations, prevent direct contact to soil, and reduce leaching to groundwater through creation of a low-permeability monolith and/or chemical immobilization.	**Moderate** Implementable on the Quendall Property; part of the selected remedy for the Quendall Site.	**High**	**Retained**
In Situ Passive Attenuation Zone (PAZ)	Used to control the migration of groundwater contaminated with organic and inorganic contaminants by passively treating impacted groundwater *in situ* . A PAZ consists of a trench backfilled with permeable, sorptive, and/or reactive materials. Common sorptive materials include granular activated carbon, organoclay, wood mulch/compost, and ZVI.	**High** Already implemented at Site with ZVI with proven effectiveness. Provides protection for groundwater pathways through the passive treatment of groundwater passing through the barrier. Would not address concentrations upgradient.	**Moderate** Implementable on the Quendall Property. Requires more staging area and disturbance than *in situ* chemical stabilization using injections.	**Moderate**	**Retained**
In Situ Flushing	Similar to conventional pump-and-treat, except the treated water is injected back into the contaminated area at strategic locations to direct contaminants toward extraction wells and increase groundwater flow through the plume. Likely requires more aggressive *ex-situ* treatment than pump-and-treat.	**Low** Capture of injected water can be difficult, risking mobilization of contamination toward the Lake. Contaminant removal rate likely diffusion-limited due to heterogeneous soils, so flushing may not provide much incremental benefit.	**Low** Technology has low implementability. Would need much more surface infrastructure to provide treatment, and additional wells to provide adequate containment.	**High**	**Not Retained**
Monitored Natural Attenuation (MNA)	MNA relies upon attenuation of COCs in groundwater by natural processes including biodegradation, abiotic degradation, adsorption, and dilution.	**Moderate** Demonstrated to be effective at the Site for reducing arsenic concentrations before discharge to the lake, but very slow.	**High** Readily implementable with minimal initial investment. NA is occurring at the Site, but the timeframe may not be reasonable.	**Low**	**Retained**

Notes:

MTCA = Model Toxics Control Act

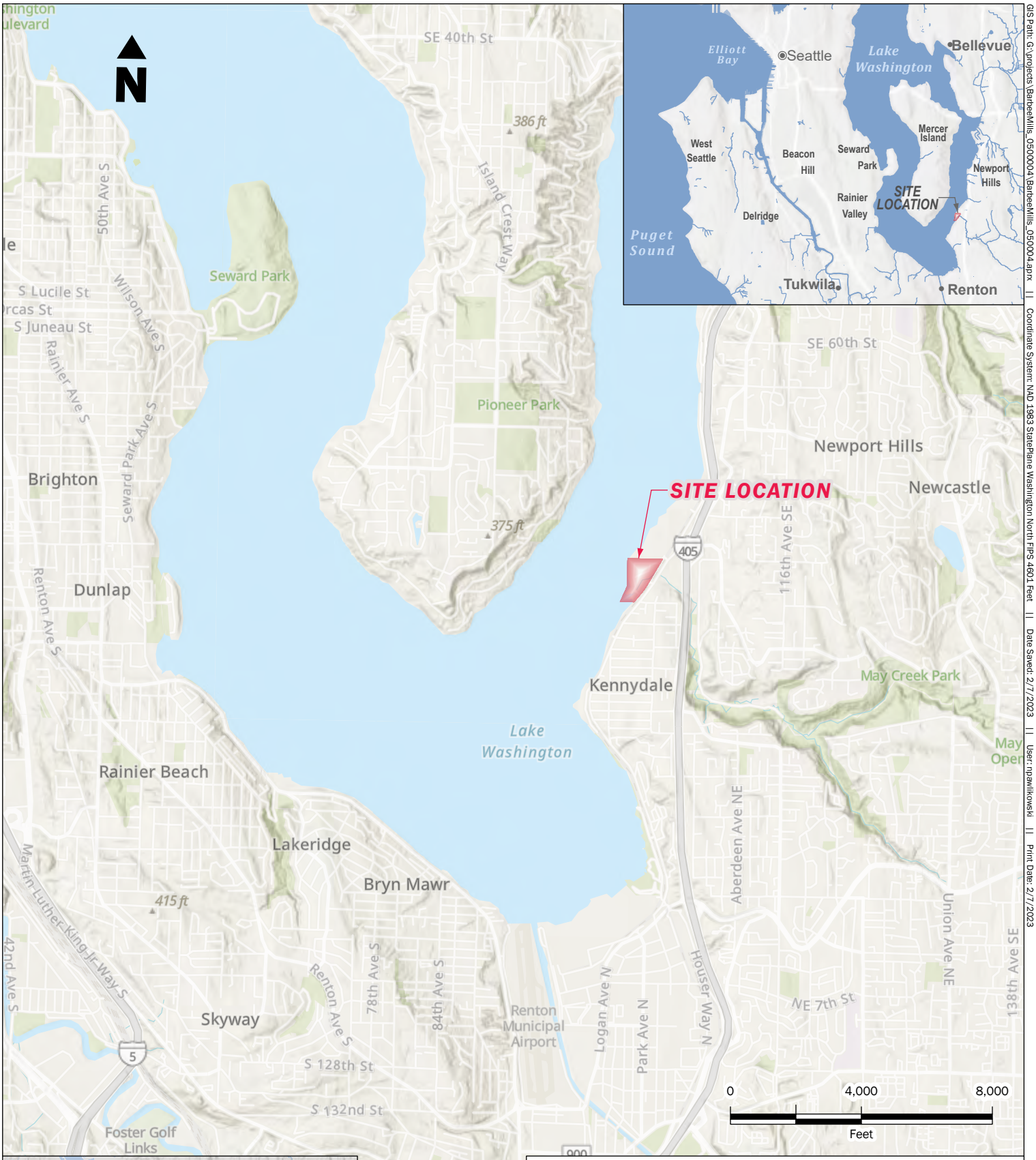
Grey shading - technology not retained

Table 11-1. Disproportionate Cost Analysis
Project No. 050004, Barbee Mill Site, Renton, Washington

Remedial Alternatives		Alternative 1 - Monitored Natural Attenuation (MNA) with Institutional Controls (IC)	Alternative 2 - Hot Spot *In-Situ* Chemical Reduction (ISCR) or *In Situ* Solidification, including MNA and IC	Alternative 3 - Passive Attenuation Zone (PAZ) Extension, including MNA and IC	Alternative 4 - ISS of shallow plume on Quendall Terminals, including MNA and IC	Alternative 5 - ISS of shallow and deep plumes on Quendall Terminals, Pump-and-Treat of shallow groundwater on Barbee Property, including MNA and IC
Description of Alternatives						
Common Elements		Completed Remedial Actions: excavation of contaminated soil, passive attenuation zone construction on Property to treat arsenic in groundwater, operation of groundwater pump and treat system for two years, removal of wood-impacted sediments Common Proposed Actions: Groundwater monitoring until cleanup levels are achieved Institutional Controls: Environmental covenants on the former Barbee Mill Property and on the upland portion of the Quendall Property restricting groundwater use and disturbance of remedy, notifications to natural resource trustees, the Washington State Department of Natural Resources (DNR), and the United States Army Corps of Engineers (USACE).			
Additional Remedial Actions		None.	- Treatability and pilot testing of ISCR using injection of chemical amendments to precipitate arsenic (e.g., a zero valent iron slurry) to confirm ability to achieve a benthic-protection based remediation level; - Treatment of groundwater on Quendall Terminals exceeding the remediation level using injection wells or direct-push methods.	- Extending the existing PAZ along shoreline on Quendall Property, consisting of the same material (a mixture of clean sand and iron filings that remove arsenic from groundwater via sorption and/or precipitation). This includes: 1) Excavation of native soil to the maximum depth of arsenic exceeding the cleanup level, with shoring (e.g., bioslurry trench) to maintain sidewalls; and 2) Backfilling with the amendment mixture.	- Selection of an amendment appropriate for in situ arsenic stabilization through solidification, such as cement/blast furnace slag; and - Addition of amendments by injection into contaminated soil as a slurry and mixing with a large-diameter auger. This alternative would target all accessible soil (i.e., on the Quendall Terminals Property) in which shallow groundwater exceeds the cleanup level.	-Selection of an amendment appropriate for in situ arsenic stabilization through solidification, such as cement/blast furnace slag; and - Addition of amendments by injection into contaminated soil as a slurry and mixing with a large-diameter auger. This alternative would target all accessible soil (i.e., on the Quendall Terminals Property) in which shallow and deep groundwater exceeds the cleanup level; and - Additional treatment of plume on Barbee Property via operation of the existing pump-and-treat system.
Contingency Actions		Resume operation of Pump-and-Treat System; In-Situ Chemical Reduction on Quendall	In Situ Solidification; Resume operation of Pump-and-Treat System	Resume operation of Pump-and-Treat System	Resume operation of Pump-and-Treat System	Resume operation of Pump-and-Treat System
Evaluation of Alternatives						
General Criteria	Protection of Human Health and the Environment	Yes – Alternative will protect human health and the environment.	Yes – Alternative will protect human health and the environment.	Yes – Alternative will protect human health and the environment.	Yes – Alternative will protect human health and the environment.	Yes – Alternative will protect human health and the environment.
	Compliance with Cleanup Standards	Yes – Longer restoration timeframe because no active measures are proposed.	Yes – Active remedial measures are used to provide treatment and shorten the restoration timeframe.	Yes – Active remedial measures are used to provide treatment and shorten the restoration timeframe.	Yes – Active remedial measures are used to provide treatment and shorten the restoration timeframe.	Yes – Active remedial measures are used to provide treatment and shorten the restoration timeframe.
	Compliance with Applicable State and Federal Laws	Yes – Compliance with applicable laws will be ensured through obtaining required permits and meeting the substantive requirements of exempt Federal, State, and local permits	Yes – Compliance with applicable laws will be ensured through obtaining required permits and meeting the substantive requirements of exempt Federal, State, and local permits	Yes – Compliance with applicable laws will be ensured through obtaining required permits and meeting the substantive requirements of exempt Federal, State, and local permits	Yes – Compliance with applicable laws will be ensured through obtaining required permits and meeting the substantive requirements of exempt Federal, State, and local permits	Yes – Compliance with applicable laws will be ensured through obtaining required permits and meeting the substantive requirements of exempt Federal, State, and local permits
	Prevent or Minimize Present and Future Releases and Migration of Hazardous Substances in the Environment	Yes - contaminant migration controlled by prior and proposed remedial actions.	Yes - contaminant migration controlled by prior and proposed remedial actions.	Yes - contaminant migration controlled by prior and proposed remedial actions.	Yes - contaminant migration controlled by prior and proposed remedial actions.	Yes - contaminant migration controlled by prior and proposed remedial actions.
	Provide Resilience to Climate Change	Yes - climate change is not anticipated to impact performance of this alternative.	Yes - climate change is not anticipated to impact performance of this alternative.	Yes - climate change is not anticipated to impact performance of this alternative.	Yes - climate change is not anticipated to impact performance of this alternative.	Yes - climate change is not anticipated to impact performance of this alternative.
	Provision for Compliance Monitoring	Yes – Alternative includes provisions for compliance monitoring through long-term performance groundwater monitoring.	Yes – Alternative includes provisions for compliance monitoring through short- and long-term performance groundwater monitoring.	Yes – Alternative includes provisions for compliance monitoring through short- and long-term performance groundwater monitoring.	Yes – Alternative includes provisions for compliance monitoring through short- and long-term performance groundwater monitoring.	Yes – Alternative includes provisions for compliance monitoring through short- and long-term performance groundwater monitoring.
	Not Rely Primarily on Institutional Controls and Monitoring	Yes - Alternative includes significant prior active remediation and additional planned treatment to achieve objectives.	Yes - Alternative includes significant prior active remediation and additional planned treatment to achieve objectives.	Yes - Alternative includes significant prior active remediation and additional planned treatment to achieve objectives.	Yes - Alternative includes significant prior active remediation and additional planned treatment to achieve objectives.	Yes - Alternative includes significant prior active remediation and additional planned treatment to achieve objectives.
	Not Rely Primarily on Dilution or Dispersion	Yes - Alternative includes significant prior active remediation and additional planned treatment to achieve objectives.	Yes - Alternative includes significant prior active remediation and additional planned treatment to achieve objectives.	Yes - Alternative includes significant prior active remediation and additional planned treatment to achieve objectives.	Yes - Alternative includes significant prior active remediation and additional planned treatment to achieve objectives.	Yes - Alternative includes significant prior active remediation and additional planned treatment to achieve objectives.
	Provides a Reasonable Restoration Time Frame	Yes - arsenic concentrations are below cleanup levels at the groundwater conditional point of compliance. Arsenic concentrations exceeding soil cleanup level are below the standard point of compliance for direct contact.	Yes - arsenic concentrations are below cleanup levels at the groundwater conditional point of compliance. Arsenic concentrations exceeding soil cleanup level are below the standard point of compliance for direct contact.	Yes - arsenic concentrations are below cleanup levels at the groundwater conditional point of compliance. Arsenic concentrations exceeding soil cleanup level are below the standard point of compliance for direct contact.	Yes - arsenic concentrations are below cleanup levels at the groundwater conditional point of compliance. Arsenic concentrations exceeding soil cleanup level are below the standard point of compliance for direct contact.	Yes - arsenic concentrations are below cleanup levels at the groundwater conditional point of compliance. Arsenic concentrations exceeding soil cleanup level are below the standard point of compliance for direct contact.
Criteria to Evaluate Use of Permanent Solutions to the Maximum Extent Practicable	Protectiveness (30% weighting factor)	Site exposure risks are currently low. Elevated groundwater concentrations will remain for an extended time, and protection from groundwater ingestion will rely on institutional controls for extended period of time based on the expected duration of MNA. 5	Site exposure risks are currently low. Active remediation will treat most groundwater to below levels protective of benthic organisms more quickly than MNA. 7	Site exposure risks are currently low. Higher concentrations of arsenic will remain in Site groundwater in the upland, but active treatment along the shoreline will treat groundwater to cleanup levels prior to discharge to Lake Washington more quickly than MNA. Higher concentrations will remain in the upland but drinking water restrictions are in place. 7	Site exposure risks are currently low. This alternative will actively treat more groundwater at the Site than other alternatives, but concentrations above the cleanup level will remain on the Property and in the deep system on the Quendall Property for an extended time. 8	Site exposure risks are currently low. This alternative will actively treat more groundwater at the Site than any other alternative, but concentrations above the cleanup level will remain on the Property for an extended time. 9
	Permanence (20% weighting factor)	Natural attenuation and continued treatment with the PAZ will permanently reduce the toxicity and volume of contamination over an extended timeframe. Because this alternative relies on natural processes for treatment of the plume outside the existing PAZ, this alternative scores lower than Alternatives 2 through 5 which provide additional chemical and/or physical immobilization of contamination. 6	Because the permanence of immobilization using ISCR depends on Site geochemistry, ISCR is considered slightly less permanent than ISS. However, Site geochemistry is controlled by natural reducing conditions from native soils and has been stable and is not expected to change significantly in the future. 8	This alternative immobilizes contamination by a mechanism similar to Alternative 2, only the distribution method in the subsurface is different. Because the permanence of immobilization with the PAZ depends on Site geochemistry, it is considered slightly less permanent than ISS (Alternatives 4 and 5). However, Site geochemistry is controlled by natural reducing conditions from native soils and has been stable and is not expected to change significantly in the future 8	ISS is considered highly permanent due to immobilization of contamination both chemically and physically (containment within a low-permeability matrix). Alternative 4 addresses a smaller area of the arsenic plume than Alternative 5; however, the additional area treated by Alternative 5 contains lower concentrations of arsenic and therefore a small proportion of contaminant mass. It is also located further upland, and does not pose a threat to surface water. Therefore, Alternative 4 was rated similar to Alternative 5. 9	ISS is considered highly permanent due to immobilization of contamination both chemical and physically (containment within a low-permeability matrix). Alternative 5 addresses the maximum accessible area of the arsenic plume and is considered the most permanent alternative. 9
	Long-Term Effectiveness (25% weighting factor)	There is a moderate degree of uncertainty given the length of time contamination is expected to persist at the Site. However the magnitude of residual risk is low and controls are effective. 5	Active remediation will reduce the length of time contamination is expected to persist at the Site above cleanup levels, and reduce the degree of uncertainty over MNA alone. There is slightly more uncertainty with ISCR compared to ISS because ISCR will require pilot testing to confirm ability to distribute reagent via injection and reagent performance. ISS will require treatability testing for design, but is a proven technology for arsenic independent of soil heterogeneity. 6	Active remediation will reduce the length of time contamination is expected to persist at the Site, and reduce the degree of uncertainty over MNA alone. The PAZ is a proven technology as it has been successfully implemented on Site. 7	Active remediation will reduce the length of time contamination is expected to persist at the Site, and reduce the degree of uncertainty over MNA alone. 8	Active remediation will reduce the length of time contamination is expected to persist at the Site, and reduce the degree of uncertainty over MNA alone. 8
	Management of Implementation Risks (15% weighting factor)	There is a very low short-term risk to human health or the environment posed by monitoring activities. Site exposure risks are already low and construction is not required to implement. 9	There is a low to moderate short-term risk from drilling and injection activities. Potential water quality effects of the ISCR reagent can be safely managed through engineering design. The chemical reagents/additives for ISCR and ISS are safe to handle and injections only require routine drilling equipment. 8	There is a moderate short-term risk from the proximity of deep trenching to the shoreline of Lake Washington. The reactive material in the PAZ is safe to handle and will not create any potential water quality issues based on performance monitoring of the existing PAZ. 7	There is a low to moderate short-term risk from heavy construction activities for ISS using deep soil-mixing that can be controlled using standard construction site health and safety practices. ISS is expected to result in only localized pH effects and not create water quality impacts. The risks from this alternative are slightly higher than Alternatives 1 and 2 due to the greater extent of active earthwork in close proximity to the residential development. 7	There is a low to moderate short-term risk from heavy construction activities for ISS using deep soil-mixing that can be controlled using standard construction site health and safety practices. ISS is expected to result in only localized pH effects and not create water quality impacts. The risks from this alternative are slightly higher than Alternatives 1 and 2 due to the greater extent of active earthwork in close proximity to the residential development. 6
	Implementability (10% weighting factor)	Highly implementable. An environmental covenant has been placed on the Property, and an environmental covenant is in the process of being recorded on the Quendall Property. Access agreements are in place to continue monitoring. This alternative is compatible with potential future remediation and development activities on the Quendall Property. 9	Highly implementable. The chemical reagents/additives for ISCR and ISS are commonly available and use standard construction equipment. This alternative is compatible with potential future remediation and development activities on the Quendall Property, although coordination with development design will be required. 8	Moderately to highly implementable. Deep trenching near the shoreline of Lake Washington and the existing residences on the Property will require careful planning and engineering design. This alternative may need to be modified depending on subsurface elements of the Quendall Property development. 6	Moderate to highly implementable. The additives for ISS are commonly available and use standard construction equipment. This alternative covers a greater area than Alt 2 and will require more coordination with Quendall Property remediation and development activities, particularly for managing increased soil volumes from ISS. 7	Moderate to highly implementable. The additives for ISS are commonly available and use standard construction equipment. This alternative covers a greater area than Alts 2 and 4 and will require more coordination with Quendall Property remediation and development activities, particularly for managing increased soil volumes from ISS. The existing pump-and-treat system would need labor and materials to resume operation. 6
MTCA Benefits Ranking[2]		6.2	7.2	7.1	8.0	8.0
Estimated Cost[3]		$310,000	$1,620,000	$1,900,000	$5,300,000	$11,050,000
Benefit/Cost Ratio[4]		**2.00**	**0.44**	**0.37**	**0.15**	**0.07**

Notes:
MTCA Model Toxics Control Act
1) A numeric scale of 1 to 10 is used to rate the alternatives with respect to the criteria to evaluate use of permanent solutions to the maximum extent practicable, where 1 is low and 10 is high.
2) The MTCA benefits ranking is obtained by multiplying the rating for each criterion by its weighting factor, and summing the results for the six criteria.
3) Costs are Net Present Value in 2023 dollars based on a 2.5% discount rate. The costs shown are rounded to three significant figures.
4) The benefit/cost ratio is obtained by dividing the alternative's MTCA benefits ranking by its estimated cost (in $NPV million).

FIGURES



Location Map

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect CONSULTING	FEB-2023	BY: DFR / EAH	FIGURE NO. 1-1
	PROJECT NO. 050004	REV BY: DIM / NCP	

GIS Path: G:\projects\BarbeeMills_050004\BarbeeMills_050004.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 2/7/2023 || User: npawlikowski || Print Date: 2/7/2023

GIS Path: G:\projects\Barbee\Mills_050000\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx | Layout: 1-2 Barbee Mill and Quendall Property Boundaries | User: tetiev.duran | Print Date: 12/14/2023

Lake Washington

State-Owned Aquatic Lands

HAZELWOOD LN

N 42ND PL

N 41ST PL

WILLIAMS AVE N

WELLS AVE N

N 40TH PL

LAKE WASHINGTON BLVD N

May Creek

I-405 FWY

N 40TH ST

PARK AVE N

N 39TH CT

N 39TH PL

Quendall Site OU1 Boundary

Quendall Site OU2 Boundary

Former BNSF Railroad ROW

Quendall Property Boundary

Barbee Property Boundary

0 125 250 Feet

Barbee Property and Quendall Site Operable Unit Boundaries

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting	DEC-2023	BY: DIM / HMD	FIGURE NO. 1-2
	PROJECT NO. 050004	REVISED BY: ---/---	

Data source credits: None || Basemap Service Layer Credits: Pictometry, King County

Existing Site Features

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting	DEC-2023	BY: DFR / EAC	FIGURE NO. 2-1
	PROJECT NO. 050004	REV BY: DIM / NCP / HMD	

GIS Path: G:\projects\BarbeeMills_050004\RIFS\BarbeeMill_050004_RIFS\BarbeeMill_050004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 12/11/2023 || User: haley.duran || Print Date: 12/11/2023

Key for Historical Building and Equipment Areas	
A	Sawmill
B	Planer
C	Press/Old Dry Kiln
D	Shop
E	Storage/Loading Facility
F	Dry Kiln
G	Stacker
H	Boise Building/Cut Line/High Lean To
I	Black Building
J	Warehouse 1
K	Warehouse 2
L	Office

See Section 2.3.2.3 of text for detailed descriptions of Historical Operational Areas.

Lake Washington

Former Shipyard Area

Outfall 002

Outfall 001

Outfall 003

Sawmill Outfall

Former Spray Area

Former Spray Area

Former Spray Area

Former Arsenic Treatment Area

Discharge to Sanitary Sewer

LAKE WASHINGTON BLVD N

Tank 1

Tank 2

Tank 3

Tank 4

Tank 5

Tank 6

Parking Area

May Creek

Former Log Storage Area

N 40TH ST

DRAFT

- Former USTs and ASTs
- Former Catch Basin
- Former Outfall
- Former Spray Area
- Former Storm Sewer Line
- Historical Building Footprint
- 2' Contours from Engineering Report
- Barbee Property Line

Source: Aerial Photo NAIP 2006

0 150 300 Feet

Historical Operational Areas

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting	DEC-2023	BY: DFR / EAH	FIGURE NO. 2-2
	PROJECT NO. 050004	REV BY: DIM / NCP	

GIS Path: G:\projects\BarbeeMills_0500004\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 12/11/2023 || User: haley.duran || Print Date: 12/11/2023

- Cross Section Location
- Auger Soil Boring
- Direct Push Boring
- Direct Push Boring with Temporary Groundwater Sample
- Baseline/Confirmation Sediment Sampling Locations
- Baseline Sediment Sampling Locations
- Excavation Confirmation Soil Sample
- Test Pit
- Vibracore and Porewater/Sediment Sampling Location
- Historical Monitoring Well
- PAZ Perfomance Monitoring Peizometer
- PAZ Performance Monitoring Well
- Quendall Terminals Monitoring Well
- Pump and Treat Extraction Well
- Porewater Sampling Location
- Wellpoint

Geosyntec Explorations

- Porewater
- Sediment

Note: N. Outfall and BA-SED-01 locations based on Hart Crowser base map outfall location.

Source: Aerial Imagery from King County, 2017.

Exploration and Sample Locations

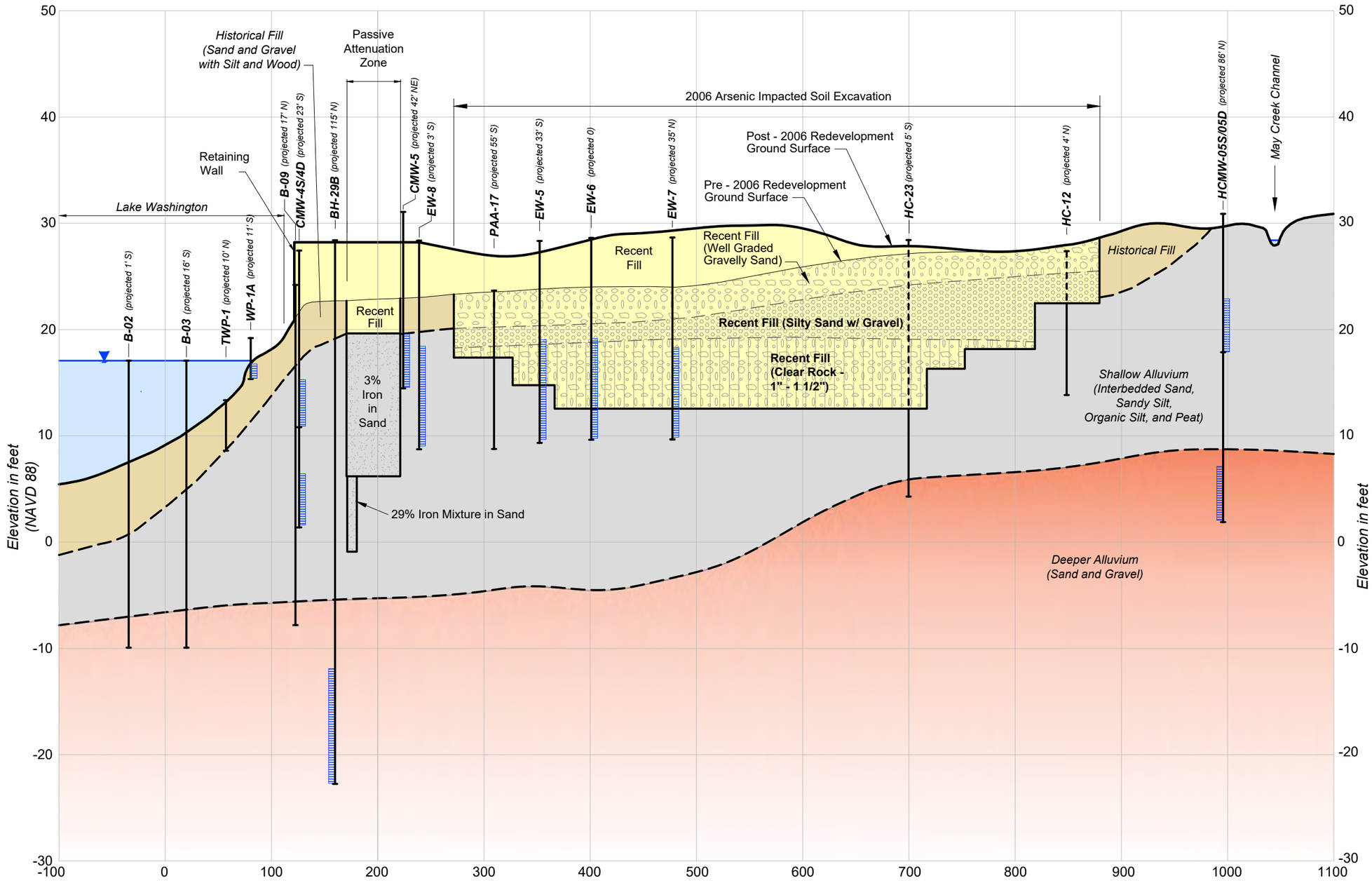
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Aspect Consulting	DEC-2023	BY: DIM / NCP	FIGURE NO. 3-1
	PROJECT NO. 050004	REVISED BY: HMD	

0 120 240 Feet

GIS Path: G:\projects\BarbeeMills_0500004\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 12/20/2023 || User: Robyn.Pepin || Print Date: 12/22/2023

A Northwest — Southeast **A'**



LEGEND

- Ground Surface
- Geologic Unit Contact
- Well Screen
- Well Open Hole, Uncased
- Lake Level September 2018
- HC-12 — Well Number
- Recent Fill
- Historical Fill
- Shallow Alluvium
- Deep Alluvium

DRAFT

Horizontal Scale: 1" = 100'
Vertical Scale: 1" = 10'
Vertical Exaggeration 10x

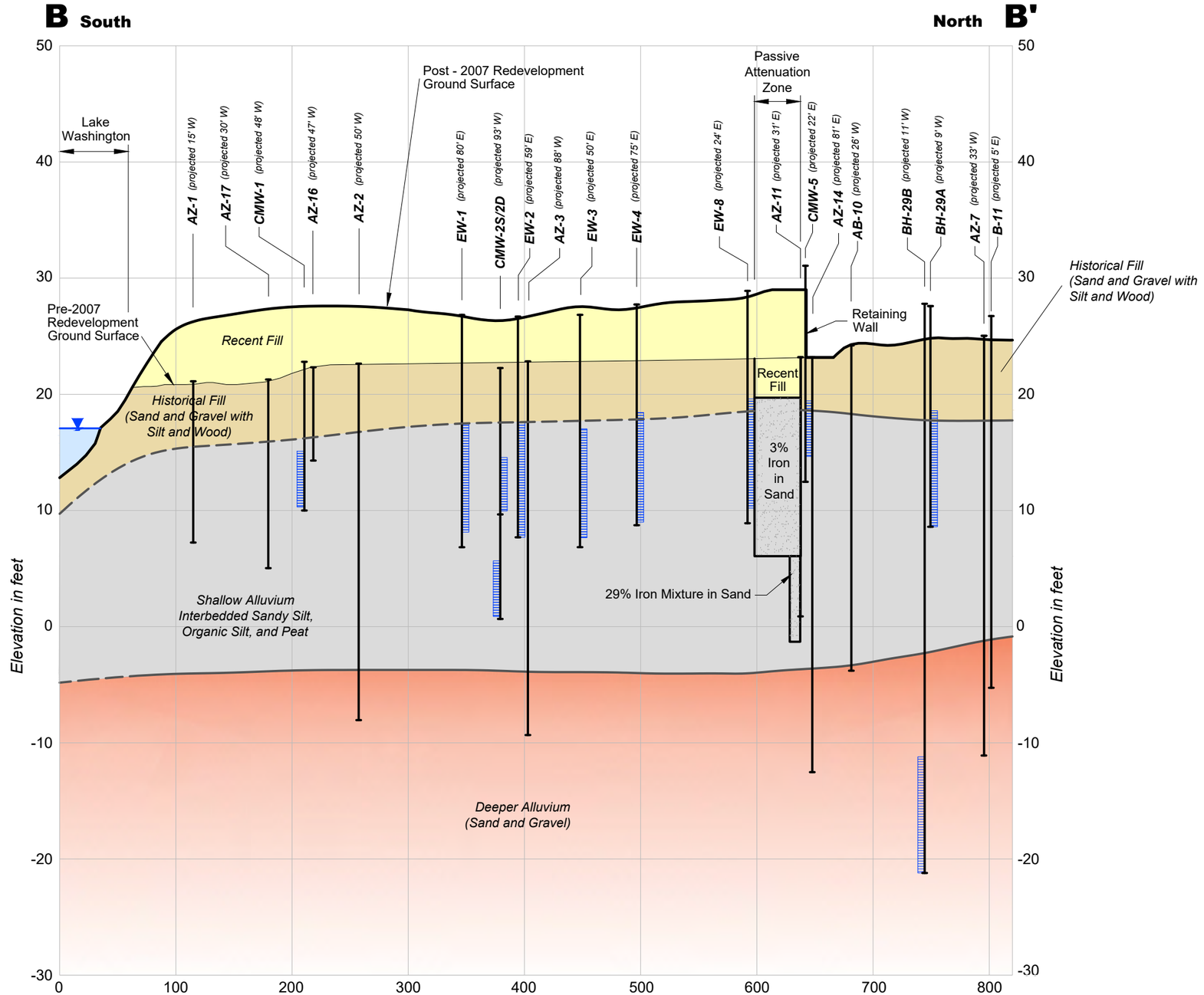
0 100 200 Feet

Cross Section A-A'

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting	FEB-2023	BY: DIM/CMV	FIGURE NO. 3-2
	PROJECT NO. 050004	REVISED BY: SCC	

CAD Path: Q:\Barbee Mill\050004 Barbee Mill\2019-03 RI\050004-AA with and without Arsenic Data.dwg Cross Section A 11x17L || Date Saved: Apr 01, 2019 4:12pm || User: scudd



LEGEND

- Ground Surface
- Geologic Unit Contact
- Well Screen
- Well Open Hole, Uncased
- Lake Level September 2018
- AZ-7 — Well Number
- Recent Fill
- Historical Fill
- Shallow Alluvium
- Deep Alluvium

Horizontal Scale
0 100 200
Feet

Vertical Exaggeration X 10
Scale: 1" = 100' Horizontal
1" = 10' Vertical

DRAFT

Cross Section B-B'

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting	FEB-2023	BY: DFR/PMB/DIM	FIGURE NO. 3-3
	PROJECT NO. 050004	REV BY: SCC	

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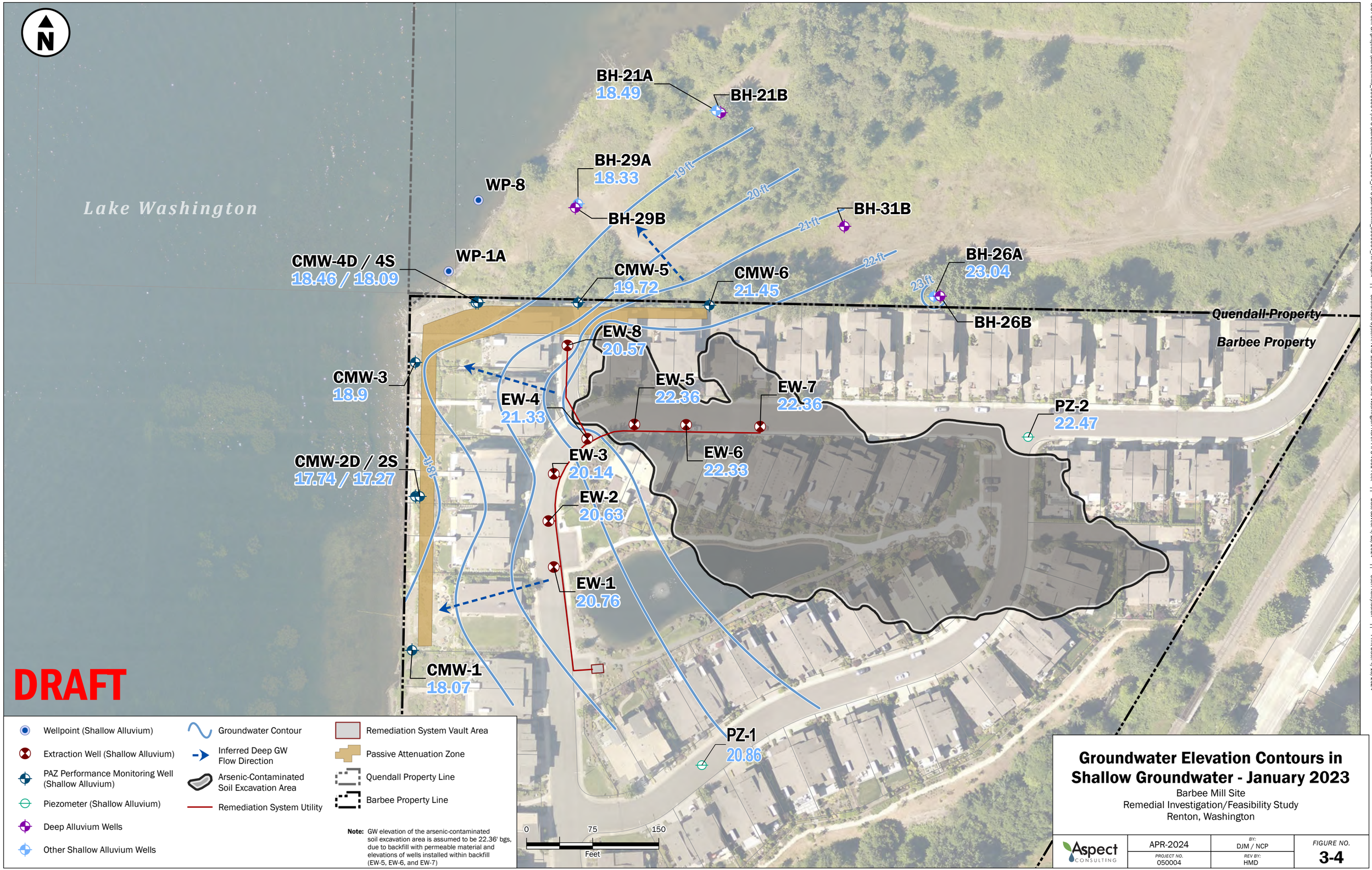


Source: Aerial Imagery from King County, 2017. *Groundwater Elevations in NAVD88*

Groundwater Elevation Contours in Shallow Groundwater - January 2023

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Aspect Consulting	APR-2024	BY: DJM / NCP	FIGURE NO. 3-4
	PROJECT NO. 050004	REV BY: HMD	

GIS Path: G:\projects\BarbeeMills_0500004\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 4/18/2024 || User: haley.duran || Print Date: 4/18/2024

Source: Aerial Imagery from King County, 2017.

Groundwater Elevations in NAVD88

Groundwater Elevation Contours in Deeper Groundwater - January 2023

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Aspect Consulting	APR-2024	BY: DJM / NCP	FIGURE NO. 3-5
	PROJECT NO. 050004	REV BY: HMD	

GIS Path: G:\projects\BarbeeMills_0500004\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 4/18/2024 || User: haley.duran || Print Date: 4/18/2024

Notes:
1. Bathymetric data was collected in 1996 by CRA Northwest in conjunction with Busch, Roed, and Hitchings (BRH).

Legend

- Historical Outfall Location
- Contour 1 ft (NAVD88)
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Preliminary Sediment Boundary
- Historical Building Footprint

N

0 100 200 400 Feet

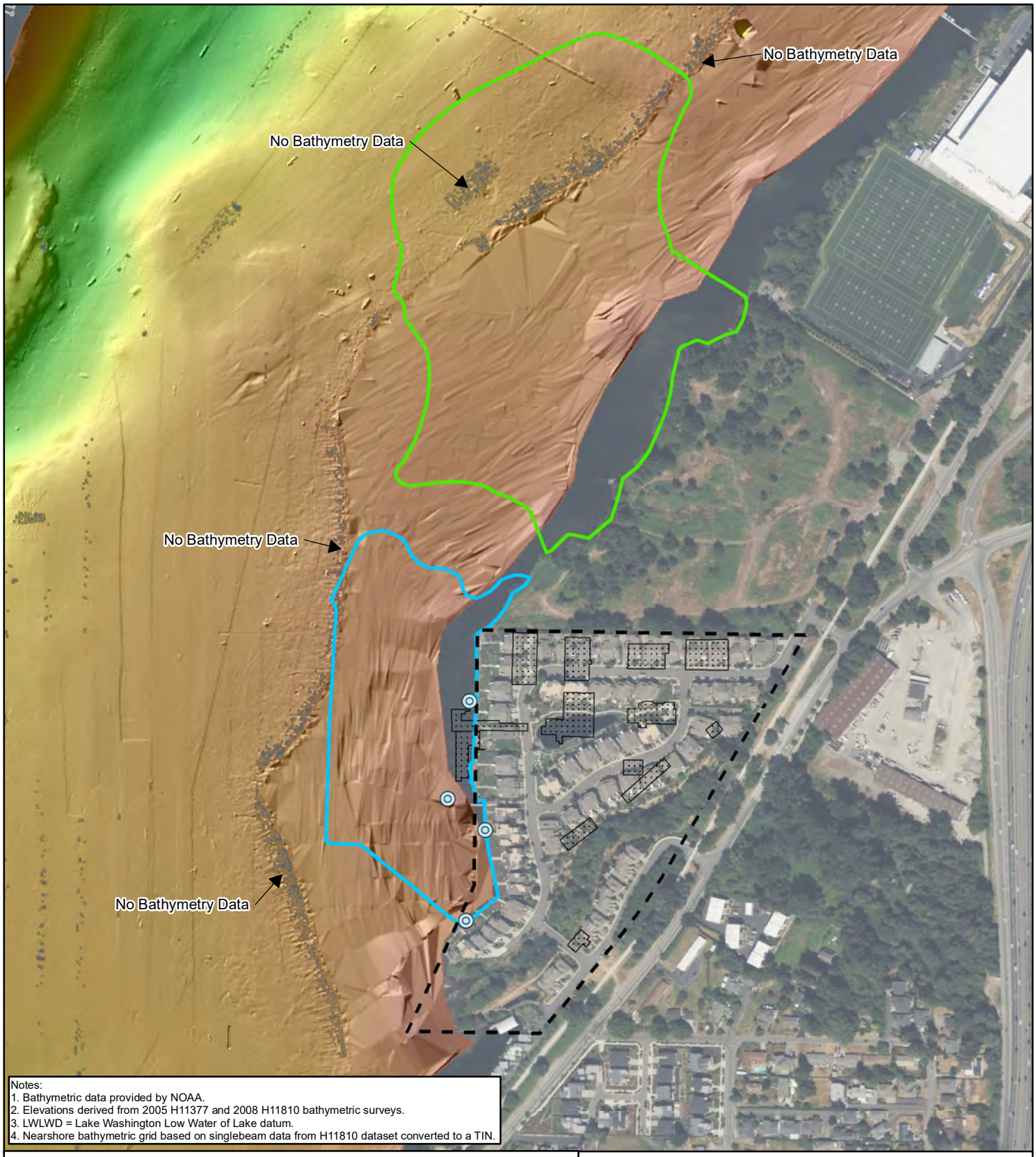
1996 Lake Washington Bathymetry (Pre-2002 Sediment Removal)
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869 | November 2023

Figure 3-6

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 3-6 1996 Lake Washington Bathymetric Survey.mxd 11/17/2023 5:13:44 AM



Notes:
1. Bathymetric data provided by NOAA.
2. Elevations derived from 2005 H11377 and 2008 H11810 bathymetric surveys.
3. LWLWD = Lake Washington Low Water of Lake datum.
4. Nearshore bathymetric grid based on singlebeam data from H11810 dataset converted to a TIN.

Legend

- Historical Outfall Location
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Preliminary Sediment Boundary
- Historical Building Footprint

Bathymetric Elevation
Feet LWLWD
High : -0.38
Low : -41.42

N

0 100 200 400 Feet

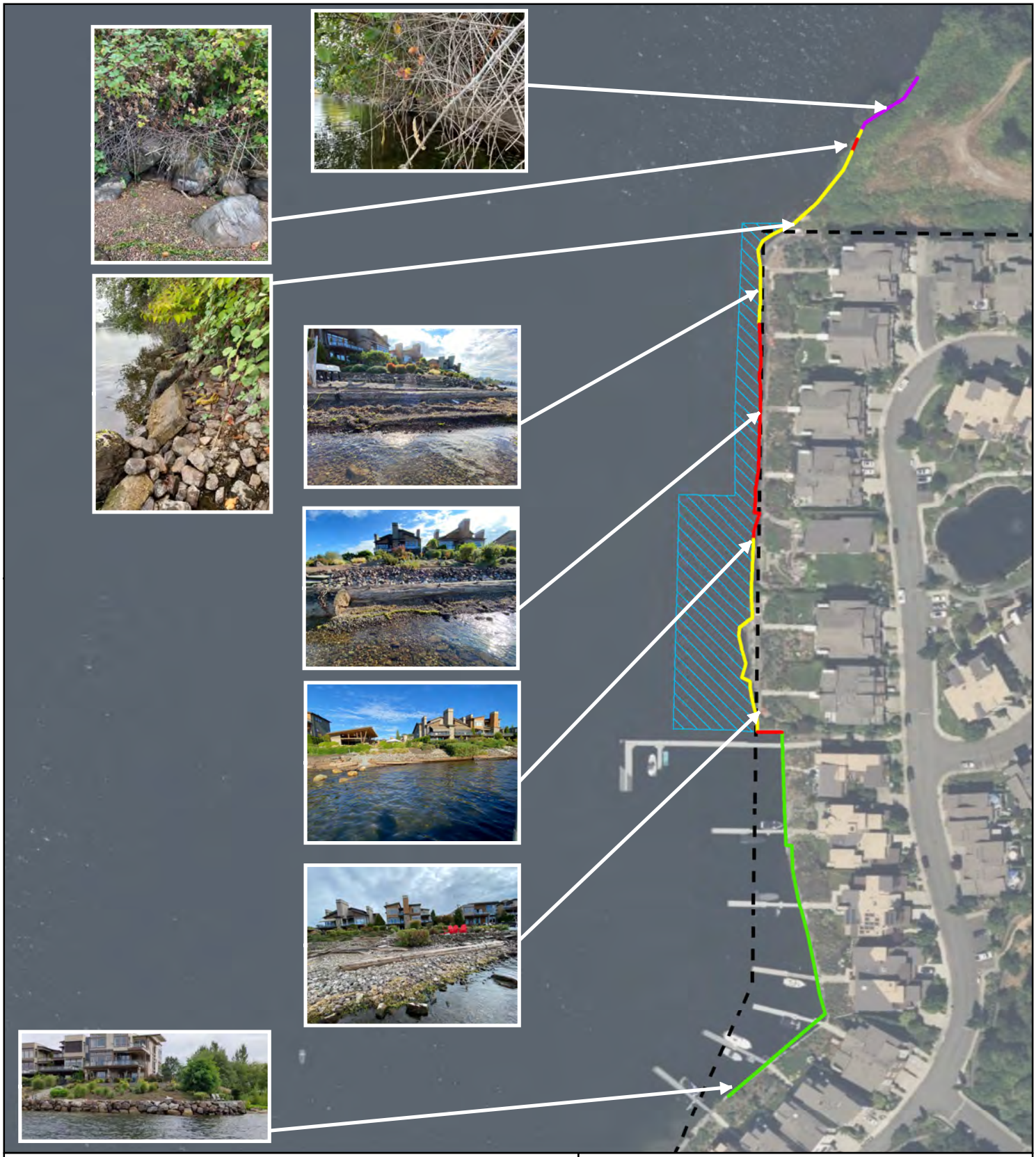
2005/2008 Lake Washington Bathymetric Survey (Post-2002 Sediment Removal)
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

Figure 3-7

PNG0869 | November 2023

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 3-7 2005 Lake Washington Bathymetric Survey.mxd 11/17/2023 5:17:04 AM



Legend

Shoreline Type

- Beach
- Bulkhead
- Not Accessible
- Riprap

Habitat Restoration Area

N

0 50 100 200 Feet

Shoreline Features

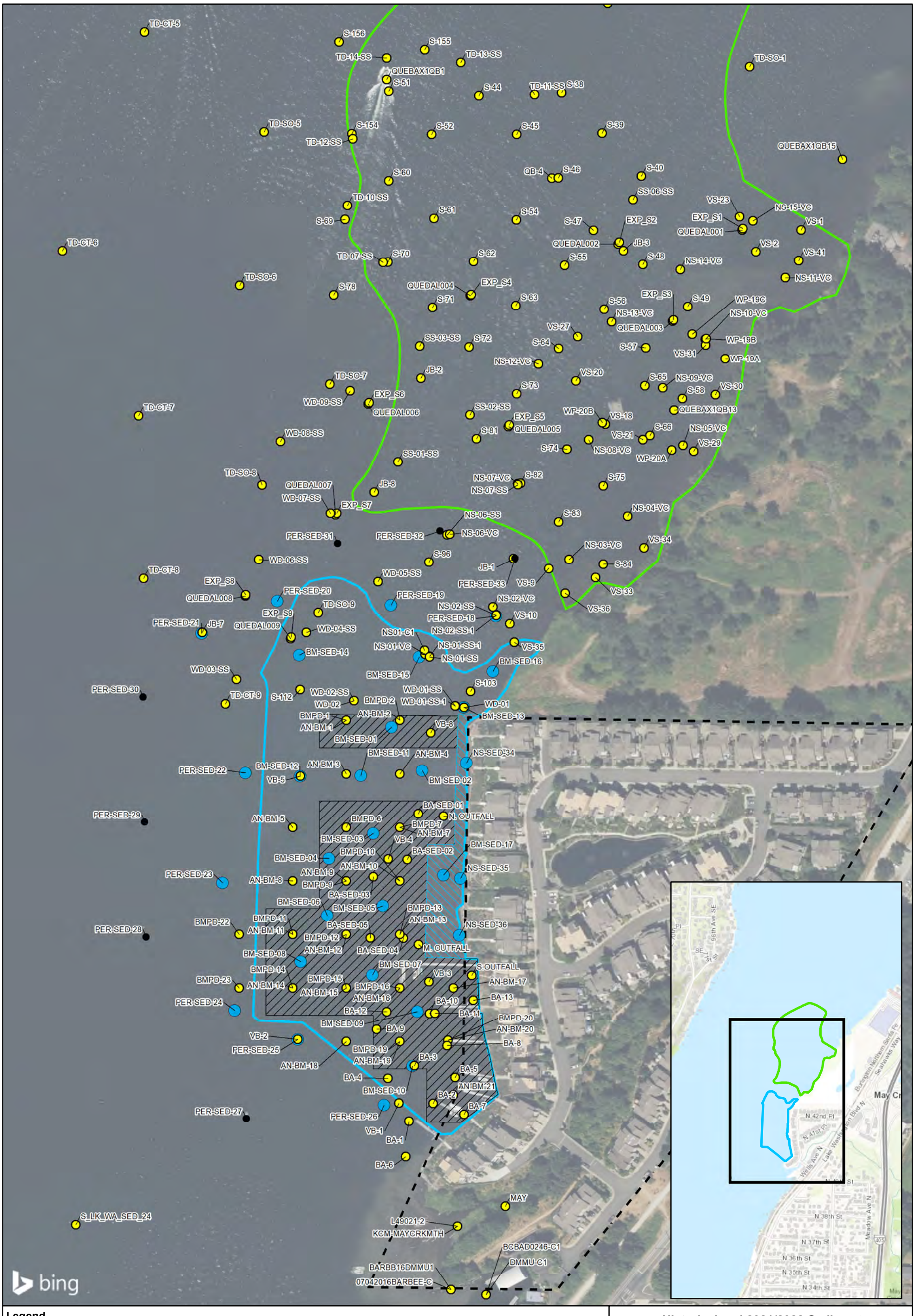
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869 | November 2023

Figure 3-8

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 3-8 Shoreline Structure.mxd 11/17/2023 5:18:01 AM



Legend

- 2021/2022 Sediment Sample Location
- Archived Sample Location
- Historical Sediment Sample Location
- Barbee Property Boundary
- Habitat Restoration Area
- Barbee Site, Preliminary Sediment Boundary
- Quendall Site, Operable Unit 2
- 2002 Sediment Removal Area

N

0 50 100 200 Feet

Historical and 2021/2022 Sediment Sample Locations

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869	November 2023	Figure 4-1

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 4-1 Historical and Current Sample Locations.mxd 11/17/2023 5:19:07 AM

2006 Arsenic-Contaminated Soil Excavation Depths

5'	11'
8'	12'
9'	13'
10'	15'

- PCP Excavation Confirmation Sample
- West TPH Excavation Confirmation Sample
- Post-Dredge Sediment Sample
- East TPH Excavation Confirmation Sample
- 2005 Habitat Restoration Area
- 1999/2002 Sediment Dredge Area
- 2006 Soil Excavation Area

Notes:
1) See Figure 3 for arsenic excavation confirmation sample locations.
2) Excavation depths based on pre-development site grade

Source: Aerial Imagery from King County, 2017.

Sediment Dredge Area

BMPD-1 BMPD-2

Sediment Dredge Area

BMPD-6 BMPD-7

BMPD-9 BMPD-10

BMPD-11 BMPD-12 BMPD-13

Lake Washington

BMPD-14 BMPD-15 BMPD-16 BMPD-17

Sediment Dredge Area

BMPD-19 BMPD-20

BMPD-21

Habitat Restoration Area

HSE-B-8 HSE-B-9 HSE-B-10 HSE-B-7 HSE-B-6 HSE-B-5 HSE-B-3 HSE-B-4

HSE-C-1 HSE-C-2 HSE-C-4 HSE-C-5 HSE-C-3

East TPH Excavation Area

PCP Excavation Area

West TPH Excavation Area

HSE-A-3 HSE-A-4 HSE-A-5 HSE-A-1 HSE-A-2

8' 8' 10' 15' 13' 12' 11' 15' 11' 10' 9' 5' 13' 5' 15' 8' 9' 12' 15' 10' 12' 10' 15' 10' 12' 8' 10' 13' 11' 8' 10' 5' 11'

N

0 100 200

Feet

Completed Remedial Actions Soil and Sediment

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting	DEC-2023	BY: DFR / EAC	FIGURE NO. 4-2
	PROJECT NO. 050004	REV BY: DIM / NCP / HMD	

DRAFT

GIS Path: G:\projects\BarbeeMills_050004\RIFS\BarbeeMill_050004_RIFS\BarbeeMill_050004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 12/12/2023 || User: haley.duran || Print Date: 12/12/2023

Quendall Site Monitoring Well

- Shallow Alluvium Wells
- Deep Alluvium Wells

Shallow Alluvium Wells

- Wellpoint
- Extraction Well
- PAZ Performance Monitoring Well
- Peizometer
- Porewater Sampling Location
- Excavation Footprint
- Remediation System Utility
- Passive Attenuation Zone
- Remediation System Vault Area

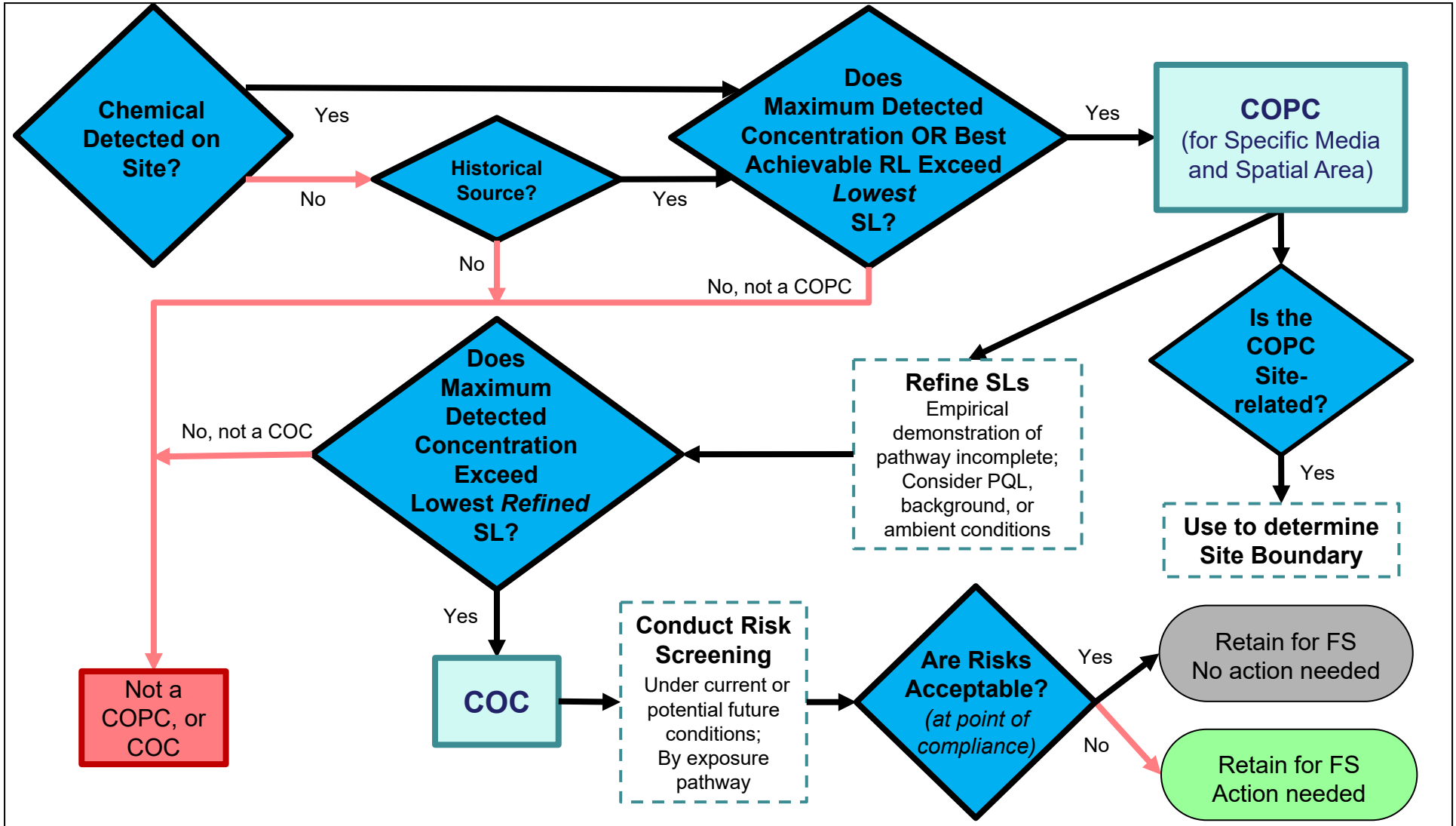
Source: Aerial Imagery from King County, 2017.

Interim Remedial Action Treatment System and Groundwater Performance Monitoring Locations

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting	DEC-2023	BY: DFR / EAC	FIGURE NO. 4-3
	PROJECT NO. 050004	REV BY: DIM / NCP	

GIS Path: G:\projects\BarbeeMills_050004\RIFS\BarbeeMill_050004_RIFS\BarbeeMill_050004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 12/11/2023 || User: haley.duran || Print Date: 12/11/2023



YES – Black Arrow

NO – Red Arrow

Acronyms:
COPC = Contaminant of Potential Concern
COC = Contaminant of Concern
PQL = Practical Quantitation Limit
RL = Reporting Limit
SL = Screening Level

Decision Flowchart for Identifying COPCs and COCs

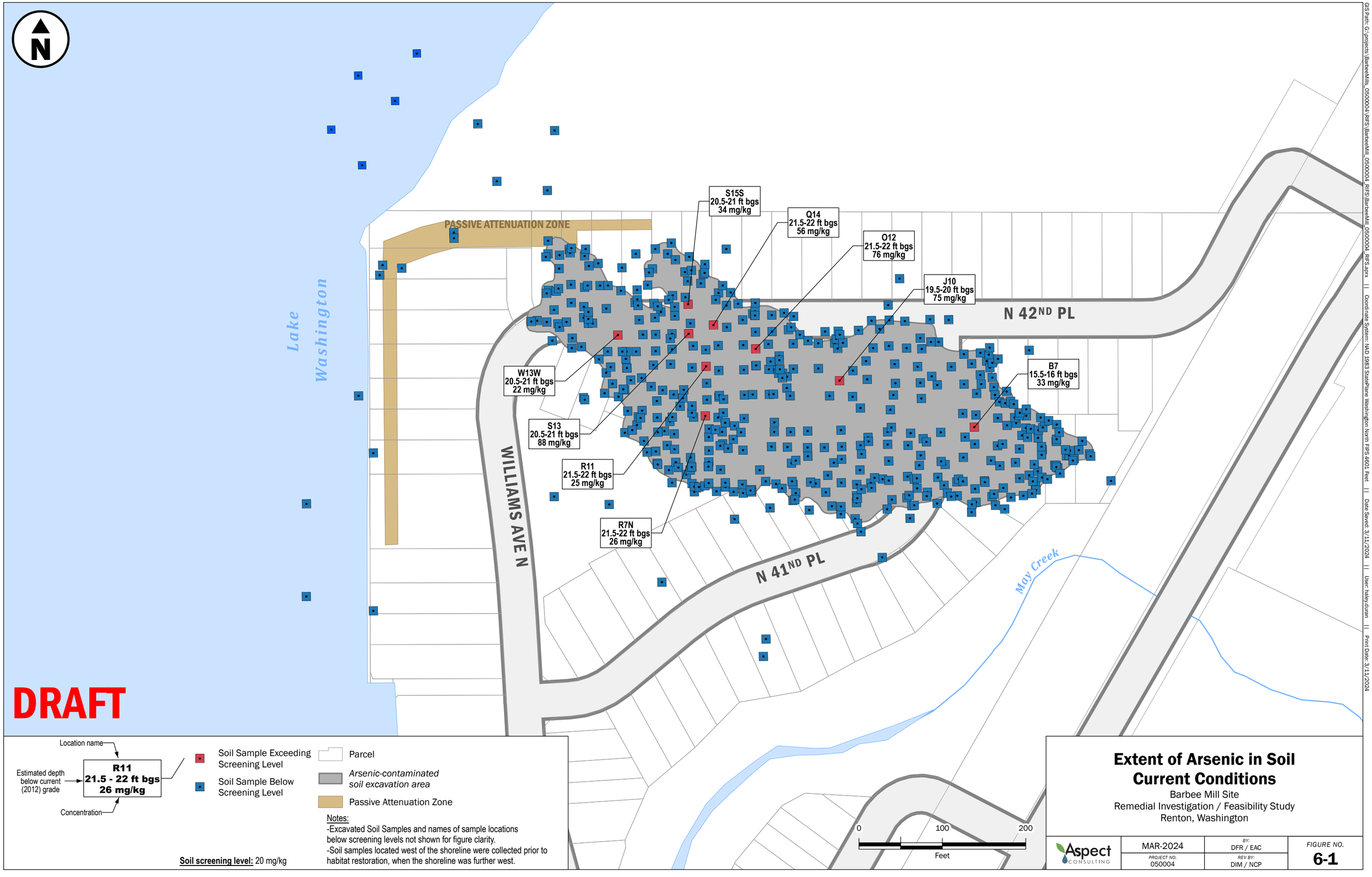
Barbee Mill Site, RI/FS Report

Aspect CONSULTING Geosyntec consultants

050004 | February 2023

Figure 5-1

S:\Barbee Mill\Report Drafts\RIFS\Figures



GIS Path: G:\projects\BarbeeMills_0500004\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 3/11/2024 || User: haleyduran || Print Date: 3/11/2024

DRAFT

- Post-2007 Groundwater Sample Above Screening Level
- Post-2007 Groundwater Sample Below Screening Level
- Pre-2007 Groundwater Sample Above Screening Level
- Pre-2007 Groundwater Sample Below Screening Level
- Data not used for defining plume boundary
- Approximate DNAPL extent
- Extent of Groundwater Above Screening Level (16µg/L)
- Arsenic-Contaminated Soil Excavation Area
- Parcel
- Groundwater Elevation Contour (January 2023)
- Inferred Shallow GW Flow Direction
- Passive Attenuation Zone

Notes:

1) When multiple samples are collected from the same location, the most recent value is shown.
2) Screening level for groundwater: 16 µg/L
3) When multiple samples are collected from different depths at the same location, the maximum value is shown.
4) Maximum westerly extent of groundwater above screening level based on groundwater modeling (See Section 8).
5) Names of samples for below screening levels not shown for figure clarity.
6) Arsenic results are shown in ug/L
7) See Section 6.1.1.2 of text for rationale of arsenic plume extent.
8) Pre-2007 samples collected west of the current shoreline were collected prior to habitat restoration, when the shoreline was further west.

B-17 68; TWP-02 26; HC-37 120; B-06 78; B-07 68; AZ-8 69; WP-2 29; AZ-7 18; B-11 24; B-08 180; WP-8 140; HC-38 96; AB-10 220; B-13 28; B-12 31; TWP-01 49; AZ-6 4500; BH-29A 150; AZ-11 2900; WP-1 820; AZ-14 120; B-09 700; HC-35 25; HC-34 3600; B-14 64; B-15 64; CMW-4S 58; CMW-4D 230; HCMW-01D 1700; HCMW-01S 4300; EW-8 240; CMW-6 140; HC-45 18; B-16 20; AZ-5 750; AZ-20 270; HC-22 3300; EC-4 3800; HC-18 28000; EC-1 4800; AZ-4 33; RMW-01 110; EC-8 75; EC-2 32000; HC-11 29000; RMW-03 110; HC-36 72; AZ-19 25; EW-6 38; HC-02 450; HCMW-02 32500; HC-17 14000; EC-11 530; HC-10 17; HC-47 150; AZ-3 120; EW-4 41; HC-03 180; HC-09 33; EW-2 120; EW-5 30; HCMW-04 19000; HC-46 20000; CMW-2D 170; AZ-18 250; EC-12 15000; HC-16 9000; HCMW-03 258; AZ-15 20; EC-6 230; EC-3 510; HC-15 3100; HC-07 380; EC-5 380; HC-19 430; HC-42 65; AZ-2 25; HC-44 95; HC-39 100; EW-1 68; HC-41 220; HC-12 110; WP-6 84; AZ-16 31; HC-20 180; HC-13 19; HC-40 33; AZ-17 25; HC-48 100; CMW-1 64; AZ-10 30

19-ft; 20-ft; 21-ft; 22-ft; 23 ft; 18ft

N 42ND PL; N 41ND PL; WILLIAMS AVE N; May Creek; Lake Washington

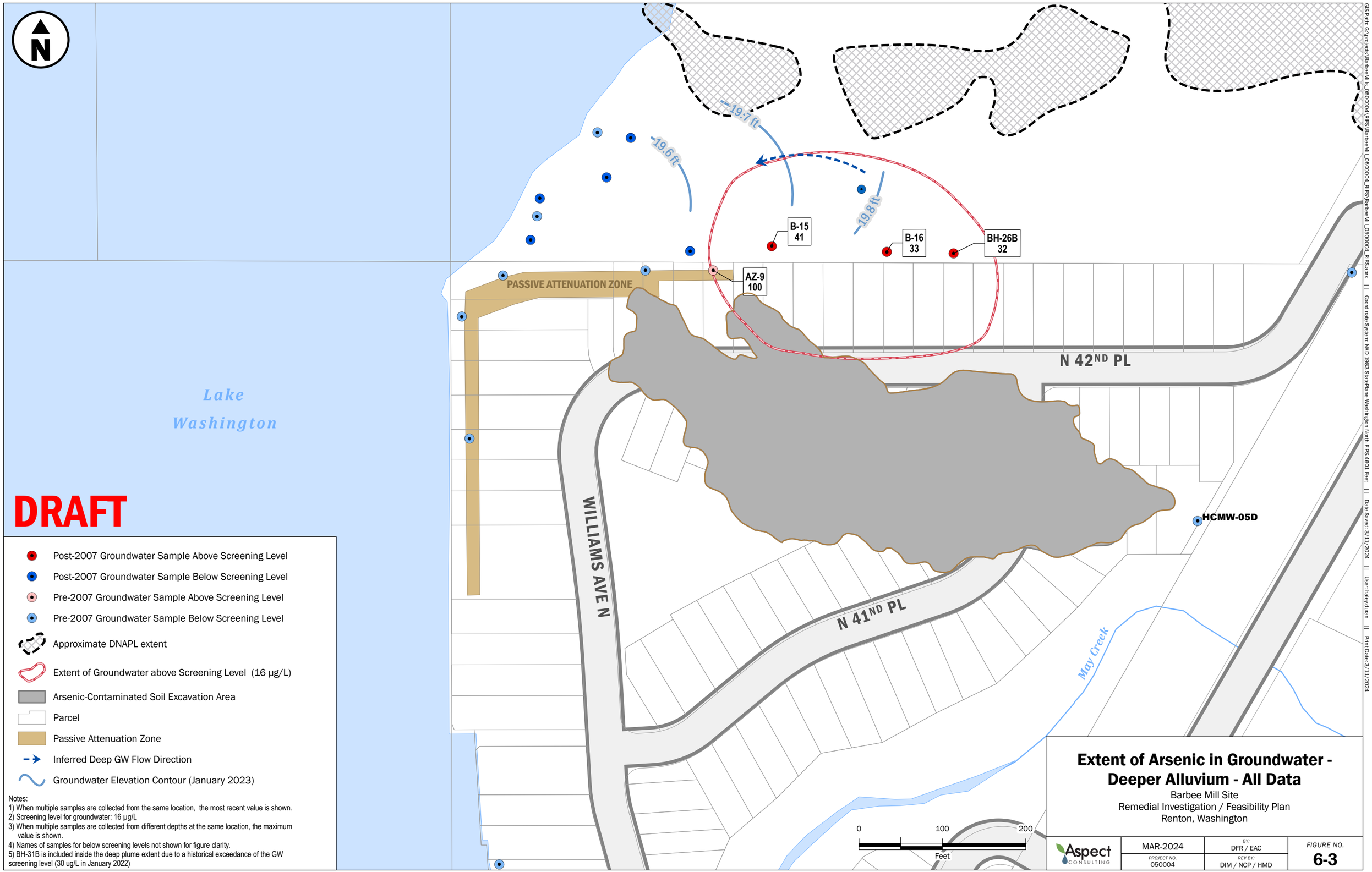
0 100 200 Feet

Extent of Arsenic in Groundwater - Shallow Alluvium - All Data

Barbee Mill Site
Remedial Investigation \ Feasibility Study
Renton, Washington

Aspect Consulting	MAR-2024	BY: DFR / EAC	FIGURE NO. 6-2
	PROJECT NO. 050004	REV BY: DIM / NCP / HMD	

GIS Path: G:\projects\BarbeeMills_050004\RIFS\BarbeeMill_050004_RIFS\BarbeeMill_050004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 3/18/2024 || User: haley.duran || Print Date: 3/18/2024



DRAFT

- Post-2007 Groundwater Sample Above Screening Level
- Post-2007 Groundwater Sample Below Screening Level
- Pre-2007 Groundwater Sample Above Screening Level
- Pre-2007 Groundwater Sample Below Screening Level
- Approximate DNAPL extent
- Extent of Groundwater above Screening Level (16 µg/L)
- Arsenic-Contaminated Soil Excavation Area
- Parcel
- Passive Attenuation Zone
- Inferred Deep GW Flow Direction
- Groundwater Elevation Contour (January 2023)

Notes:
1) When multiple samples are collected from the same location, the most recent value is shown.
2) Screening level for groundwater: 16 µg/L
3) When multiple samples are collected from different depths at the same location, the maximum value is shown.
4) Names of samples for below screening levels not shown for figure clarity.
5) BH-31B is included inside the deep plume extent due to a historical exceedance of the GW screening level (30 ug/L in January 2022)

Extent of Arsenic in Groundwater - Deeper Alluvium - All Data

Barbee Mill Site
Remedial Investigation / Feasibility Plan
Renton, Washington

Aspect Consulting	MAR-2024	BY: DFR / EAC	FIGURE NO. 6-3
	PROJECT NO. 050004	REV BY: DIM / NCP / HMD	

GIS Path: G:\projects\BarbeeMills_050004\RIFS\BarbeeMill_050004_RIFS\BarbeeMill_050004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 3/11/2024 || User: haley.duran || Print Date: 3/11/2024

Depth bls	B-01	B-02	B-03	B-04	B-05
19 ft	1.7	1.5	1U	3.1	8.5
23 ft	5.1	1U	1.1	6.4	3.4
27 ft	4.4	2.6	4.4	6.2	1.8

Depth BLS	TWP-1	TWP-2
6 ft	49	26

Depth bgs	B-06	B-07	B-08	B-09	B-10	B-11	B-12	B-13	B-14	B-15	B-16	B-17
8 ft	3U	12	--	--	71	--	3U	4.8	--	4.6	--	--
12 ft	27	68	160	17	97	10	14	13	64	5.4	--	34
16 ft	46	43	150	32	210	14	3U	28	60	3U	--	68
20 ft	78	24	150	170	220	24	3U	19	3U	3U	--	15
24 ft	6.7	3.5	180	700	40	19	3U	3U	--	38	--	--
28 ft	3.7	8.1	3U	22	3U	3U	31	3.6	9.4	78	20	--
32 ft	--	--	7.9	3U	--	4.4	--	--	10	84	33	--
36 ft	--	--	--	--	--	--	--	--	--	41	--	--
40 ft	--	--	--	--	--	--	--	--	--	36	--	--

Lake Washington

B-05 8.5
B-01 5.1
TWP-02 26
B-06 78
B-17 68
B-11 24
B-07 68
B-04 6.4
WP-8 3.9
BH-29A 150
BH-29B 3
B-12 31
B-02 2.6
B-08 180
TWP-01 49
B-03 4.4
B-13 28
AB-10 220
WP-1A 140
B-09 700
B-14 64
B-15 84
B-16 33
BH-26B 32
BH-26A 15
CMW-04S 58
CMW-04D 230
CMW-5 2
CMW-6 140
BH-21A 4.6
BH-21B 160
BH-31B 12

19.7 ft
19 ft
19.6 ft
20 ft
21 ft
19.8 ft
22 ft
23 ft

Inferred Shallow Groundwater Flow Direction

Inferred Deep Groundwater Flow Direction

Location Types

- Offshore Borings
- Temporary Well Points
- Upland Borings
- Monitoring Wells
- Data Not Used for Defining Plume Boundary
- Shallow Groundwater Elevation Contour (Jan. 2023)
- Deep Groundwater Elevation Contour (Jan. 2023)
- Deep Arsenic Plume Extent
- Shallow Arsenic Plume Extent
- Passive Attenuation Zone
- Approximate extent of DNAPL
- Barbee Property Line
- Quendall Property Line

0 ft — Not Sampled — Below SL — Exceeds SL — 52 ft

NOTES

1 All units are ug/L
2 Highlighted cells indicate exceedance of 16 ug/L SL
3 Deep Arsenic Plume based on extent of arsenic exceeding SL in groundwater greater than 30 feet bgs. BH-31B is included inside the deep plume extent due to a historical exceedance of the screening level (30 ug/L in January 2022)
4 Shallow Arsenic Plume based on extent of arsenic exceeding SL in groundwater less than 30 feet bgs
5 SL = Screening Level, bgs = Below Ground Surface, bls = Below Lake Surface
6 Non-populated cells = sample not collected
7 Vertical datum: NAVD 88
8 Dissolved arsenic concentrations from January 2023 are shown for each monitoring well
9 Grab groundwater results from the 2018 Data Gaps Investigation are presented in tabular form. The maximum result from each location is shown next to the location
10 Sample intervals are 4 feet for B-01 through B-17, TWP-1 and TWP-2.
11 All offshore samples are BLS. All upland samples are BGS.
12 See Section 6.1.1.2 of text for rationale of arsenic plume extent

0 — 25 — 50 Feet

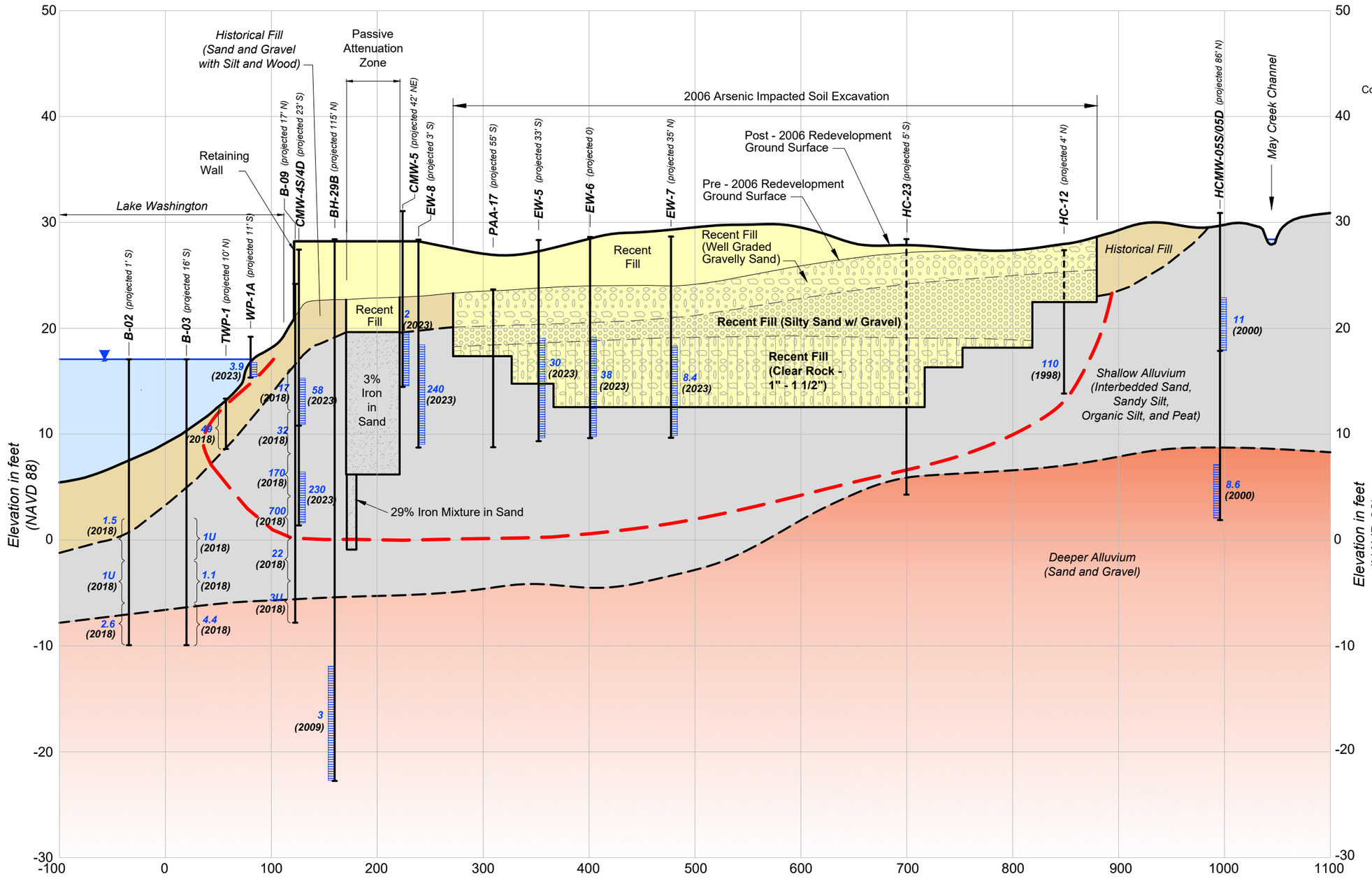
Extent of Arsenic in Groundwater - Quendall Property - Current Conditions

Barbee Mill Site
4101 Lake Washington Blvd. North
Renton, Washington

Aspect Consulting	MAR-2024	BY: JJP / SCC	FIGURE NO. 6-4
	PROJECT NO. 050004	REVISED BY: DIM / NCP / HMD	

GIS Path: G:\projects\Barbee Mill\050000s\RI/FS\Barbee Mill_0500004_RI/FS.aprx: F06-04 Arsenic in GW Quendall\1 | User: haley.oblam | | Print Date: 3/28/2024

A Northwest — A' Southeast



LEGEND

- Ground Surface
- Geologic Unit Contact
- Dissolved Arsenic Concentration in µg/L
- 450 (2016) — Well Screen; Sample Date
- Soil Boring and Well Casing
- Estimated Extent of Groundwater Exceeding Arsenic Screening Level
- Lake Level September 2018
- HC-12 — Well Number
- U — Analyte was not detected at or above the reported result

Note: Arsenic Screening Level in Groundwater 16µg/L

- Recent Fill
- Historical Fill
- Shallow Alluvium
- Deep Alluvium

Horizontal Scale: 1" = 100'
Vertical Scale: 1" = 10'
Vertical Exaggeration 10x

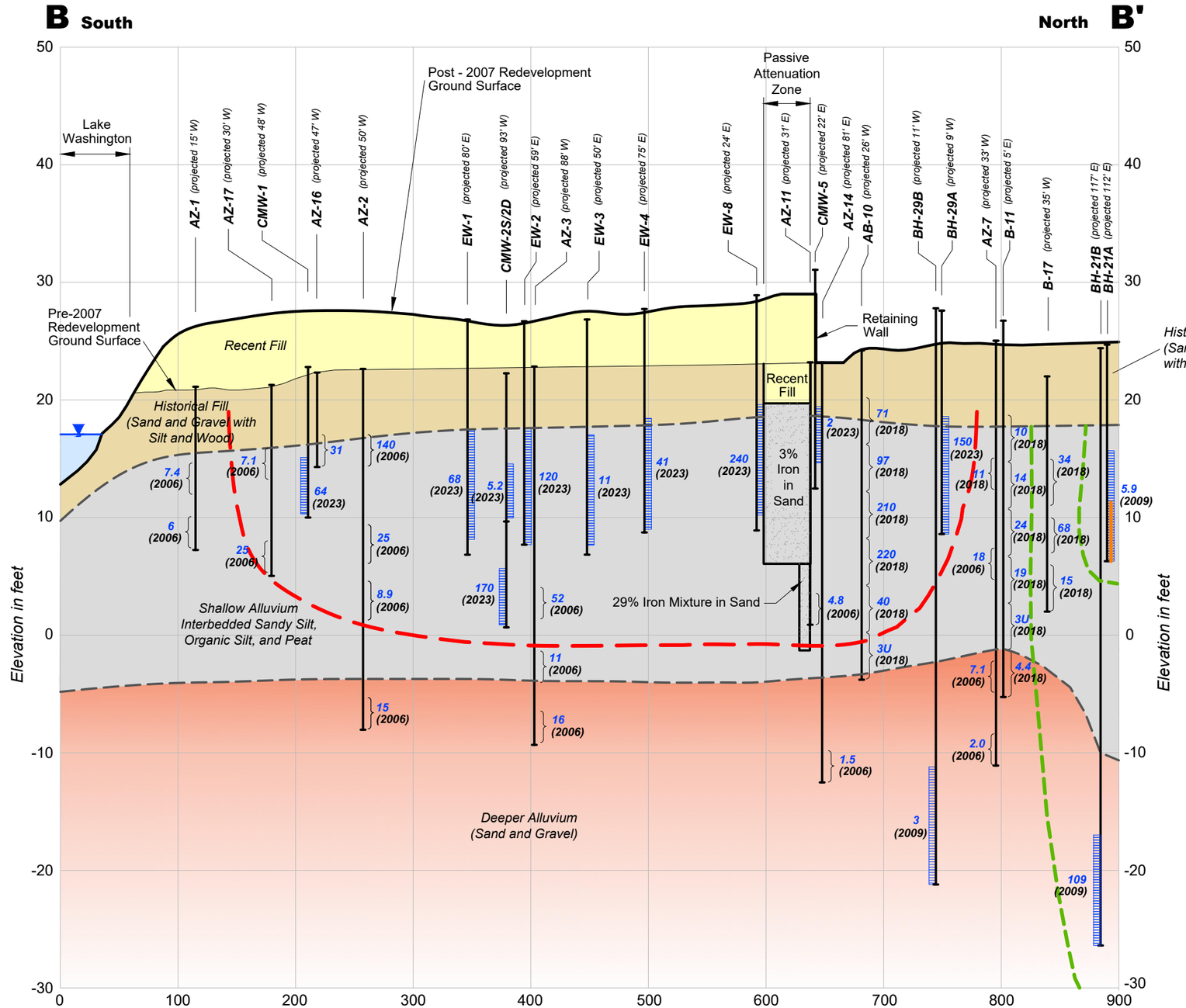
0 100 200 Feet

Cross Section A-A' - Extent of Arsenic in Groundwater - All Data

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting	Feb-2023	BY: DIM/CMV	FIGURE NO. 6-5
	PROJECT NO. 050004	REVISED BY: SCC	

CAD Path: Q:\Barbee Mill\050004 Barbee Mill\2023-02 RI-FS\050004-AA with and without Arsenic Data.dwg 6-5 Cross Section A-A' Extent of As in GW || Date Saved: Feb 21, 2023 3:42pm || User: scudd



LEGEND

- Ground Surface
- Geologic Unit Contact
- Dissolved Arsenic Concentration in µg/L; Sample Date; Hydrocarbon DNAPL — Well Screen
- Soil Boring and Well Casing
- Estimated Extent of Groundwater Exceeding Arsenic Screening Level for Barbee Mill Plume
- Estimated Extent of Groundwater Exceeding Arsenic Screening Level Due to Hydrocarbon Influence
- Lake Level September 2018
- AZ-7 — Well Number

Note: Arsenic Screening Level in Groundwater 20µg/L

- Recent Fill
- Historical Fill
- Shallow Alluvium
- Deep Alluvium

Horizontal Scale
0 100 200
Feet

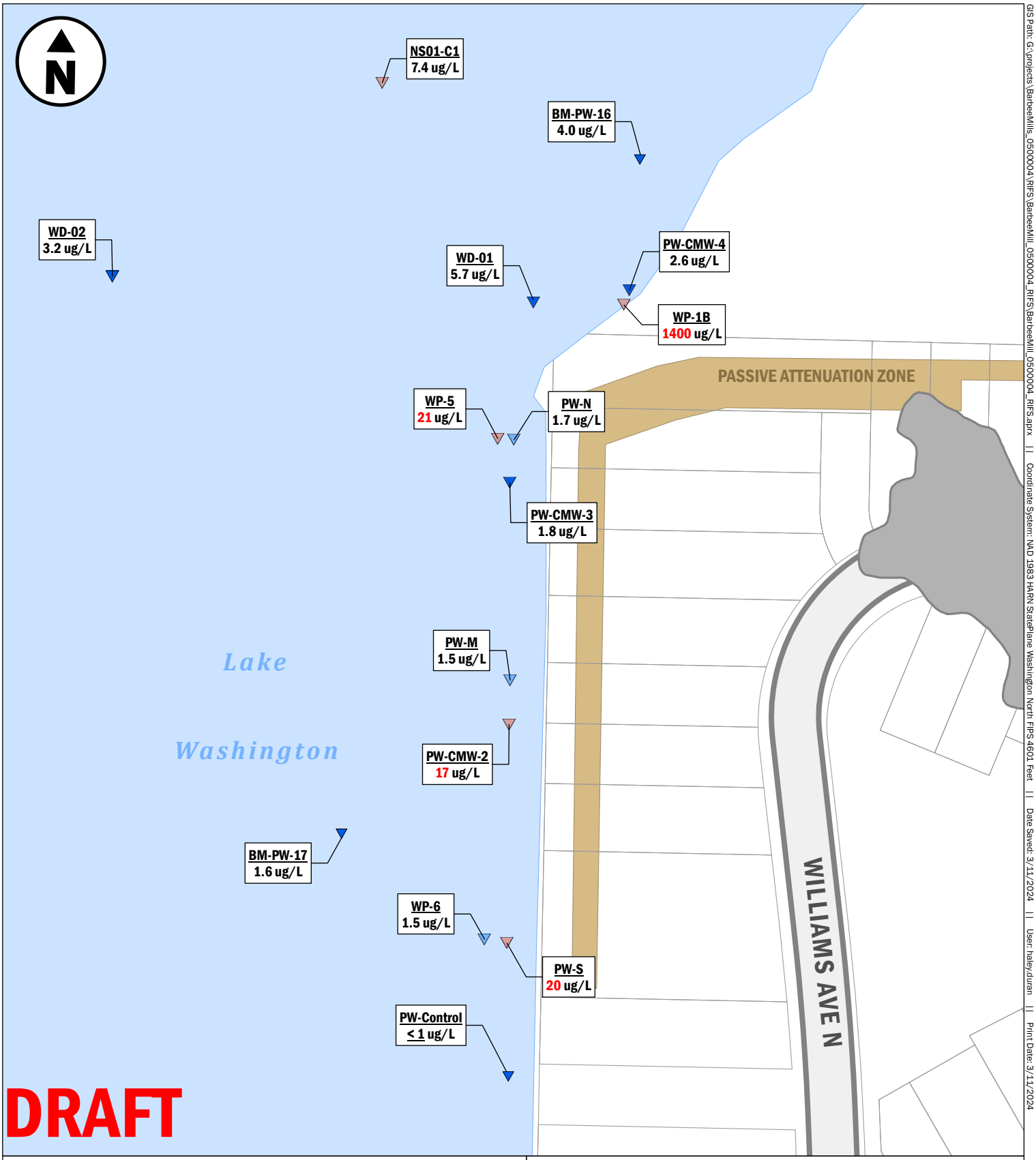
Vertical Exaggeration X 10
Scale: 1" = 100' Horizontal
1" = 10' Vertical

Cross Section B-B' - Extent of Arsenic in Groundwater - All Data

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting	Feb-2023	BY: DFR/PMB/DIM	FIGURE NO. 6-6
	PROJECT NO. 050004	REV BY: SCC	

CAD Path: Q:\Barbee Mill\050004 Barbee Mill\2023-02 RI-FS\050004-BB with and without Arsenic Data.dwg 6-6 Cross Section B-B' Extent of As in GW || Date Saved: Feb 21, 2023 3:43pm || User: scudd



Post-2006 Porewater Sample Below Screening Levels

Pre-2007 Porewater Sample Below Screening Levels

Pre-2007 Porewater Sample Above Screening Level

Arsenic-Contaminated Soil Excavation Area

Parcel

Passive Attenuation Zone

0 40 80

Feet

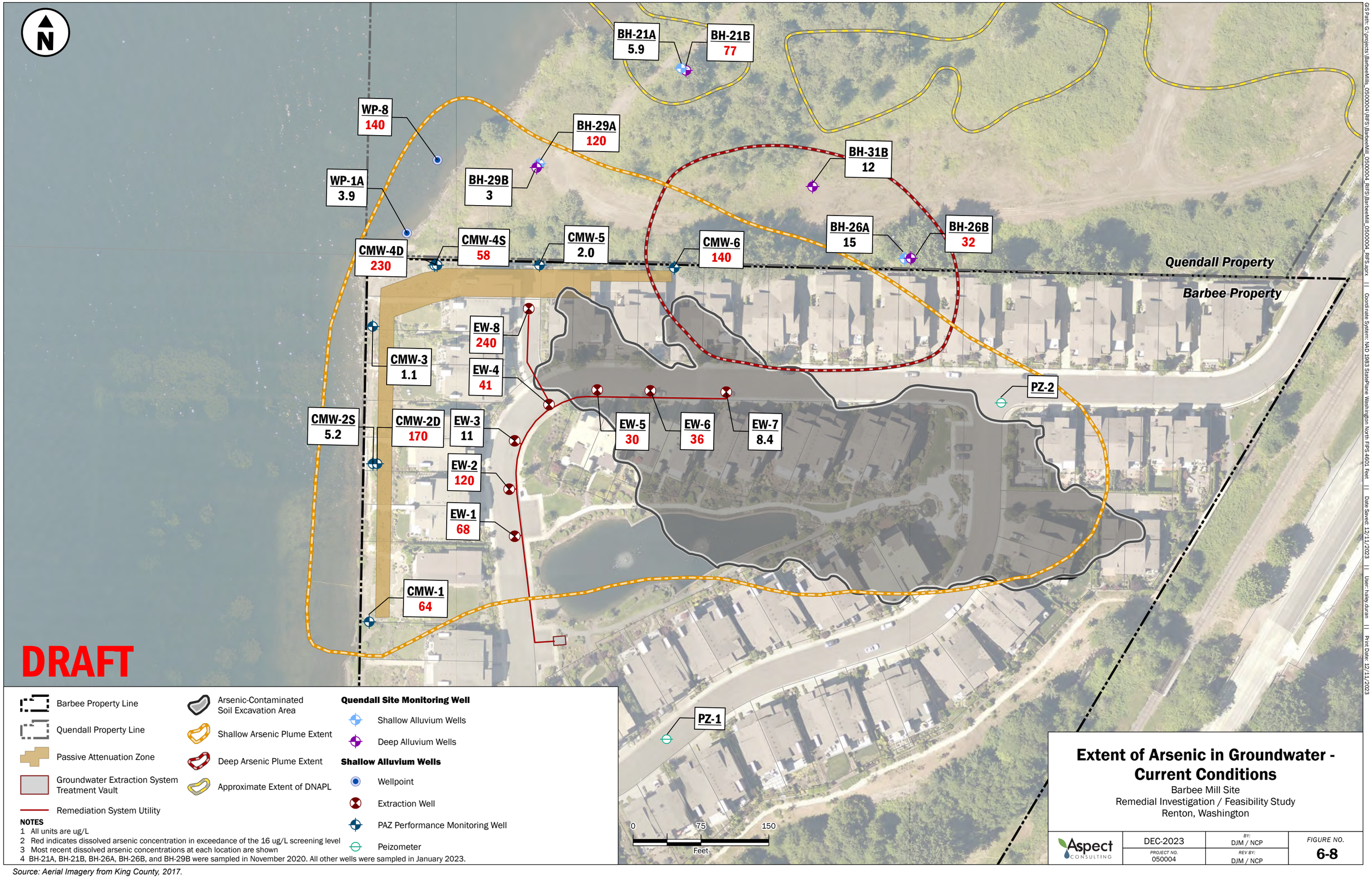
Screening Level: Arsenic: 16µg/L

Extent of Arsenic in Porewater - All Data

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

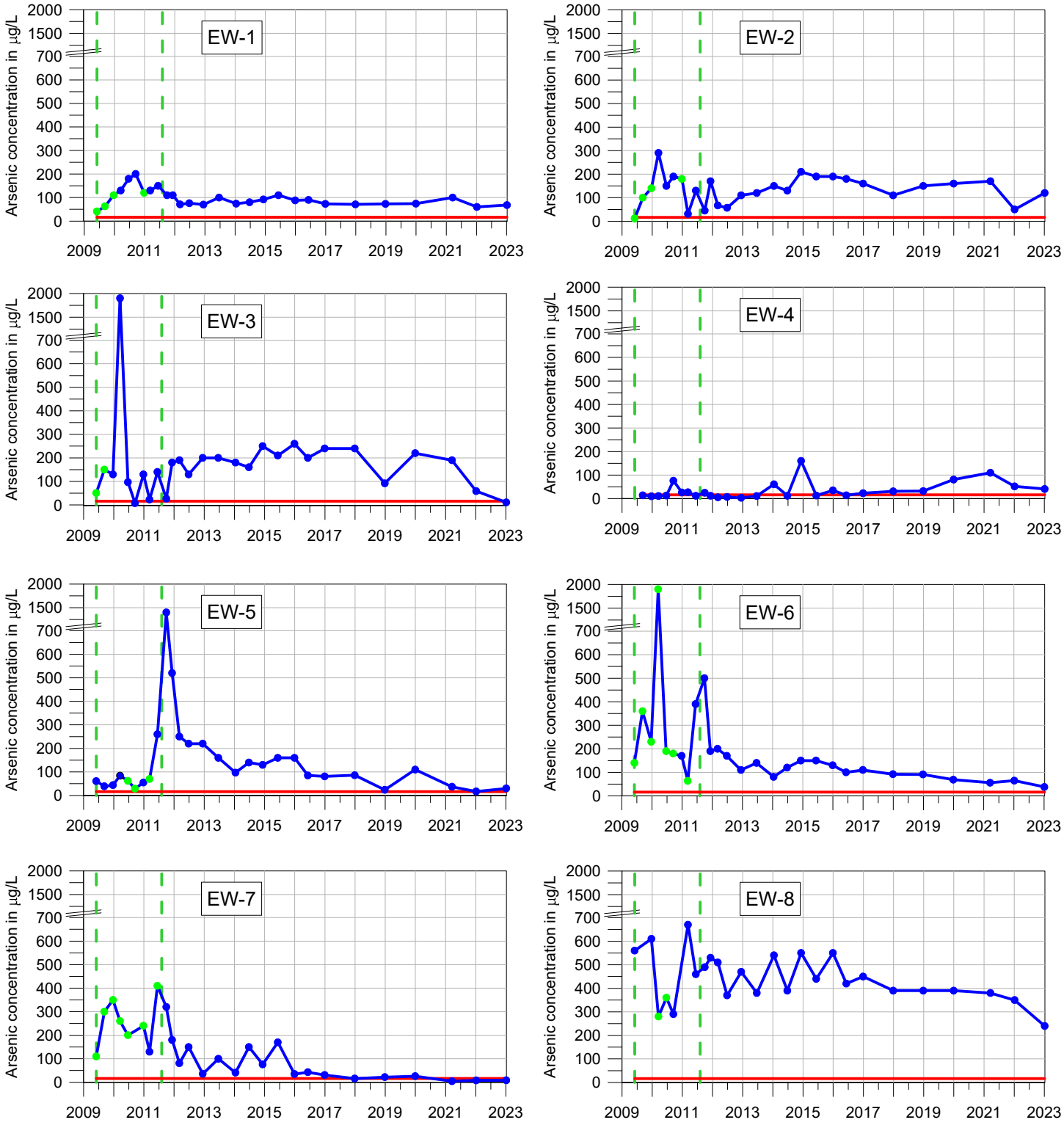
Aspect CONSULTING	MAR-2024	BY: DFR / EAC	FIGURE NO. 6-7
	PROJECT NO. 050004	REV BY: DIM / NCP / HMD	

GIS Path: G:\projects\BarbeeMills_0500004\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx || Coordinate System: NAD 1983 HARN StatePlane Washington North FIPS 4601 Feet || Date Saved: 3/11/2024 || User: haley.duran || Print Date: 3/11/2024



Source: Aerial Imagery from King County, 2017.

GIS Path: G:\projects\BarbeeMills_0500004\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 12/11/2023 || User: haley.duran || Print Date: 12/11/2023



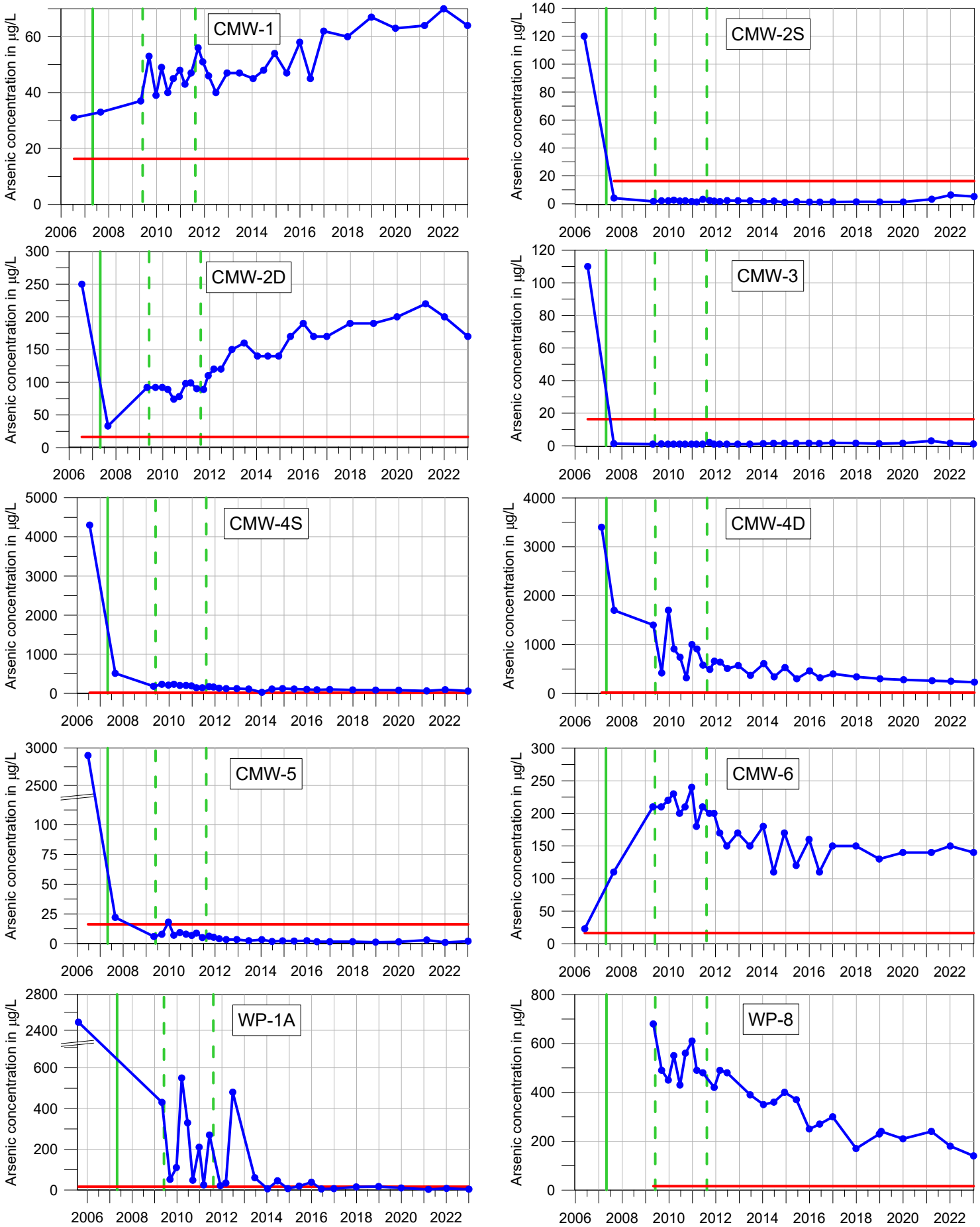
Notes:
Red line represents Site-specific natural background concentration for dissolved Arsenic (16 ug/L).
Dashed green lines represent the startup and shutdown of the Groundwater Pump and Treat System.
Total arsenic results are displayed from 9/2009 to 6/2010, Dissolved arsenic results displayed from 9/2010 to present.
Blue symbols represent samples collected while extraction well had not been operating during the month preceding sampling.
Green symbols represent samples collected when extraction well had been operating during the month preceding sampling.

Figure 6-9

Arsenic Concentration Trends Upgradient of the PAZ

Barbee Mill Site

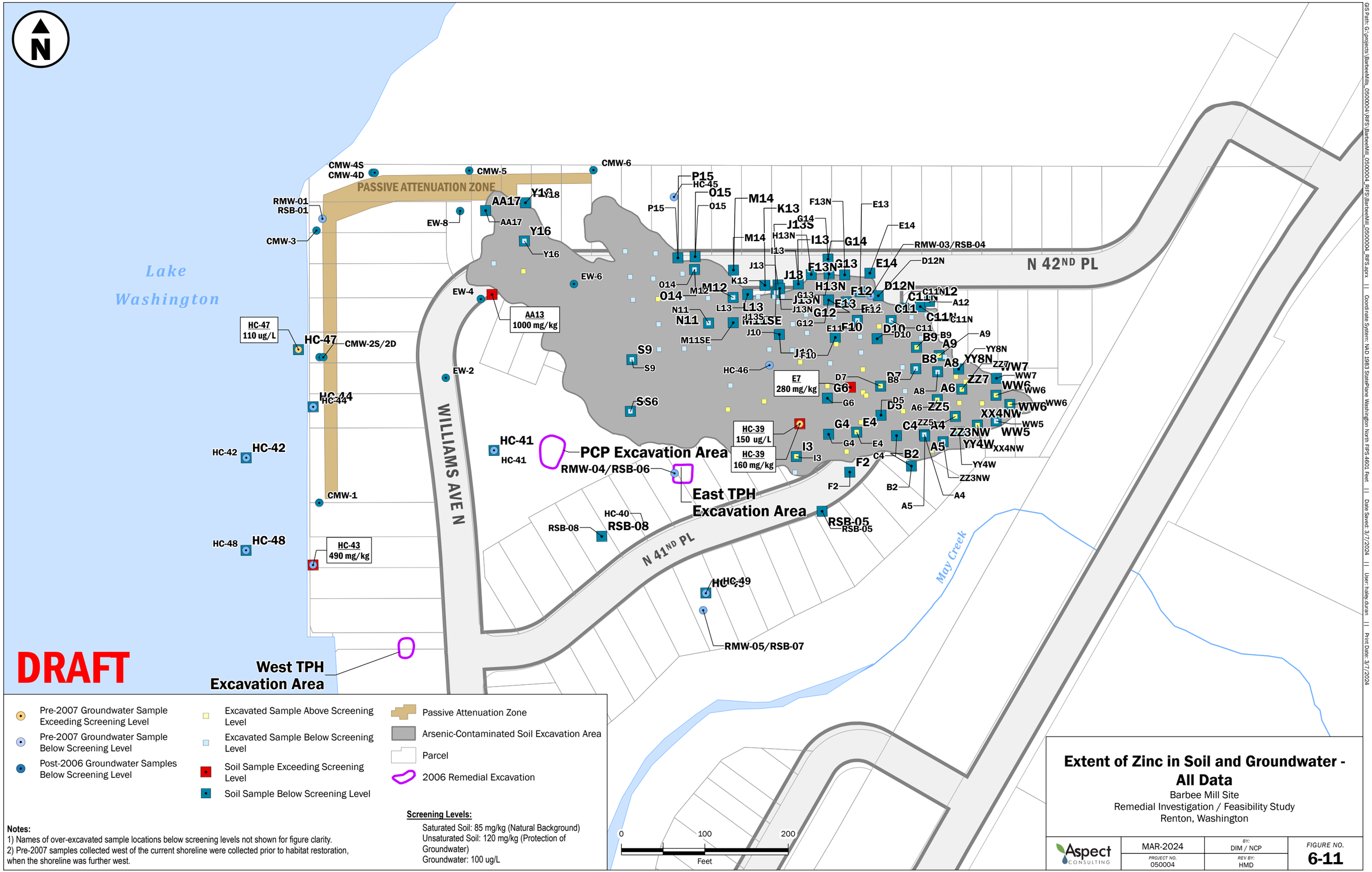
Aspect Consulting
2/8/2023

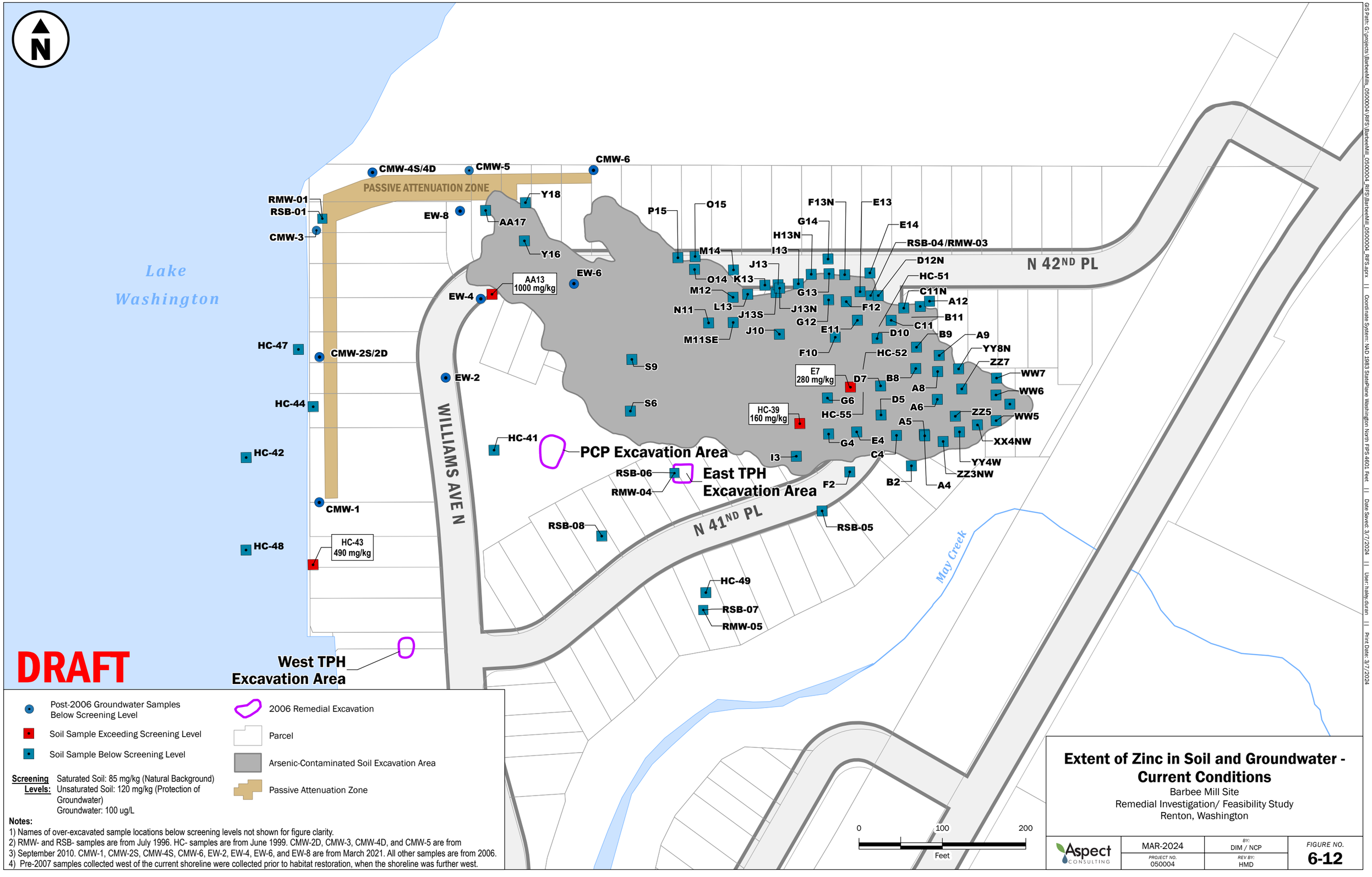


Notes:
Red line represents Site-specific natural background concentration for dissolved Arsenic (16 ug/L).
Solid green Line represents PAZ installation, and dashed green lines represent the startup and shutdown of the Groundwater Pump and Treat System.

Figure 6-10
Arsenic Concentration Trends at the PAZ Edges and Downgradient of the PAZ
Barbee Mill Site

Aspect Consulting
2/8/2023


N
Lake Washington
PASSIVE ATTENUATION ZONE
WILLIAMS AVE N
N 42ND PL
N 41ND PL
May Creek
CMW-4S
CMW-4D
CMW-5
CMW-6
RMW-01
RSB-01
CMW-3
EW-8
EW-6
EW-4
EW-2
CMW-2S/2D
CMW-1
RMW-03/RSB-04
RMW-04/RSB-06
RMW-05/RSB-07
HC-47
110 ug/L
HC-44
HC-42
HC-48
HC-43
490 mg/kg
AA13
1000 mg/kg
HC-46
E7
280 mg/kg
HC-39
150 ug/L
HC-39
160 mg/kg
HC-41
HC-40
RSB-08
RSB-05
HC-49
PCP Excavation Area
East TPH Excavation Area
West TPH Excavation Area
DRAFT
Pre-2007 Groundwater Sample Exceeding Screening Level
Pre-2007 Groundwater Sample Below Screening Level
Post-2006 Groundwater Samples Below Screening Level
Excavated Sample Above Screening Level
Excavated Sample Below Screening Level
Soil Sample Exceeding Screening Level
Soil Sample Below Screening Level
Passive Attenuation Zone
Arsenic-Contaminated Soil Excavation Area
Parcel
2006 Remedial Excavation
Notes:
1) Names of over-excavated sample locations below screening levels not shown for figure clarity.
2) Pre-2007 samples collected west of the current shoreline were collected prior to habitat restoration, when the shoreline was further west.
Screening Levels:
Saturated Soil: 85 mg/kg (Natural Background)
Unsaturated Soil: 120 mg/kg (Protection of Groundwater)
Groundwater: 100 ug/L
0
100
200
Feet
Extent of Zinc in Soil and Groundwater - All Data
Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington
Aspect Consulting
MAR-2024
PROJECT NO. 050004
BY: DIM / NCP
REV BY: HMD
FIGURE NO. 6-11
GIS Path: G:\projects\BarbeeMills_050004\RIFS\BarbeeMill_050004_RIFS\BarbeeMill_050004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 3/7/2024 || User: haley.duran || Print Date: 3/7/2024



DRAFT

- Post-2006 Groundwater Samples Below Screening Level
- Soil Sample Exceeding Screening Level
- Soil Sample Below Screening Level
- 2006 Remedial Excavation
- Parcel
- Arsenic-Contaminated Soil Excavation Area
- Passive Attenuation Zone

Screening Levels: Saturated Soil: 85 mg/kg (Natural Background)
Unsaturated Soil: 120 mg/kg (Protection of Groundwater)
Groundwater: 100 ug/L

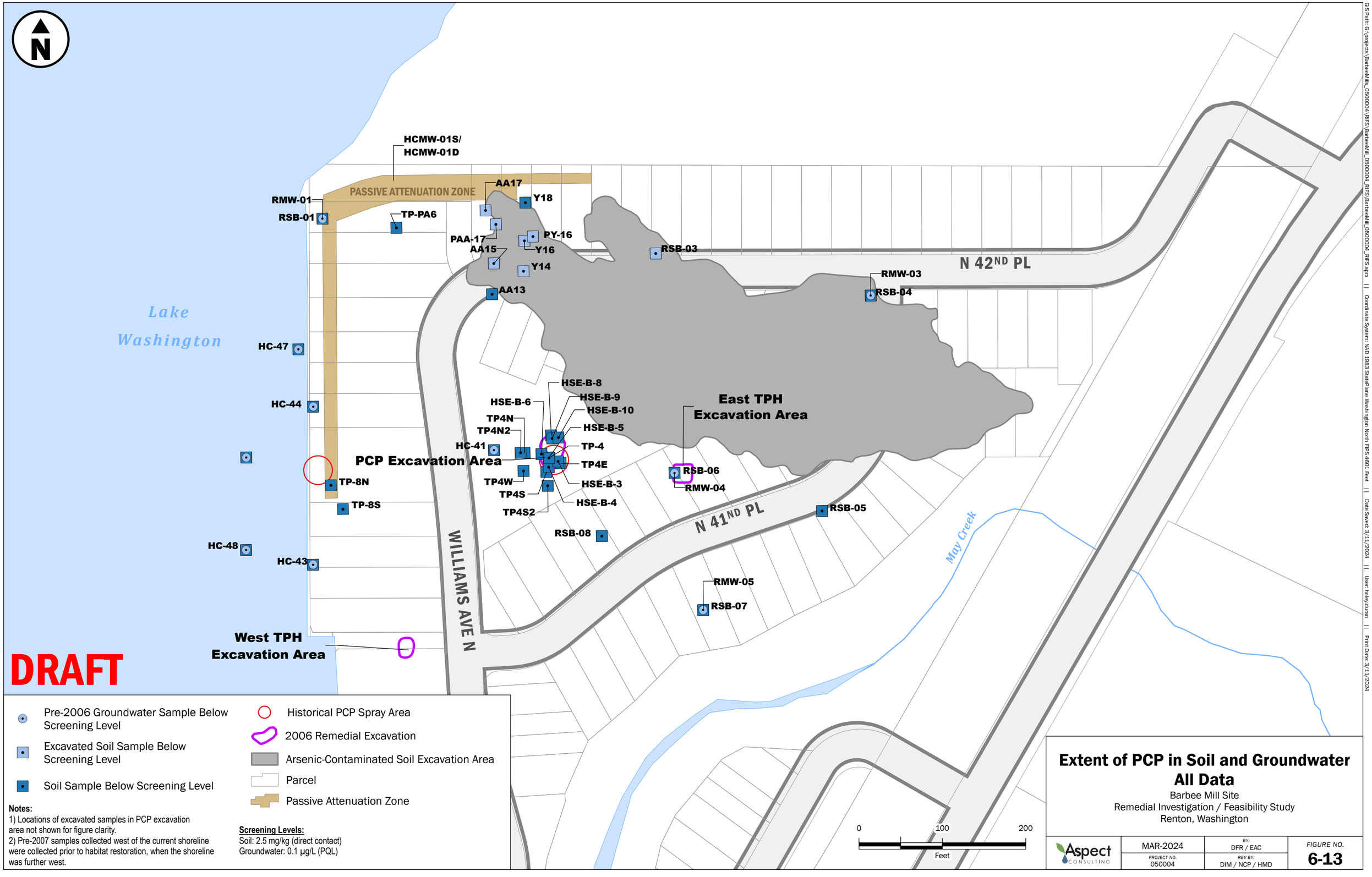
Notes:
1) Names of over-excavated sample locations below screening levels not shown for figure clarity.
2) RMW- and RSB- samples are from July 1996. HC- samples are from June 1999. CMW-2D, CMW-3, CMW-4D, and CMW-5 are from
3) September 2010. CMW-1, CMW-2S, CMW-4S, CMW-6, EW-2, EW-4, EW-6, and EW-8 are from March 2021. All other samples are from 2006.
4) Pre-2007 samples collected west of the current shoreline were collected prior to habitat restoration, when the shoreline was further west.

Extent of Zinc in Soil and Groundwater - Current Conditions

Barbee Mill Site
Remedial Investigation/ Feasibility Study
Renton, Washington

Aspect Consulting	MAR-2024	BY: DIM / NCP	FIGURE NO. 6-12
	PROJECT NO. 050004	REV BY: HMD	

GIS Path: G:\projects\BarbeeMills_0500004\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 3/7/2024 || User: haley.duran || Print Date: 3/7/2024



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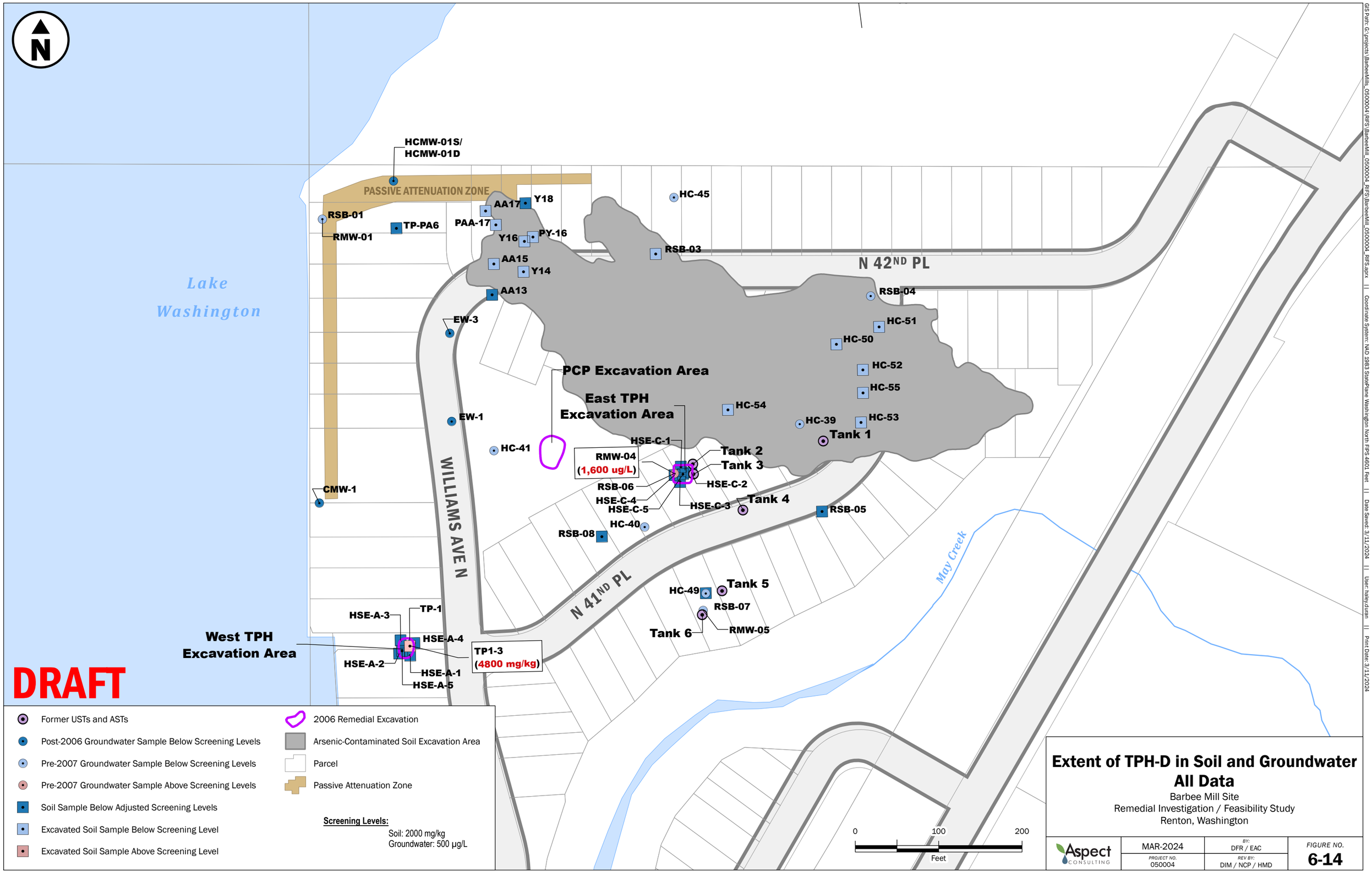
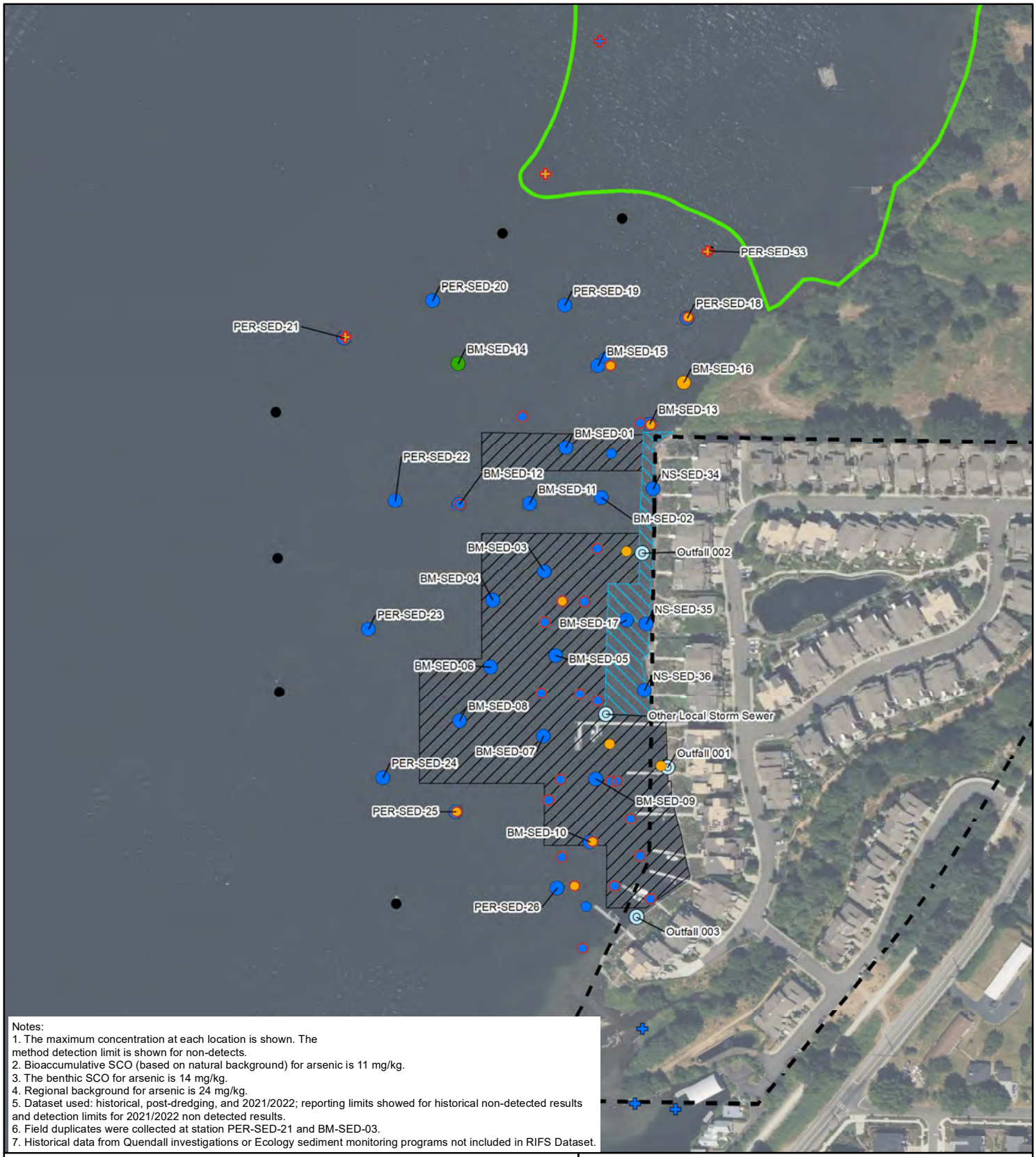

N
Lake Washington
HCMW-01S/
HCMW-01D
PASSIVE ATTENUATION ZONE
RSB-01
RMW-01
TP-PA6
AA17
Y18
PAA-17
Y16
PY-16
AA15
Y14
AA13
EW-3
HC-45
RSB-03
N 42ND PL
RSB-04
HC-51
HC-50
HC-52
HC-55
PCP Excavation Area
East TPH
Excavation Area
HC-54
HC-39
HC-53
Tank 1
EW-1
HC-41
HSE-C-1
RMW-04
(1,600 ug/L)
Tank 2
Tank 3
HSE-C-2
RSB-06
HSE-C-4
HSE-C-5
HSE-C-3
Tank 4
RSB-05
HC-40
RSB-08
CMW-1
WILLIAMS AVE N
N 41ND PL
May Creek
HC-49
Tank 5
RSB-07
RMW-05
Tank 6
HSE-A-3
TP-1
West TPH
Excavation Area
HSE-A-4
TP1-3
(4800 mg/kg)
HSE-A-2
HSE-A-1
HSE-A-5
DRAFT
Former USTs and ASTs
Post-2006 Groundwater Sample Below Screening Levels
Pre-2007 Groundwater Sample Below Screening Levels
Pre-2007 Groundwater Sample Above Screening Levels
Soil Sample Below Adjusted Screening Levels
Excavated Soil Sample Below Screening Level
Excavated Soil Sample Above Screening Level
2006 Remedial Excavation
Arsenic-Contaminated Soil Excavation Area
Parcel
Passive Attenuation Zone
Screening Levels:
Soil: 2000 mg/kg
Groundwater: 500 µg/L
0
100
200
Feet
Extent of TPH-D in Soil and Groundwater
All Data
Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington
Aspect CONSULTING
MAR-2024
PROJECT NO.
050004
BY:
DFR / EAC
REV BY:
DIM / NCP / HMD
FIGURE NO.
6-14
GIS Path: G:\projects\BarbeeMills_050004\RIFS\BarbeeMill_050004_RIFS\BarbeeMill_050004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 3/11/2024 || User: haleyduran || Print Date: 3/14/2024



Notes:
1. The maximum concentration at each location is shown. The method detection limit is shown for non-detects.
2. Bioaccumulative SCO (based on natural background) for arsenic is 11 mg/kg.
3. The benthic SCO for arsenic is 14 mg/kg.
4. Regional background for arsenic is 24 mg/kg.
5. Dataset used: historical, post-dredging, and 2021/2022; reporting limits showed for historical non-detected results and detection limits for 2021/2022 non detected results.
6. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
7. Historical data from Quendall investigations or Ecology sediment monitoring programs not included in RIFS Dataset.

Legend

- 2021/2022 Sample Location
- Historical Sample Location
- Other Historical Data[7]
- Non-detect Sample Location

Arsenic Concentration (mg/kg)

- < 11 (bioaccumulative SCO)
- 11 (bioaccumulative SCO) -14 (Benthic SCO)
- > 14 (Benthic SCO)

- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Historical and 2021/2022 Arsenic in Surface Sediment

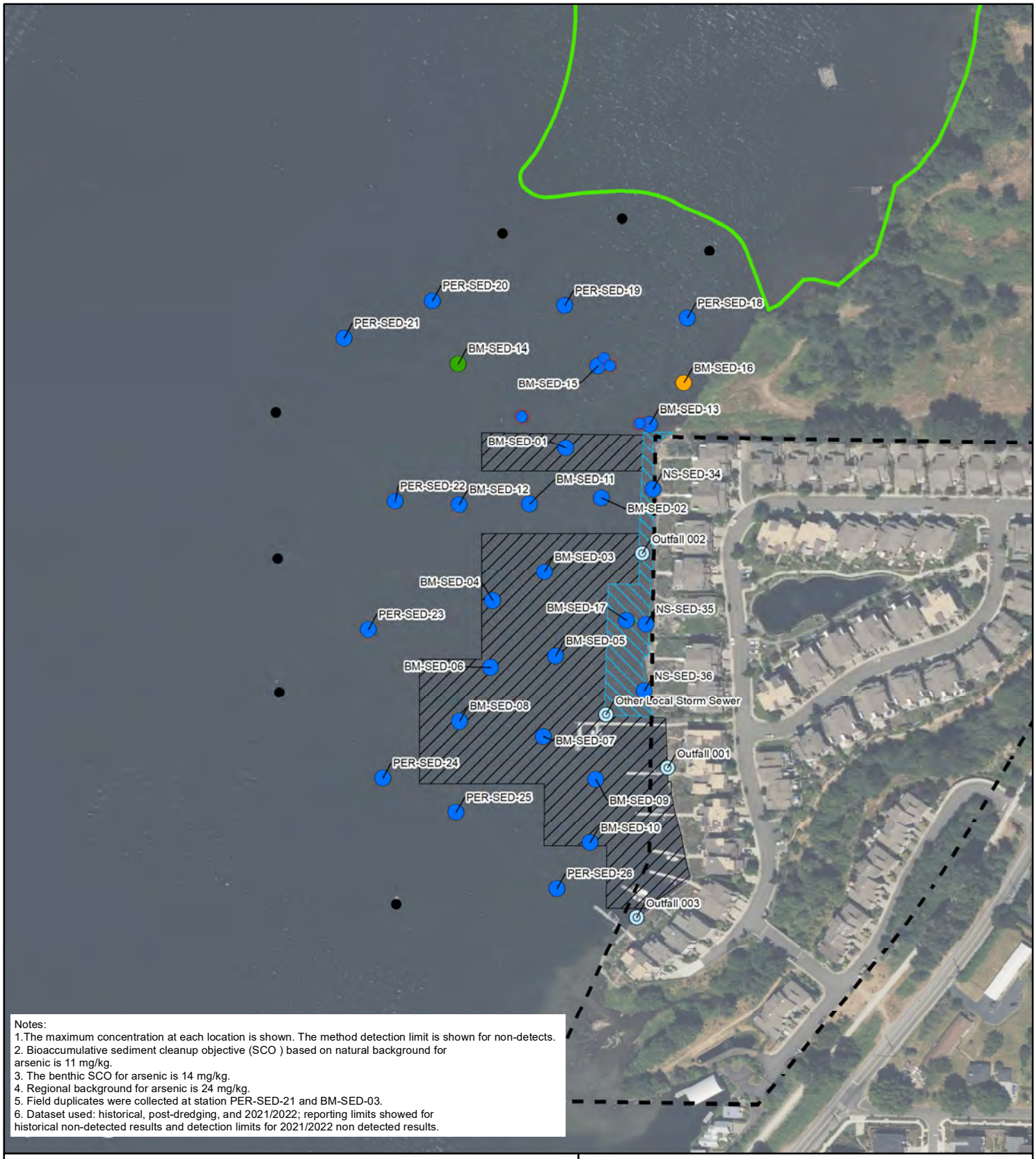
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869 | March 2024

Figure 6-15a

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-15a Historical and Current Arsenic in Surface Sediment.mxd 3/6/2024 9:14:49 AM



Notes:
1.The maximum concentration at each location is shown. The method detection limit is shown for non-detects.
2. Bioaccumulative sediment cleanup objective (SCO) based on natural background for arsenic is 11 mg/kg.
3. The benthic SCO for arsenic is 14 mg/kg.
4. Regional background for arsenic is 24 mg/kg.
5. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
6. Dataset used: historical, post-dredging, and 2021/2022; reporting limits showed for historical non-detected results and detection limits for 2021/2022 non detected results.

Legend

- Post-dredging Sample Location
- 2021/2022 Sample Location
- Non-detect Sample Location

Arsenic Concentration (mg/kg)

- < 11 (bioaccumulative SCO)
- 11 (bioaccumulative SCO) -14 (Benthic SCO)
- > 14 (Benthic SCO)
- Archived Sample Location

- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

2021/2022 Arsenic in Surface Sediment

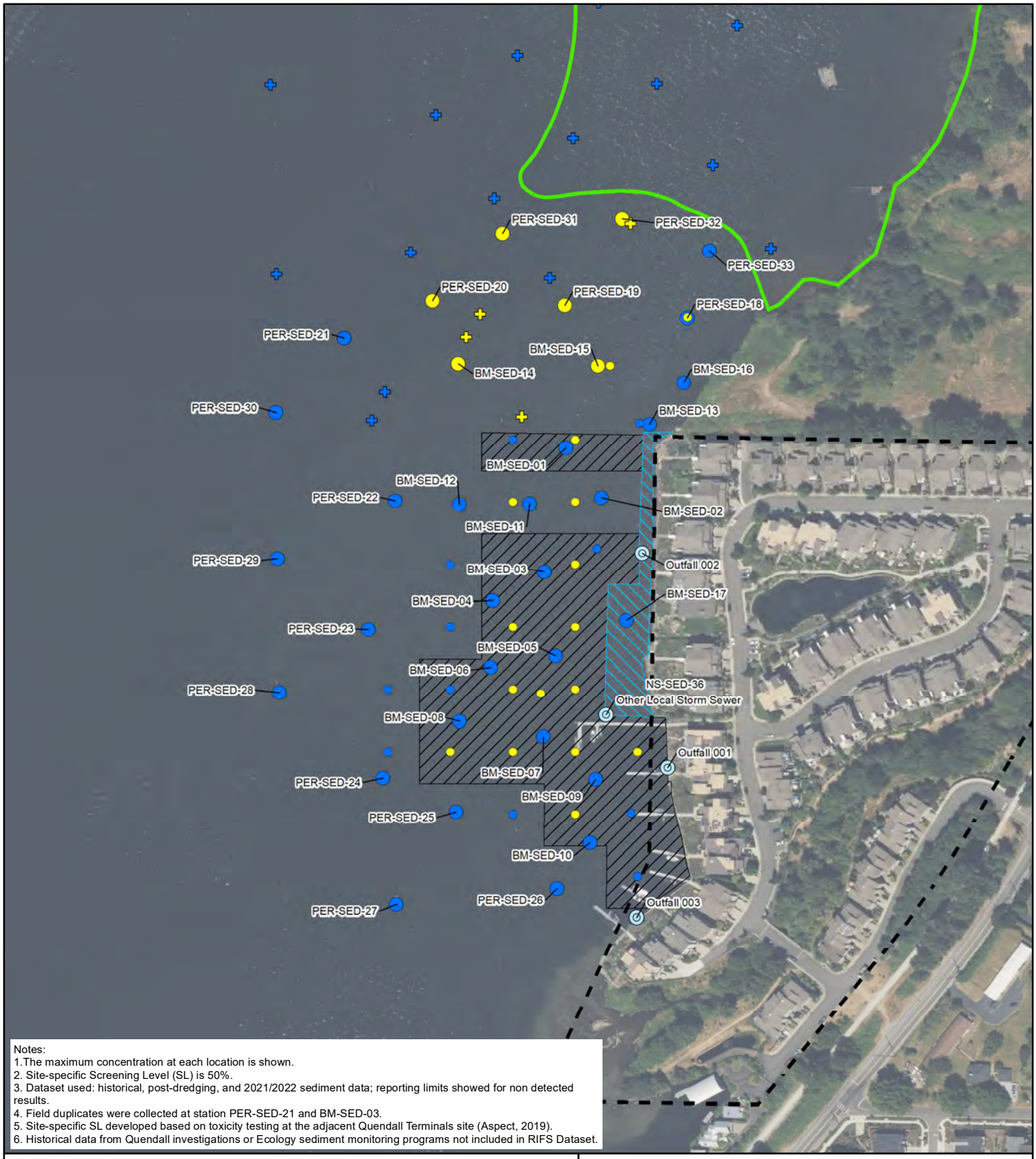
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869	March 2024

Figure 6-15b

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-15b Current Arsenic in Surface Sediment.mxd 3/8/2024 4:52:37 AM



Notes:
1.The maximum concentration at each location is shown.
2. Site-specific Screening Level (SL) is 50%.
3. Dataset used: historical, post-dredging, and 2021/2022 sediment data; reporting limits showed for non detected results.
4. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
5. Site-specific SL developed based on toxicity testing at the adjacent Quendall Terminals site (Aspect, 2019).
6. Historical data from Quendall investigations or Ecology sediment monitoring programs not included in RIFS Dataset.

Legend

- 2021/2022 Sample Location
- Historical Sample Location
- Other Historical Data[6]
- Quendall Site, Operable Unit 2
- Habitat Restoration Area
- 2002 Sediment Removal Area

Woodwaste Percentage

- < 50% (Site-specific SL)
- > 50% (Site-specific SL)
- Outfall
- Barbee Property Boundary

N

0 100 200 400 Feet

Historical and 2021/2022 Wood Debris in Surface Sediment

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

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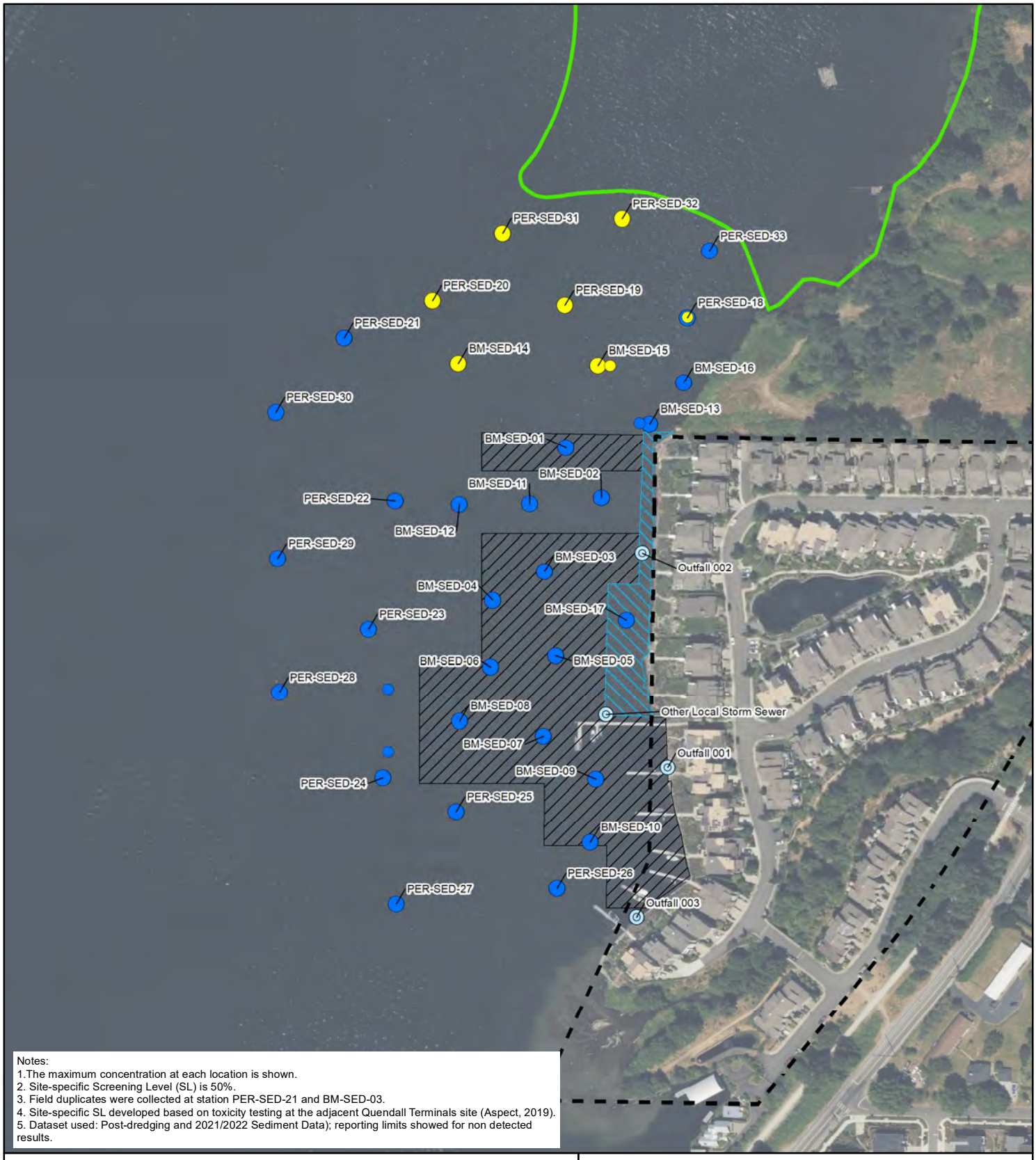
Figure 6-16a

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-16a Historical and Current Woodwaste in Surface Sediment.mxd 3/6/2024 9:17:16 AM



Notes:
1.The maximum concentration at each location is shown.
2. Site-specific Screening Level (SL) is 50%.
3. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
4. Site-specific SL developed based on toxicity testing at the adjacent Quendall Terminals site (Aspect, 2019).
5. Dataset used: Post-dredging and 2021/2022 Sediment Data); reporting limits showed for non detected results.

Legend

- Post-dredging Sample Location
- 2021/2022 Sample Location
- Habitat Restoration Area
- 2002 Sediment Removal Area

Wood Waste Percentage

- < 50% (Site-specific SL)
- > 50% (Site-specific SL)
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2

N

0 100 200 400 Feet

2021/2022 Wood Debris in Surface Sediment

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

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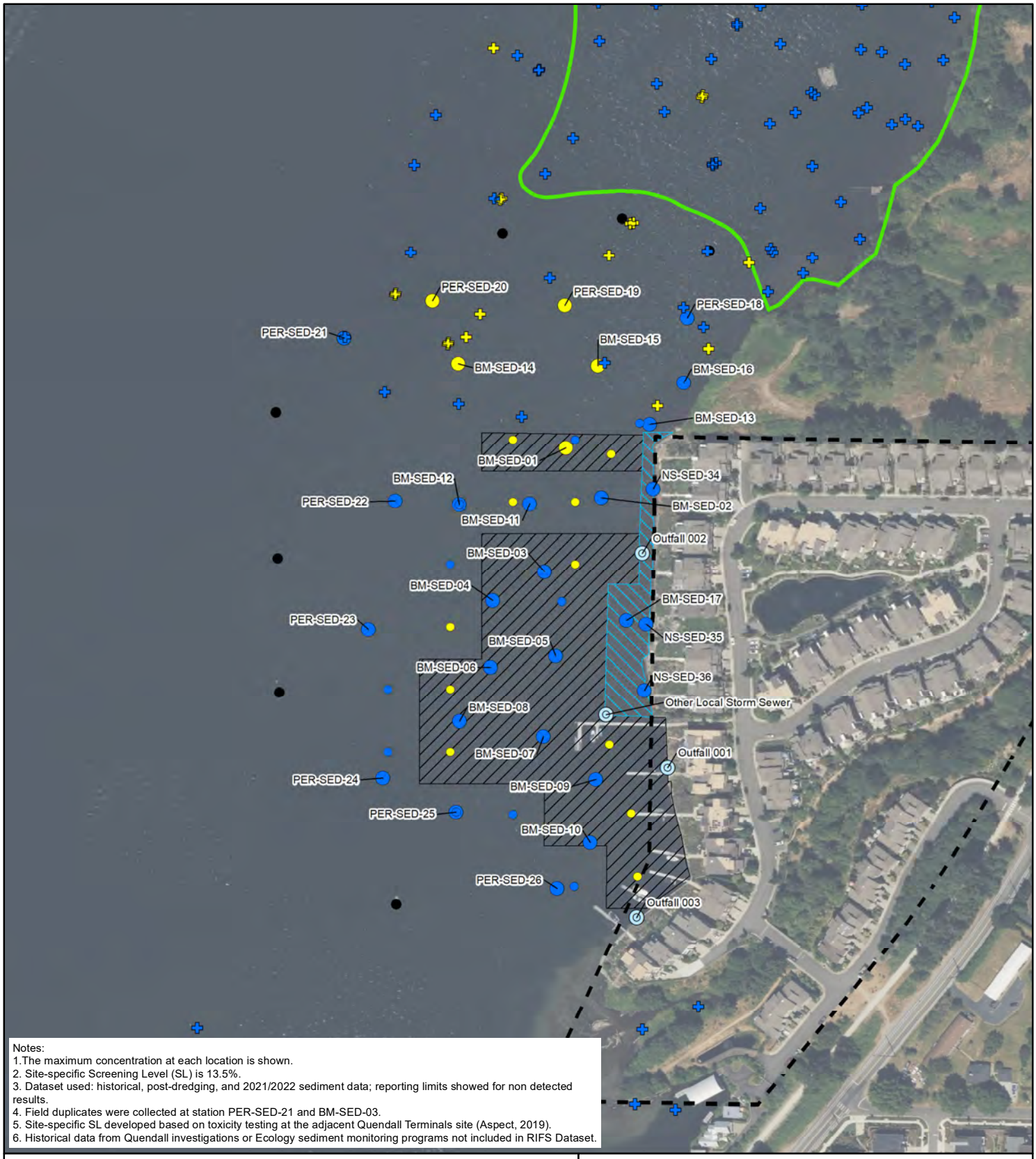
Figure 6-16b

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-16b Current Woodwaste in Surface Sediment.mxd 3/6/2024 9:18:12 AM



Notes:
1.The maximum concentration at each location is shown.
2. Site-specific Screening Level (SL) is 13.5%.
3. Dataset used: historical, post-dredging, and 2021/2022 sediment data; reporting limits showed for non detected results.
4. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
5. Site-specific SL developed based on toxicity testing at the adjacent Quendall Terminals site (Aspect, 2019).
6. Historical data from Quendall investigations or Ecology sediment monitoring programs not included in RIFS Dataset.

Legend

- 2021/2022 Sample Location
- Historical Sample Location
- Other Historical Data[6]

Total Organic Carbon (%)

- < 13.5% (Site-specific SL)
- > 13.5% (Site-specific SL)
- Archived Sample Location
- Outfall

- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Historical and 2021/2022 TOC in Surface Sediment

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

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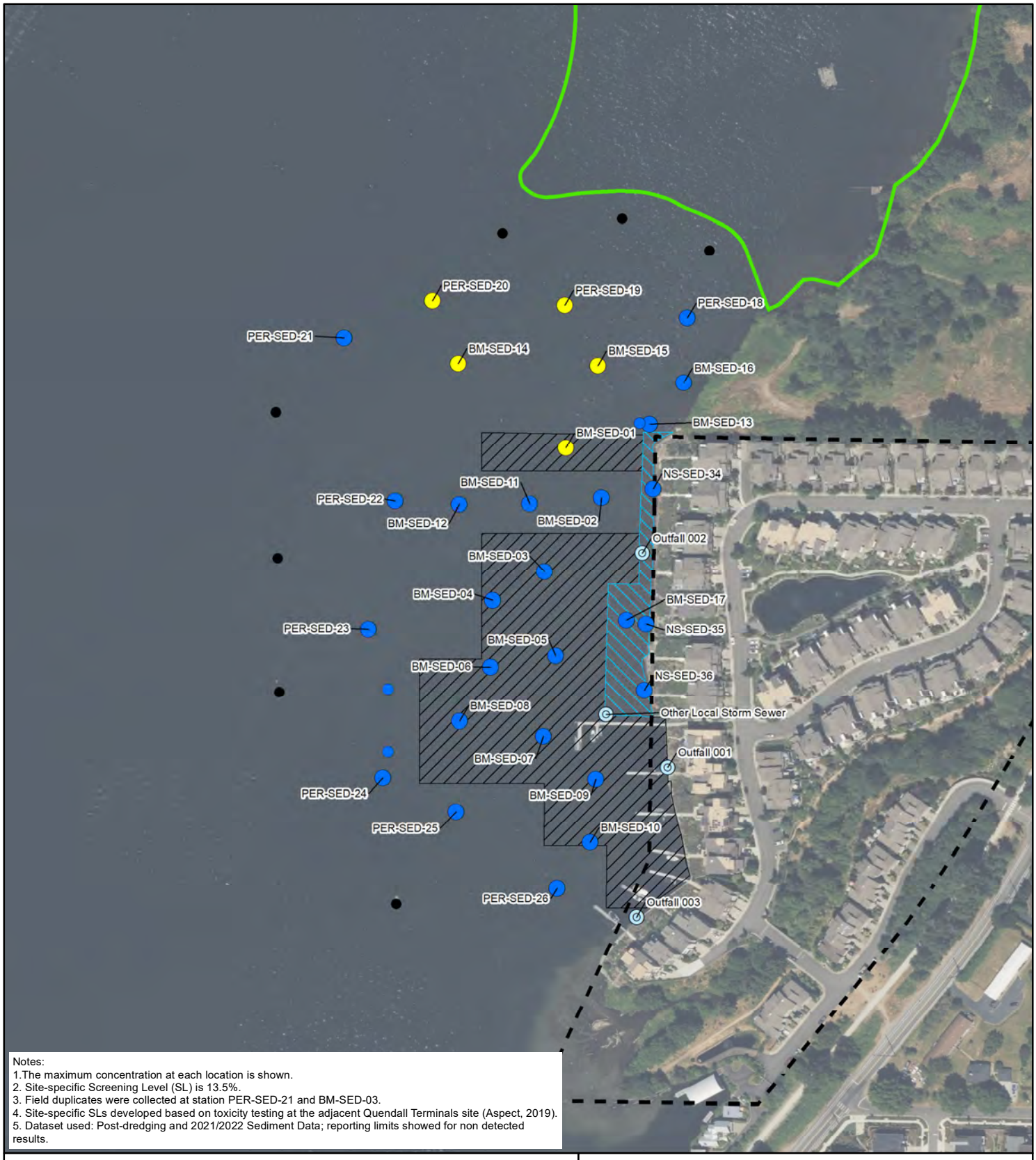
Figure 6-17a

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-17a Historical and Current TOC in Surface Sediment.mxd 3/6/2024 9:19:13 AM



Notes:
1.The maximum concentration at each location is shown.
2. Site-specific Screening Level (SL) is 13.5%.
3. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
4. Site-specific SLs developed based on toxicity testing at the adjacent Quendall Terminals site (Aspect, 2019).
5. Dataset used: Post-dredging and 2021/2022 Sediment Data; reporting limits showed for non detected results.

Legend

- Post-dredging Sample Location
- 2021/2022 Sample Location

Total Organic Carbon (%)

- <13.5 (Site-specific SL)
- >13.5 (Site-specific SL)
- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

2021/2022 TOC in Surface Sediment

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

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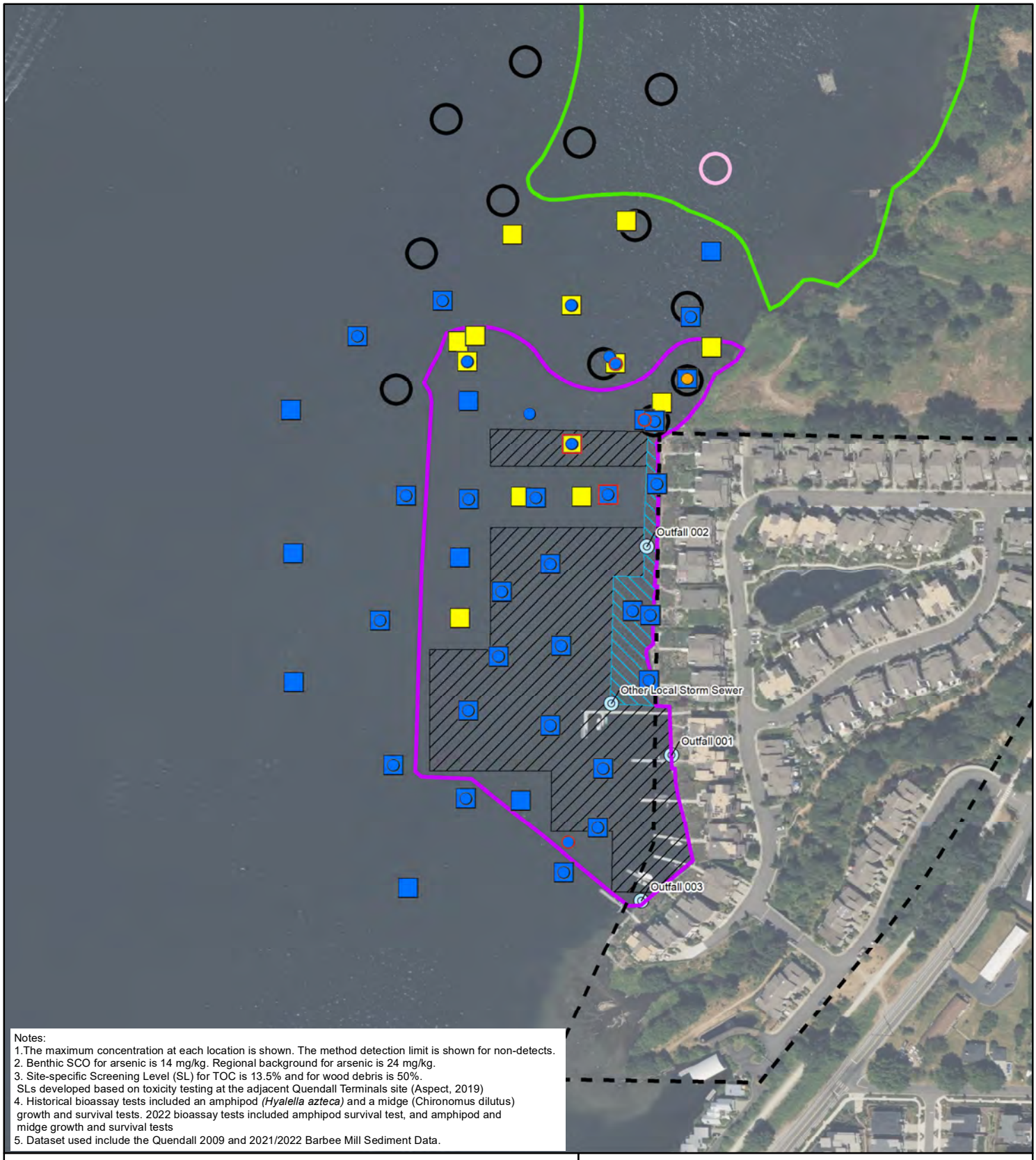
Figure 6-17b

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-17b Current TOC in Surface Sediment.mxd 3/6/2024 9:19:58 AM



Notes:
1.The maximum concentration at each location is shown. The method detection limit is shown for non-detects.
2. Benthic SCO for arsenic is 14 mg/kg. Regional background for arsenic is 24 mg/kg.
3. Site-specific Screening Level (SL) for TOC is 13.5% and for wood debris is 50%.
SLs developed based on toxicity testing at the adjacent Quendall Terminals site (Aspect, 2019)
4. Historical bioassay tests included an amphipod *(Hyalella azteca)* and a midge (Chironomus dilutus) growth and survival tests. 2022 bioassay tests included amphipod survival test, and amphipod and midge growth and survival tests
5. Dataset used include the Quendall 2009 and 2021/2022 Barbee Mill Sediment Data.

Legend

Bioassay Location: Toxic

Bioassay Location: Not Toxic

Arsenic Concentration (mg/kg)

<14 (Benthic SCO)

>14 (Benthic SCO)

Non-detect Sample Location

Wood/TOC Exceedance Location

Below Site-specific SL

Above Site-specific SL

Non-detect Sample Location

Outfall

Extent of Benthic SCO Exceedances

Quendall Site, Operable Unit 2

Habitat Restoration Area

2002 Sediment Removal Area

N

0 50 100 200 Feet

Extent of Benthic Exceedances

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

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Figure 6-18a

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-18a Extent of Benthic Exceedances.mxd 3/6/2024 9:21:59 AM

Notes:
1. The maximum concentration at each location is shown. The method detection limit is shown for non-detects. Exceedances of non-detect are not presented.
2. Bioaccumulative SCO (based on natural background) for arsenic is 11 mg/kg. Regional background for arsenic is 24 mg/kg.
3. The highest value between 2021 and 2022 investigation was reported at the re-occupied station (BM-SED-16)
4. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
5. Interpolation performed as described in the SRI Work Plan (exponent of 3.5, maximum neighbors of 4, and variable search radius) by using a dataset representative of post-dredging conditions. The dataset used includes post-dredging results and pre-dredging results collected outside the dredging footprint.
SCO = Sediment Cleanup Objective

Legend

- Historical Sample Location
- 2021/2022 Sample Location

Arsenic Concentration (mg/kg)

- < 11 (bioaccumulative SCO)
- > 11 (bioaccumulative SCO)
- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Extent of Bioaccumulative Exceedances
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Extent of Bioaccumulative Exceedances

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

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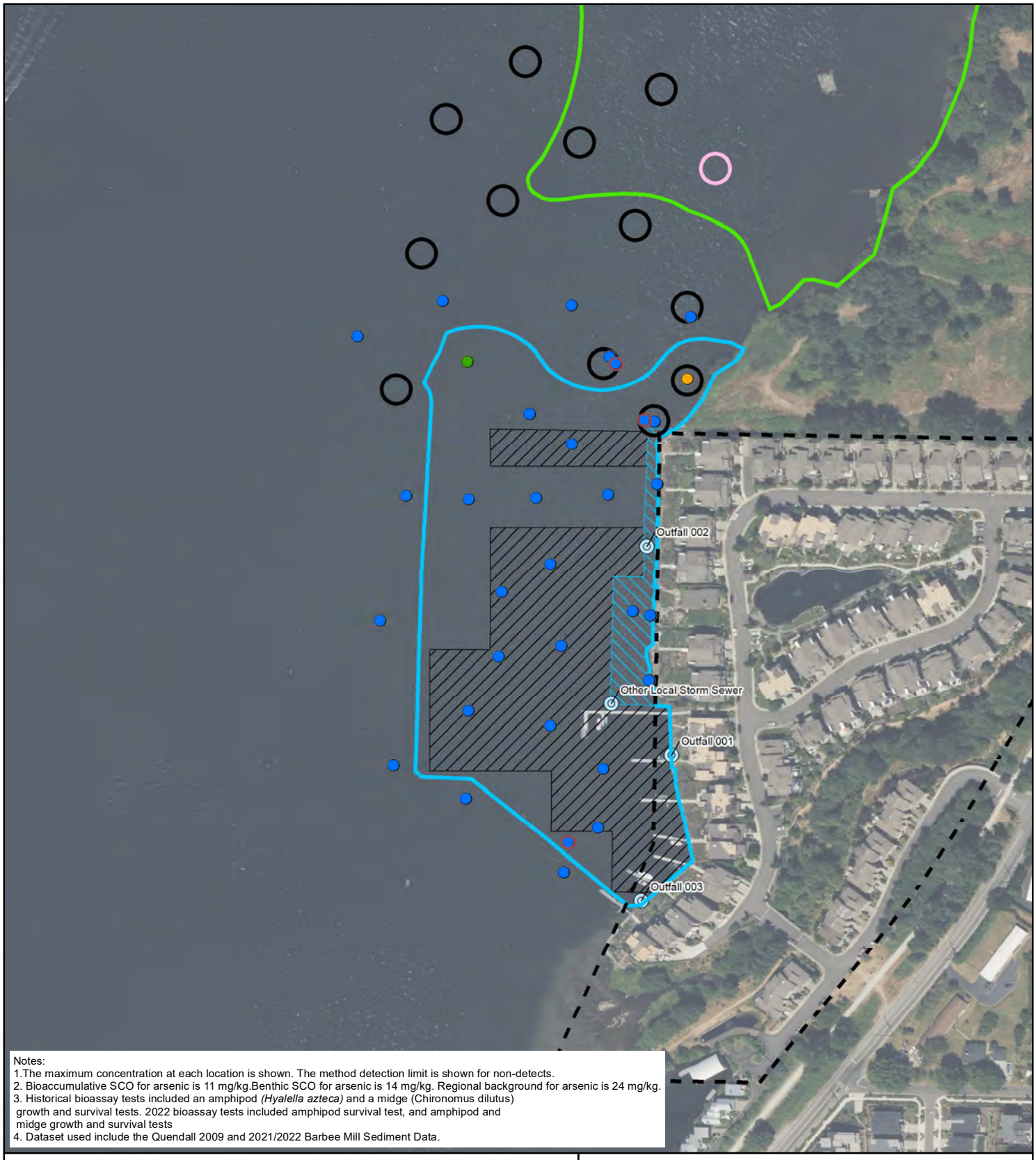
Figure 6-18b

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-18b Extent of Bioaccumulative Exceedances.mxd 3/6/2024 11:20:49 AM



Notes:
1.The maximum concentration at each location is shown. The method detection limit is shown for non-detects.
2. Bioaccumulative SCO for arsenic is 11 mg/kg.Benthic SCO for arsenic is 14 mg/kg. Regional background for arsenic is 24 mg/kg.
3. Historical bioassay tests included an amphipod *(Hyalella azteca)* and a midge (Chironomus dilutus) growth and survival tests. 2022 bioassay tests included amphipod survival test, and amphipod and midge growth and survival tests
4. Dataset used include the Quendall 2009 and 2021/2022 Barbee Mill Sediment Data.

Legend

- Bioassay Location: Toxic
- Bioassay Location: Not Toxic
- Barbee Site, Sediment Boundary
- Quendall Site, Operable Unit 2
- Habitat Restoration Area
- 2002 Sediment Removal Area

Arsenic Concentration (mg/kg)

- <11 mg/kg (Bioaccumulative SCO)
- 11-14 mg/kg (Benthic SCO)
- > 14 mg/kg (Benthic SCO)
- Non-detect Sample Location
- Outfall

N

0 50 100 200 Feet

Extent of Site Sediment Boundary

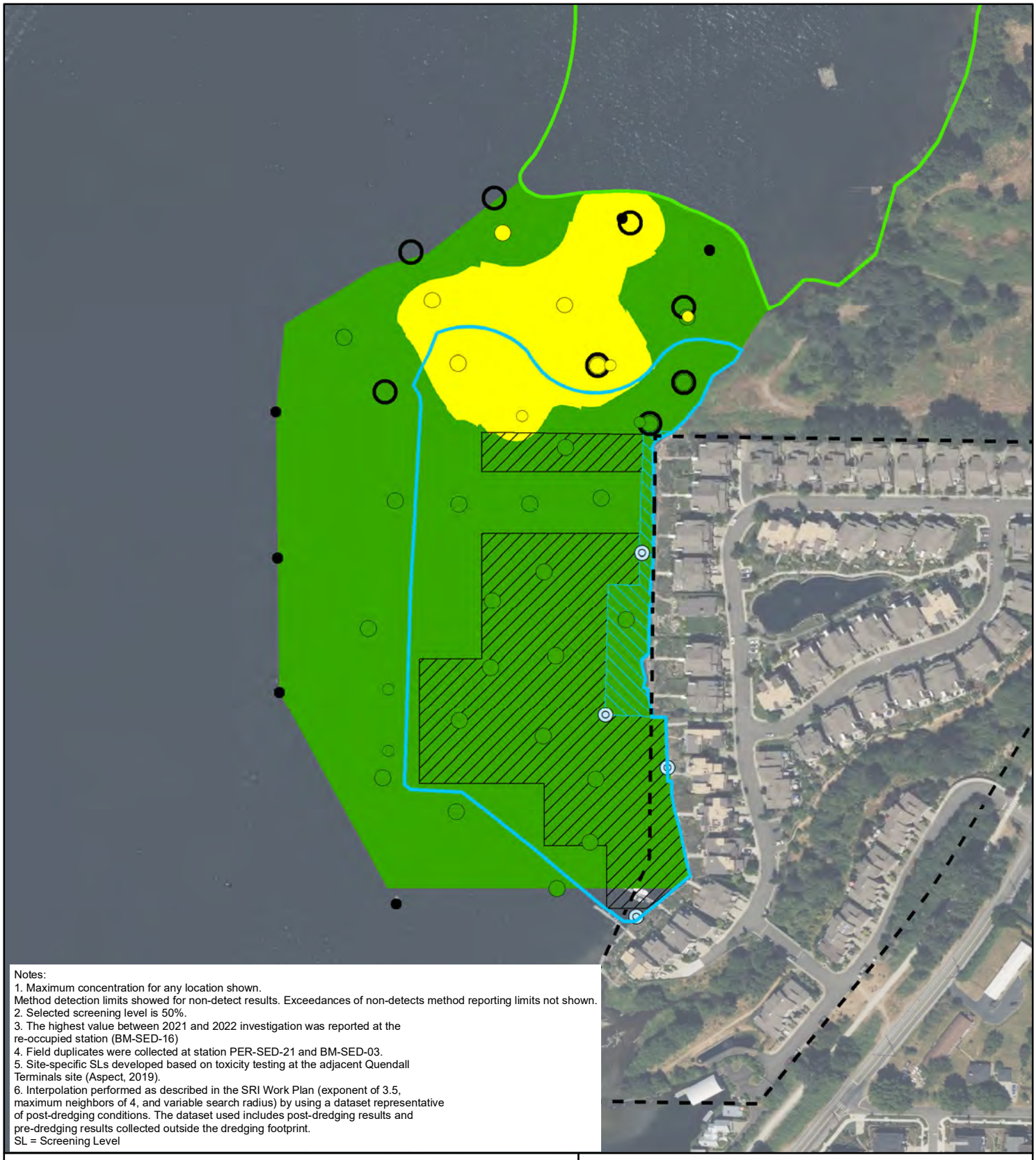
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869 | March 2024

Figure 6-18c

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-18c Extent of Site Sediment Boundary.mxd 3/6/2024 9:28:11 AM



Notes:
1. Maximum concentration for any location shown.
Method detection limits showed for non-detect results. Exceedances of non-detects method reporting limits not shown.
2. Selected screening level is 50%.
3. The highest value between 2021 and 2022 investigation was reported at the re-occupied station (BM-SED-16)
4. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
5. Site-specific SLs developed based on toxicity testing at the adjacent Quendall Terminals site (Aspect, 2019).
6. Interpolation performed as described in the SRI Work Plan (exponent of 3.5, maximum neighbors of 4, and variable search radius) by using a dataset representative of post-dredging conditions. The dataset used includes post-dredging results and pre-dredging results collected outside the dredging footprint.
SL = Screening Level

Legend

- Bioassay Location: Not Toxic
- Historical Sample Location
- 2021/2022 Sample Location

Wood Waste Percentage

- < 50 (Site-specific SL)
- > 50 (Site-specific SL)
- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Interpolated Wood Debris Percentage in Surface Sediment

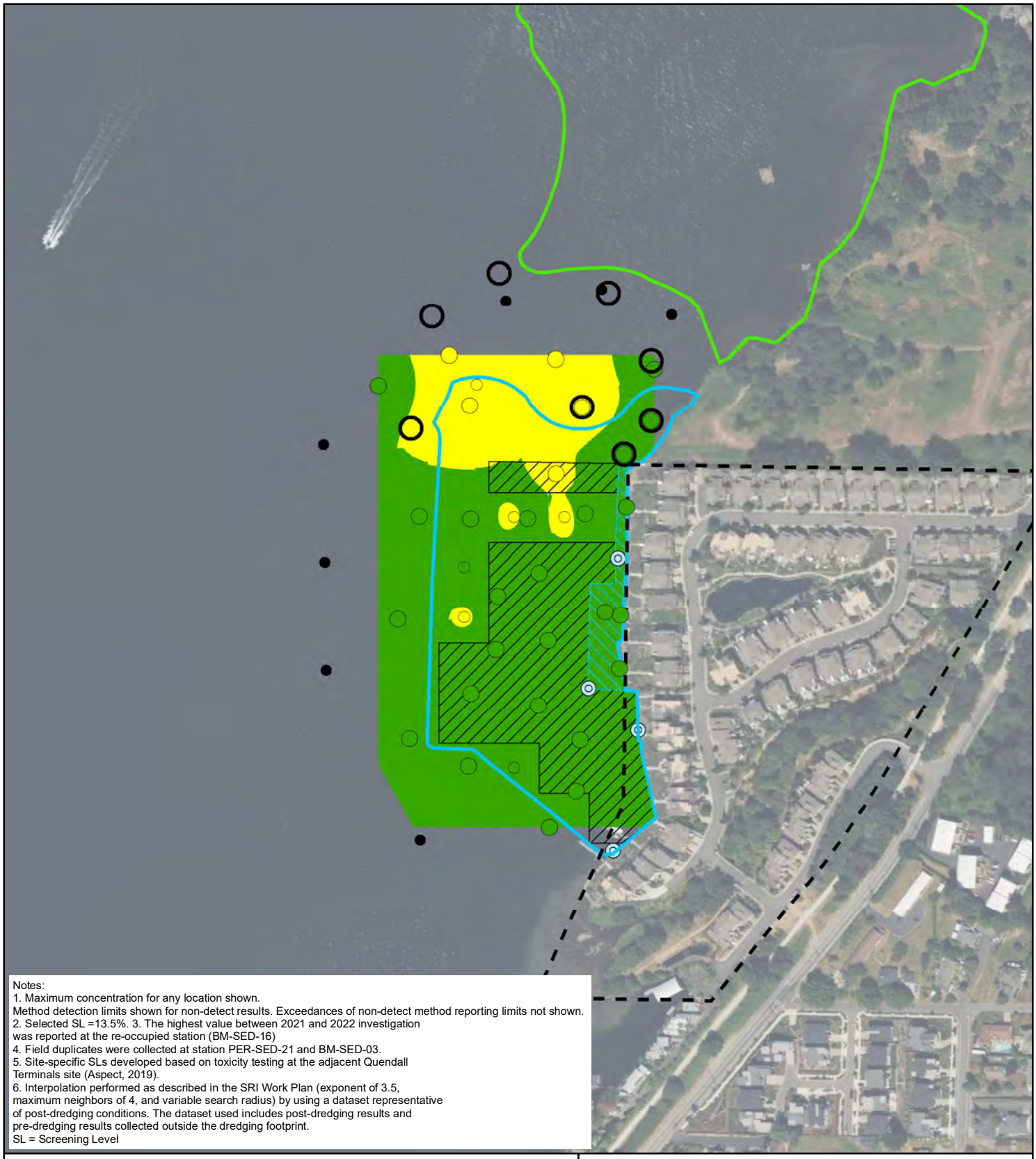
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869	March 2024

Figure 6-19

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-19 Interpolated Wood Waste Concentrations in Surface Sediment.mxd 3/4/2024 8:17:52 AM



Notes:
1. Maximum concentration for any location shown.
Method detection limits shown for non-detect results. Exceedances of non-detect method reporting limits not shown.
2. Selected SL =13.5%. 3. The highest value between 2021 and 2022 investigation
was reported at the re-occupied station (BM-SED-16)
4. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
5. Site-specific SLs developed based on toxicity testing at the adjacent Quendall
Terminals site (Aspect, 2019).
6. Interpolation performed as described in the SRI Work Plan (exponent of 3.5,
maximum neighbors of 4, and variable search radius) by using a dataset representative
of post-dredging conditions. The dataset used includes post-dredging results and
pre-dredging results collected outside the dredging footprint.
SL = Screening Level

Legend

- Bioassay Location: Not Toxic
- Historical Sample Location
- 2021/2022 Sample Location

Total Organic Carbon (%)

- <13.5 (Site-specific SL)
- >13.5 (Site-specific SL)
- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Interpolated TOC Concentrations in Surface Sediment

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

Figure 6-20

PNG0869 | March 2024

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-20 Interpolated TOC Concentrations in Surface Sediment.mxd 3/4/2024 8:18:23 AM

Notes:
1. Maximum concentration for any location shown.
2. Bioaccumulative Sediment Cleanup Objective (SCO) based on natural background for Lead is 21 mg/kg.
3. Benthic SCO for Lead is 360 mg/kg.
4. Dataset used: historical, post-dredging, and 2021/2022; reporting limits showed for historical non-detected results and detection limits for 2021/2022 non detected results.
5. Historical data from Quendall investigations or Ecology sediment monitoring programs not included in RIFS Dataset.

Legend

- 2021/2022 Sample Location
- Historical Sample Location
- Other Historical Data[5]

Lead Concentration (mg/kg)

- < 21 (bioaccumulative SCO)
- 21 (bioaccumulative SCO) - 360 (Benthic SCO)
- > 360 (Benthic SCO)

- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Historical and 2021/2022 Lead in Surface Sediment

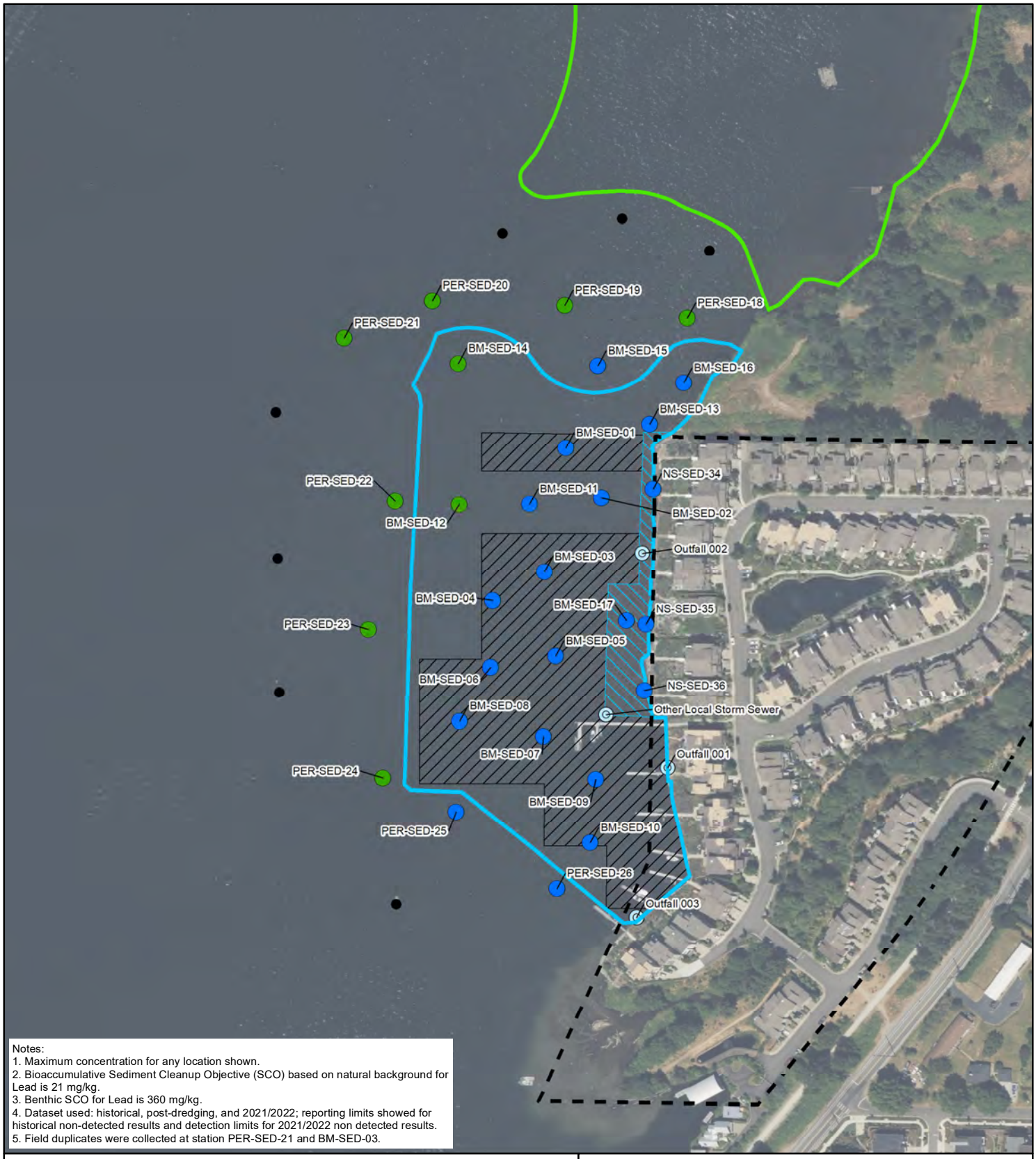
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869 | March 2024

Figure 6-21a

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-21a Historical and Current Lead in Surface Sediment.mxd 3/8/2024 4:54:22 AM



Notes:
1. Maximum concentration for any location shown.
2. Bioaccumulative Sediment Cleanup Objective (SCO) based on natural background for Lead is 21 mg/kg.
3. Benthic SCO for Lead is 360 mg/kg.
4. Dataset used: historical, post-dredging, and 2021/2022; reporting limits showed for historical non-detected results and detection limits for 2021/2022 non detected results.
5. Field duplicates were collected at station PER-SED-21 and BM-SED-03.

Legend

- Post-dredging Sample Location
- 2021/2022 Sample Location

Lead Concentration (mg/kg)

- <21
- 21 - 360
- >360
- Archived Sample Location
- Outfall

- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

2021/2022 Lead in Surface Sediment

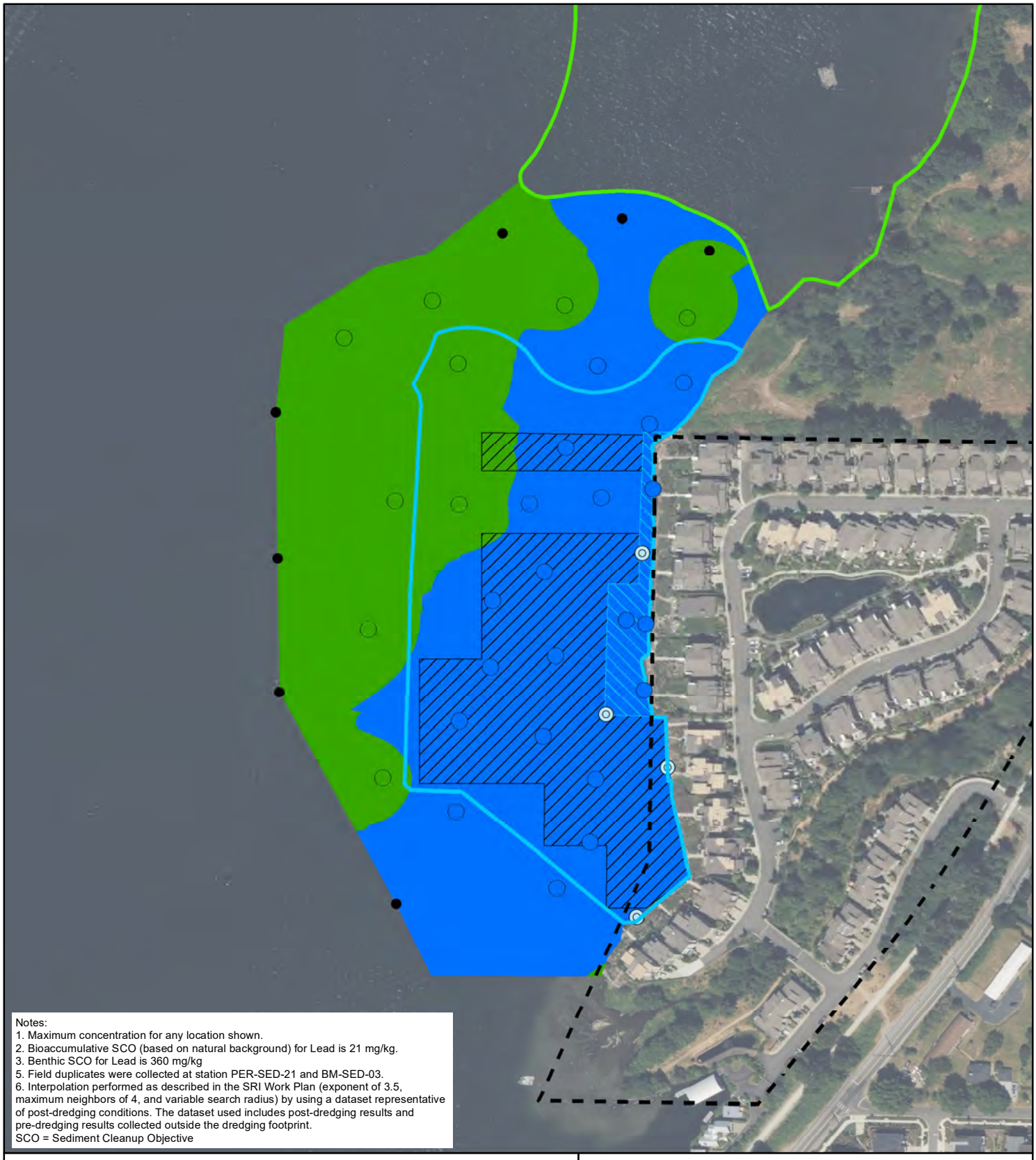
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

Figure 6-21b

PNG0869 | March 2024

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-21b Current Lead in Surface Sediment.mxd 3/8/2024 4:55:16 AM



Notes:
1. Maximum concentration for any location shown.
2. Bioaccumulative SCO (based on natural background) for Lead is 21 mg/kg.
3. Benthic SCO for Lead is 360 mg/kg
5. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
6. Interpolation performed as described in the SRI Work Plan (exponent of 3.5, maximum neighbors of 4, and variable search radius) by using a dataset representative of post-dredging conditions. The dataset used includes post-dredging results and pre-dredging results collected outside the dredging footprint.
SCO = Sediment Cleanup Objective

Legend

- Historical Sample Location
- 2021/2022 Sample Location

Lead Concentration (mg/kg)

- <21 (bioaccumulative SCO)
- 21 (bioaccumulative SCO) - 360 (Benthic SCO)
- >360 (Benthic SCO)
- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Interpolated Lead Concentrations in Surface Sediment

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

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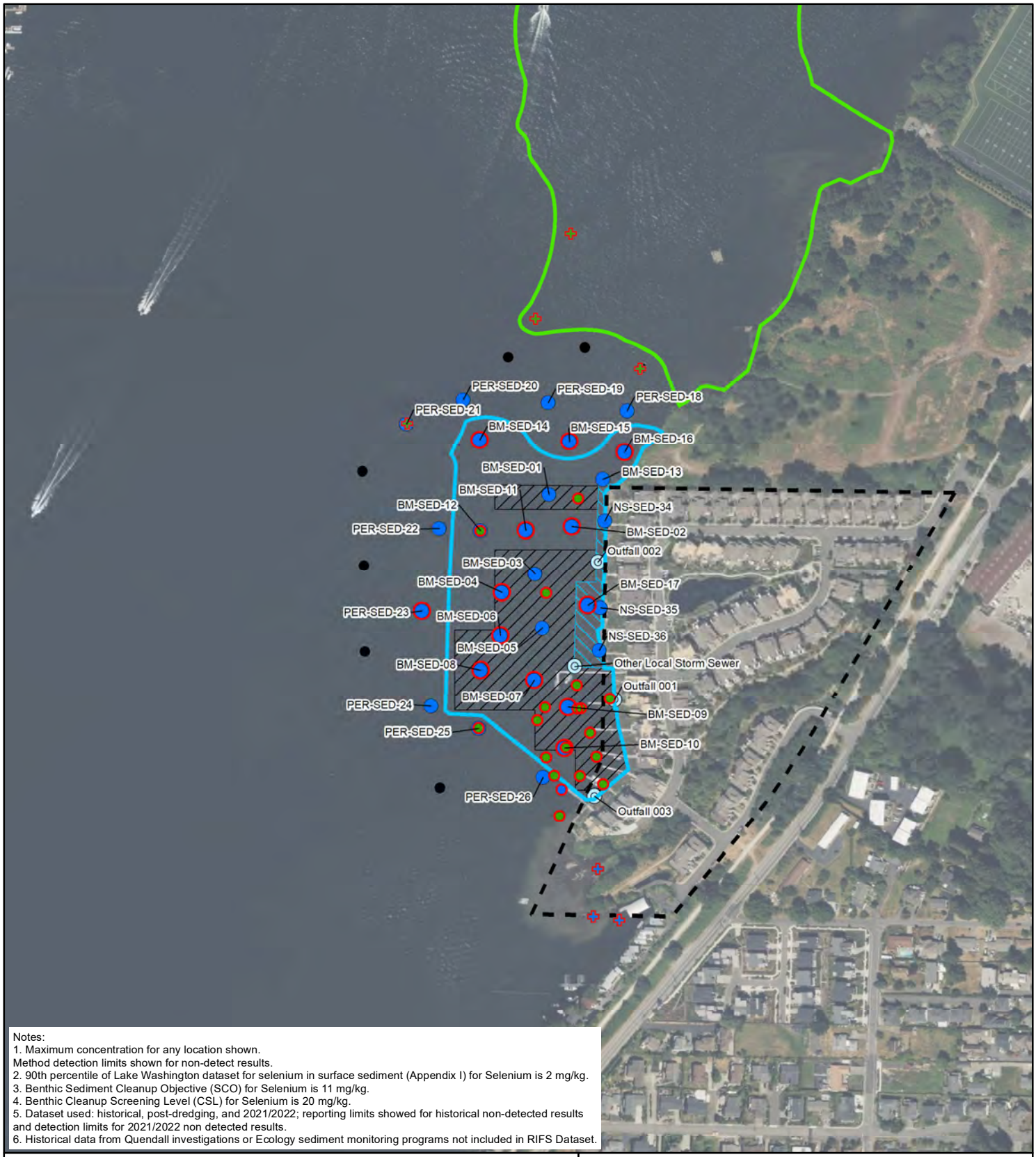
Figure 6-21c

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-21c Interpolated Lead Concentrations in Surface Sediment.mxd 3/8/2024 4:55:58 AM



Notes:
1. Maximum concentration for any location shown.
Method detection limits shown for non-detect results.
2. 90th percentile of Lake Washington dataset for selenium in surface sediment (Appendix I) for Selenium is 2 mg/kg.
3. Benthic Sediment Cleanup Objective (SCO) for Selenium is 11 mg/kg.
4. Benthic Cleanup Screening Level (CSL) for Selenium is 20 mg/kg.
5. Dataset used: historical, post-dredging, and 2021/2022; reporting limits showed for historical non-detected results and detection limits for 2021/2022 non detected results.
6. Historical data from Quendall investigations or Ecology sediment monitoring programs not included in RIFS Dataset.

Legend

- 2021/2022 Sample Location
- Historical Sample Location
- Other Historical Data[6]
- Non-detect Sample Location

Selenium Concentration (mg/kg)

- < 2.0 (90th %)
- 2.0 (90th %) - 11 (Benthic SCO)
- > 11 (Benthic SCO)

- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Historical and 2021/2022 Selenium in Surface Sediment

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

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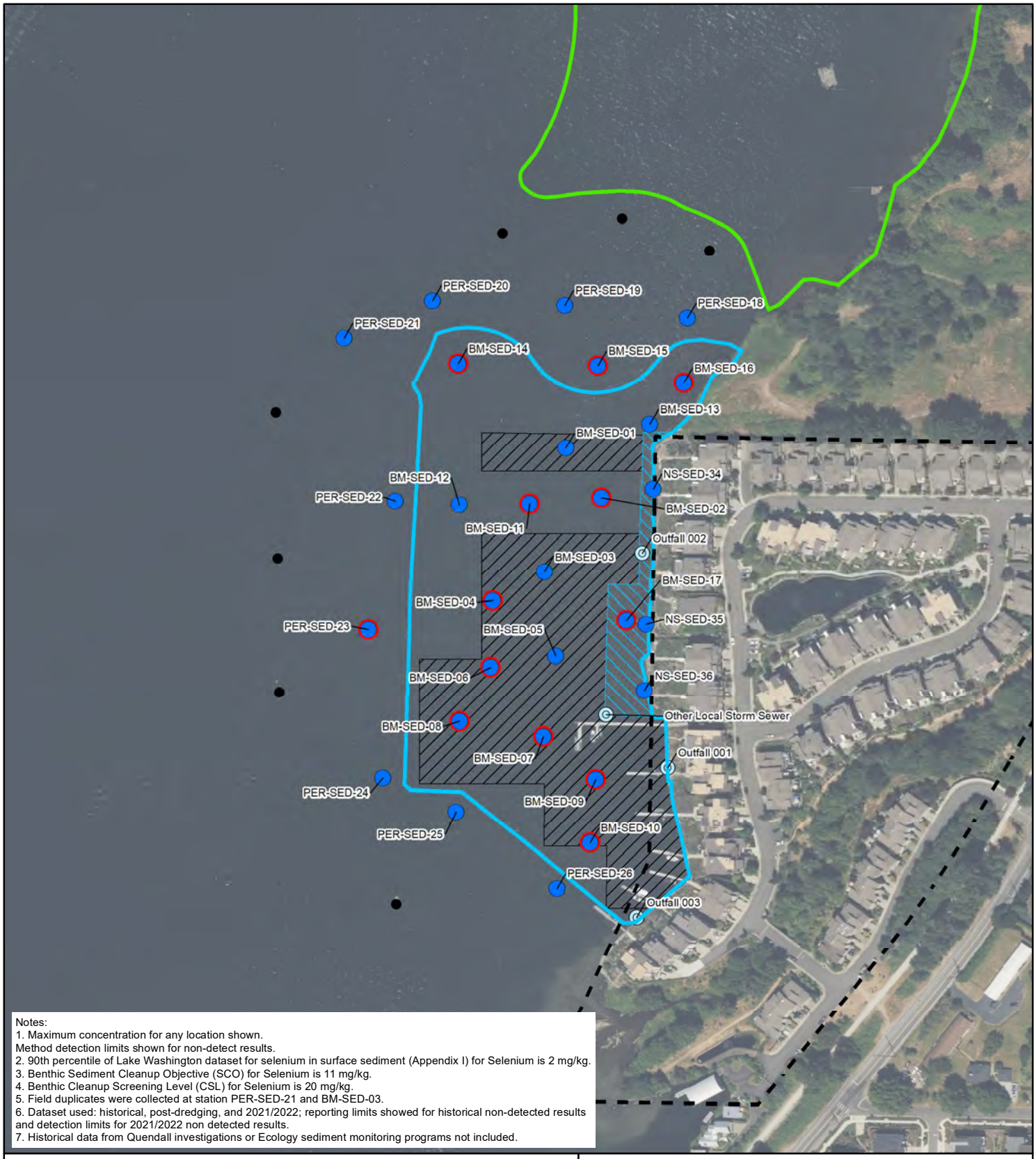
PNG0869	March 2024

Figure 6-22a

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-22a Historical and Current Selenium in Surface Sediment.mxd 3/8/2024 4:57:53 AM



Notes:
1. Maximum concentration for any location shown.
Method detection limits shown for non-detect results.
2. 90th percentile of Lake Washington dataset for selenium in surface sediment (Appendix I) for Selenium is 2 mg/kg.
3. Benthic Sediment Cleanup Objective (SCO) for Selenium is 11 mg/kg.
4. Benthic Cleanup Screening Level (CSL) for Selenium is 20 mg/kg.
5. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
6. Dataset used: historical, post-dredging, and 2021/2022; reporting limits showed for historical non-detected results and detection limits for 2021/2022 non detected results.
7. Historical data from Quendall investigations or Ecology sediment monitoring programs not included.

Legend

- Post-dredging Sample Location
- 2021/2022 Sample Location
- Non-detect Sample Location
- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Habitat Restoration Area
- 2002 Sediment Removal Area

Selenium Concentration (mg/kg)

- < 2.0 (90th %)
- 2.0 (90th %) - 11 (Benthic SCO)
- > 11 (Benthic SCO)

N

0 100 200 400 Feet

2021/2022 Selenium in Surface Sediment

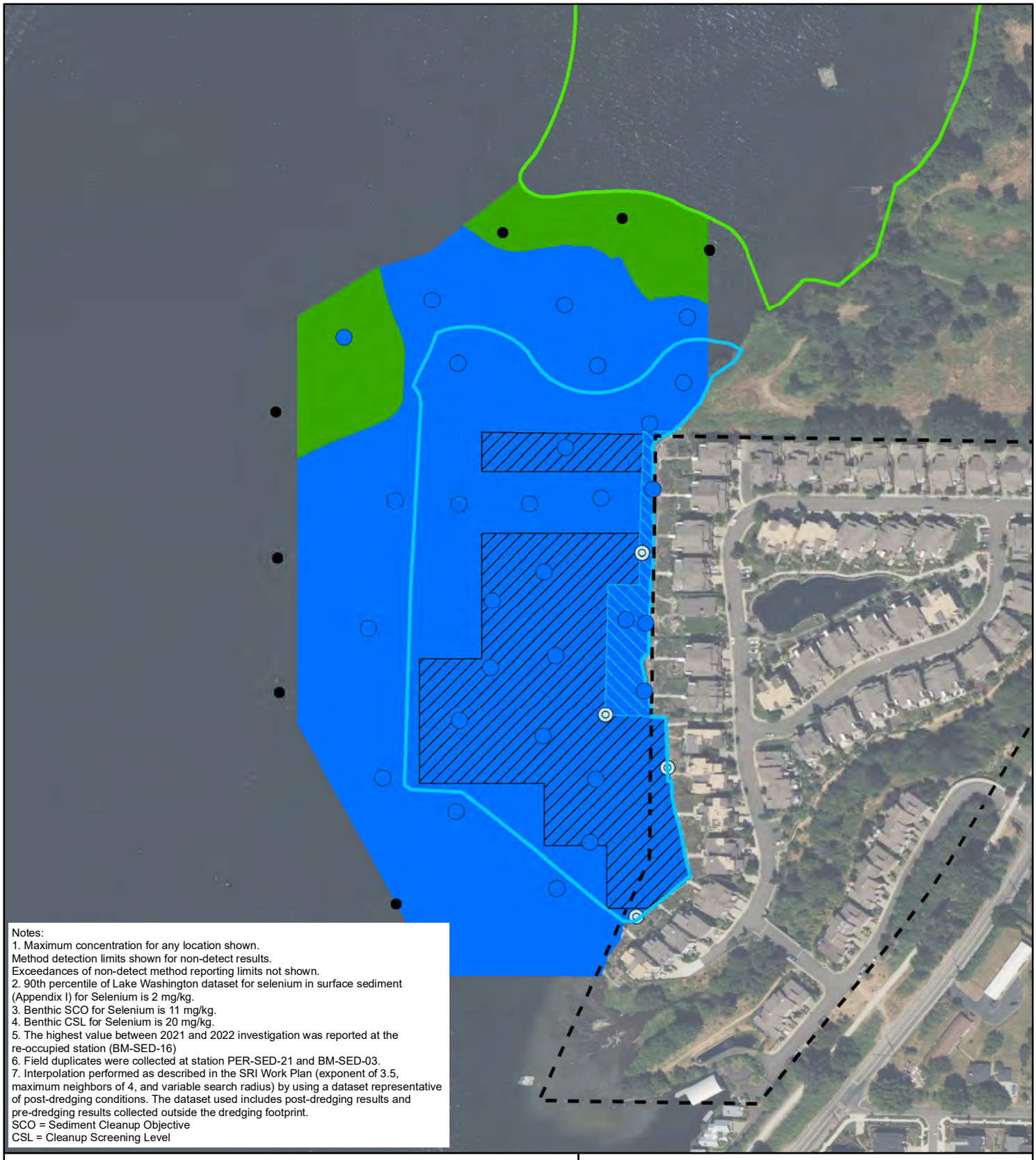
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

Figure 6-22b

PNG0869 | March 2024

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-22b Current Selenium in Surface Sediment.mxd 3/8/2024 5:00:04 AM



Notes:
1. Maximum concentration for any location shown.
Method detection limits shown for non-detect results.
Exceedances of non-detect method reporting limits not shown.
2. 90th percentile of Lake Washington dataset for selenium in surface sediment (Appendix I) for Selenium is 2 mg/kg.
3. Benthic SCO for Selenium is 11 mg/kg.
4. Benthic CSL for Selenium is 20 mg/kg.
5. The highest value between 2021 and 2022 investigation was reported at the re-occupied station (BM-SED-16)
6. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
7. Interpolation performed as described in the SRI Work Plan (exponent of 3.5, maximum neighbors of 4, and variable search radius) by using a dataset representative of post-dredging conditions. The dataset used includes post-dredging results and pre-dredging results collected outside the dredging footprint.
SCO = Sediment Cleanup Objective
CSL = Cleanup Screening Level

Legend

- Historical Sample Location
- 2021/2022 Sample Location

Selenium Concentration (mg/kg)

- < 2.0 (90th %)
- 2.0 (90th %) - 11 (Benthic SCO)
- > 11 (Benthic SCO)
- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

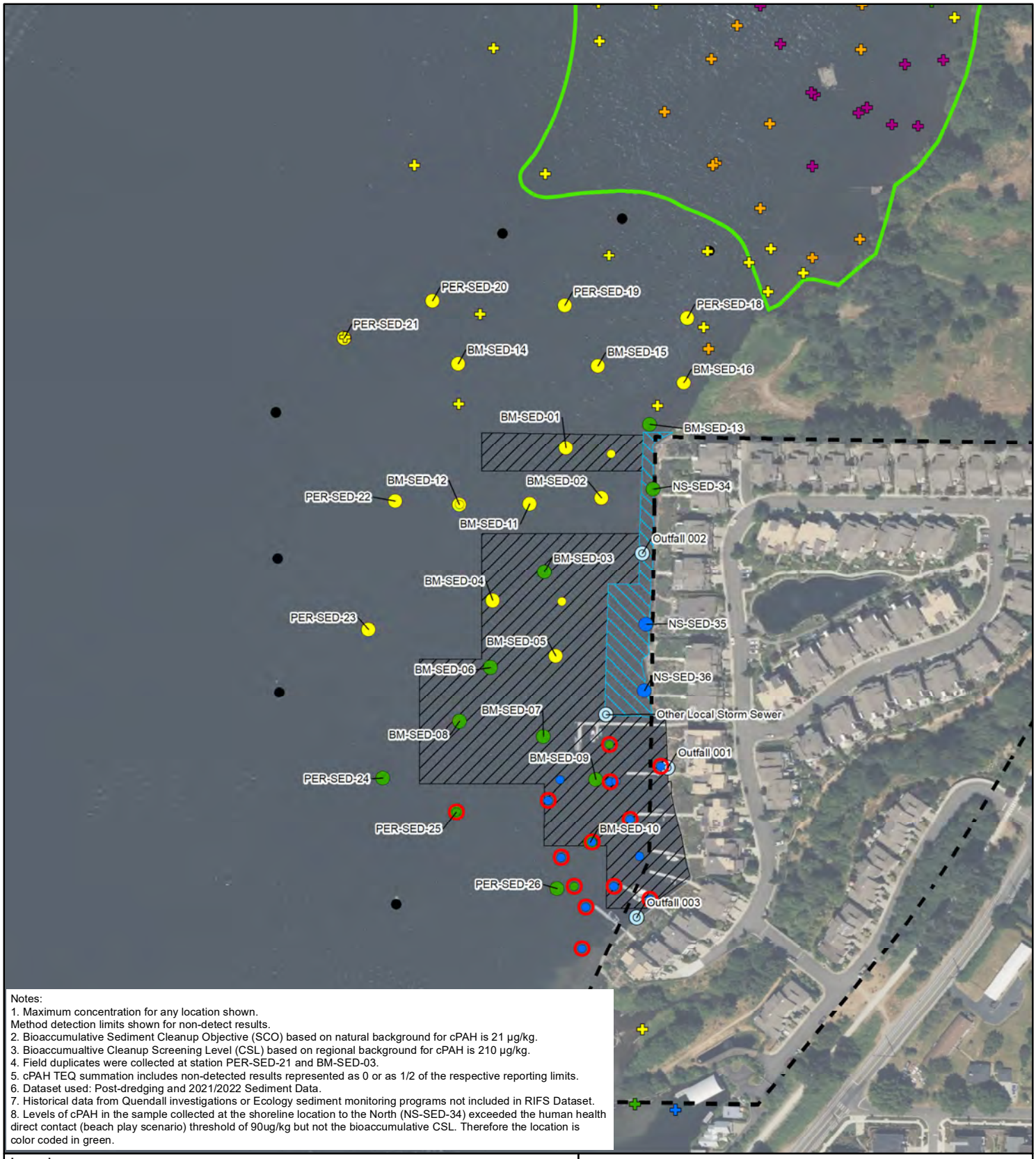
Interpolated Selenium Concentrations in Surface Sediment

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869	March 2024	Figure 6-22c

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-22c Interpolated Selenium Concentrations in Surface Sediment.mxd 3/4/2024 8:19:38 AM



Notes:
1. Maximum concentration for any location shown.
Method detection limits shown for non-detect results.
2. Bioaccumulative Sediment Cleanup Objective (SCO) based on natural background for cPAH is 21 µg/kg.
3. Bioaccumulative Cleanup Screening Level (CSL) based on regional background for cPAH is 210 µg/kg.
4. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
5. cPAH TEQ summation includes non-detected results represented as 0 or as 1/2 of the respective reporting limits.
6. Dataset used: Post-dredging and 2021/2022 Sediment Data.
7. Historical data from Quendall investigations or Ecology sediment monitoring programs not included in RIFS Dataset.
8. Levels of cPAH in the sample collected at the shoreline location to the North (NS-SED-34) exceeded the human health direct contact (beach play scenario) threshold of 90ug/kg but not the bioaccumulative CSL. Therefore the location is color coded in green.

Legend

- 2021/2022 Sample Location
- Historical Sample Location
- Other Historical Data[7]
- Non-detect Sample Location

cPAH Concentration (µg/kg)

- < 21 (bioaccumulative SCO)
- 21 (bioaccumulative SCO) - 210 (bioaccumulative CSL)
- 210 (bioaccumulative CSL) - 2,100 (10xbioaccumulative CSL)
- 2,100 (10xbioaccumulative CSL) - 21,000 (100xbioaccumulative CSL)
- >21,000 (100xbioaccumulative CSL)
- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Historical and 2021/2022 cPAH TEQ in Surface Sediment

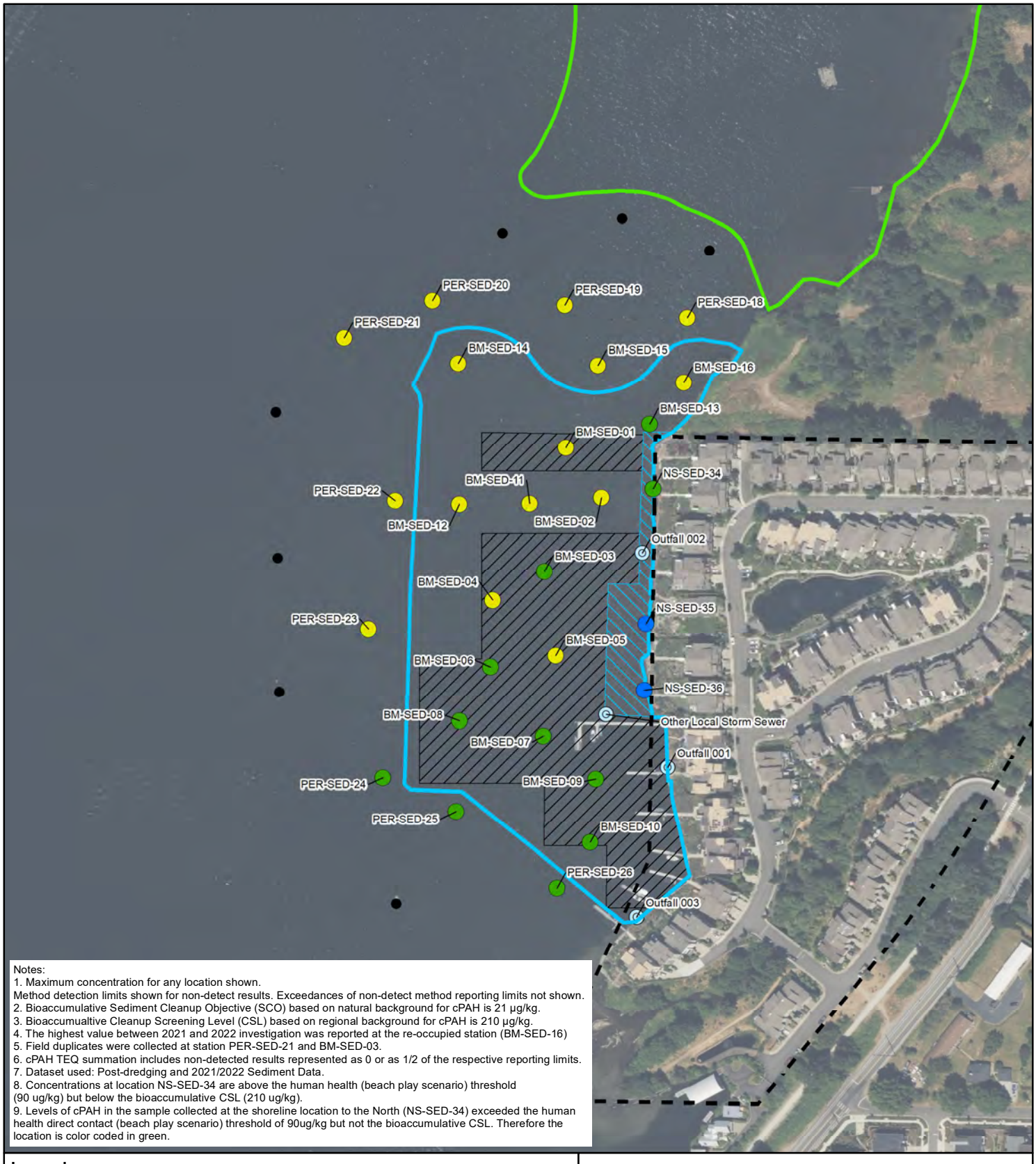
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

Figure 6-23a

PNG0869 | March 2024

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-23a Historical and Current cPAH TEQ in Surface Sediment.mxd 3/8/2024 5:02:41 AM



Notes:
1. Maximum concentration for any location shown.
Method detection limits shown for non-detect results. Exceedances of non-detect method reporting limits not shown.
2. Bioaccumulative Sediment Cleanup Objective (SCO) based on natural background for cPAH is 21 µg/kg.
3. Bioaccumualtive Cleanup Screening Level (CSL) based on regional background for cPAH is 210 µg/kg.
4. The highest value between 2021 and 2022 investigation was reported at the re-occupied station (BM-SED-16)
5. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
6. cPAH TEQ summation includes non-detected results represented as 0 or as 1/2 of the respective reporting limits.
7. Dataset used: Post-dredging and 2021/2022 Sediment Data.
8. Concentrations at location NS-SED-34 are above the human health (beach play scenario) threshold (90 ug/kg) but below the bioaccumulative CSL (210 ug/kg).
9. Levels of cPAH in the sample collected at the shoreline location to the North (NS-SED-34) exceeded the human health direct contact (beach play scenario) threshold of 90ug/kg but not the bioaccumulative CSL. Therefore the location is color coded in green.

Legend

- Post-dredge Sample Location
- 2021/2022 Sample Location

cPAH Concentration (µg/kg)

- < 21 (bioaccumulative SCO)
- 21 (bioaccumulative SCO) - 210 (bioaccumualtive CSL)
- > 210 (bioaccumualtive CSL)
- Archived Sample Location
- Outfall

- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

2021/2022 cPAH TEQ in Surface Sediment

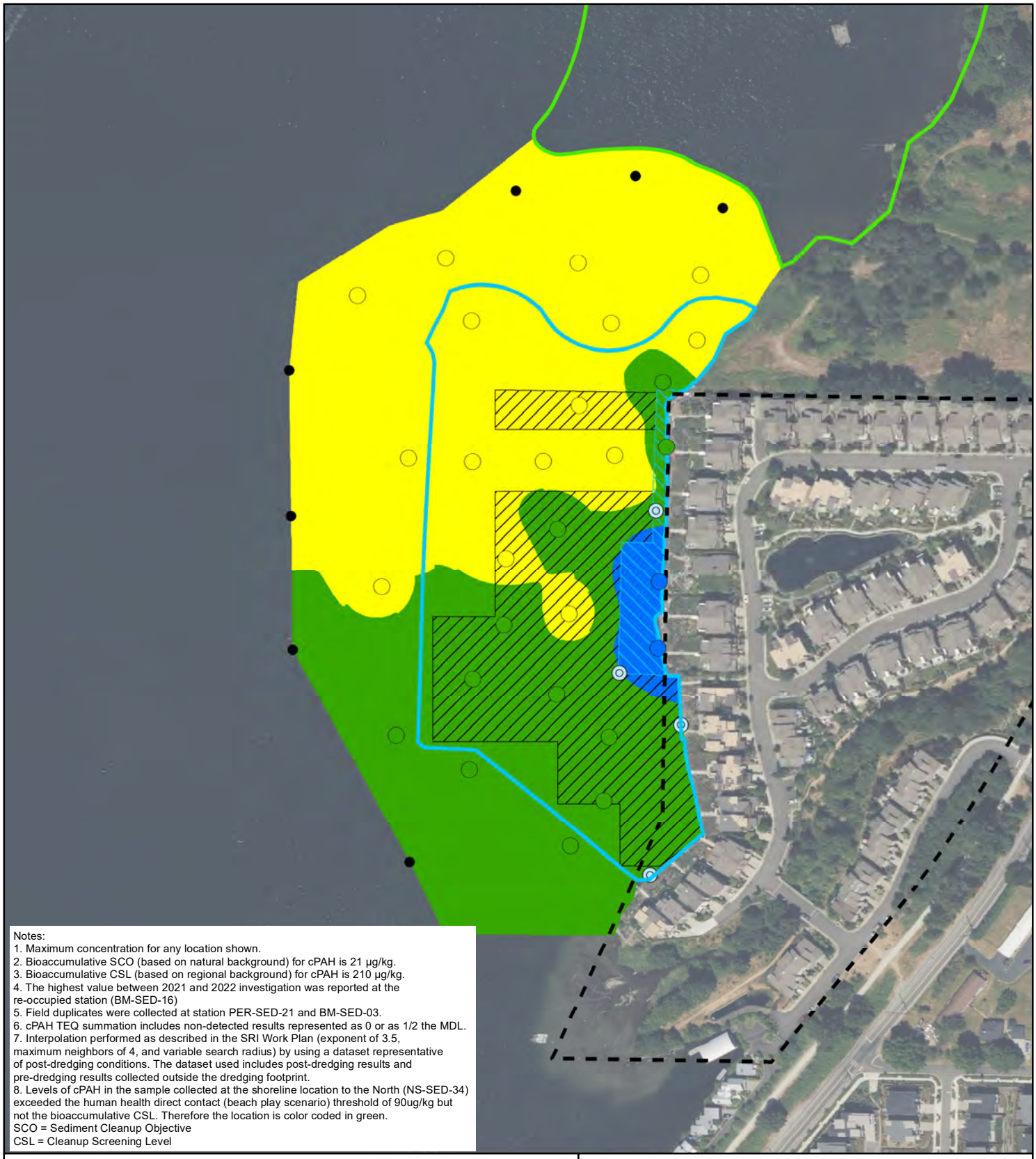
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

Figure 6-23b

PNG0869 | March 2024

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-23b Current cPAH TEQ in Surface Sediment.mxd 3/8/2024 5:05:13 AM



Notes:
1. Maximum concentration for any location shown.
2. Bioaccumulative SCO (based on natural background) for cPAH is 21 µg/kg.
3. Bioaccumulative CSL (based on regional background) for cPAH is 210 µg/kg.
4. The highest value between 2021 and 2022 investigation was reported at the re-occupied station (BM-SED-16)
5. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
6. cPAH TEQ summation includes non-detected results represented as 0 or as 1/2 the MDL.
7. Interpolation performed as described in the SRI Work Plan (exponent of 3.5, maximum neighbors of 4, and variable search radius) by using a dataset representative of post-dredging conditions. The dataset used includes post-dredging results and pre-dredging results collected outside the dredging footprint.
8. Levels of cPAH in the sample collected at the shoreline location to the North (NS-SED-34) exceeded the human health direct contact (beach play scenario) threshold of 90ug/kg but not the bioaccumulative CSL. Therefore the location is color coded in green.
SCO = Sediment Cleanup Objective
CSL = Cleanup Screening Level

Legend

- Historical Sample Location
- 2021/2022 Sample Location

cPAH Concentration (µg/kg)

- < 21 (bioaccumulative SCO)
- 21 (bioaccumulative SCO) - 210 (Bioaccumulative CSL)
- > 210 (Bioaccumulative CSL)
- Archived Sample Location
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Interpolated cPAH Concentrations in Surface Sediment

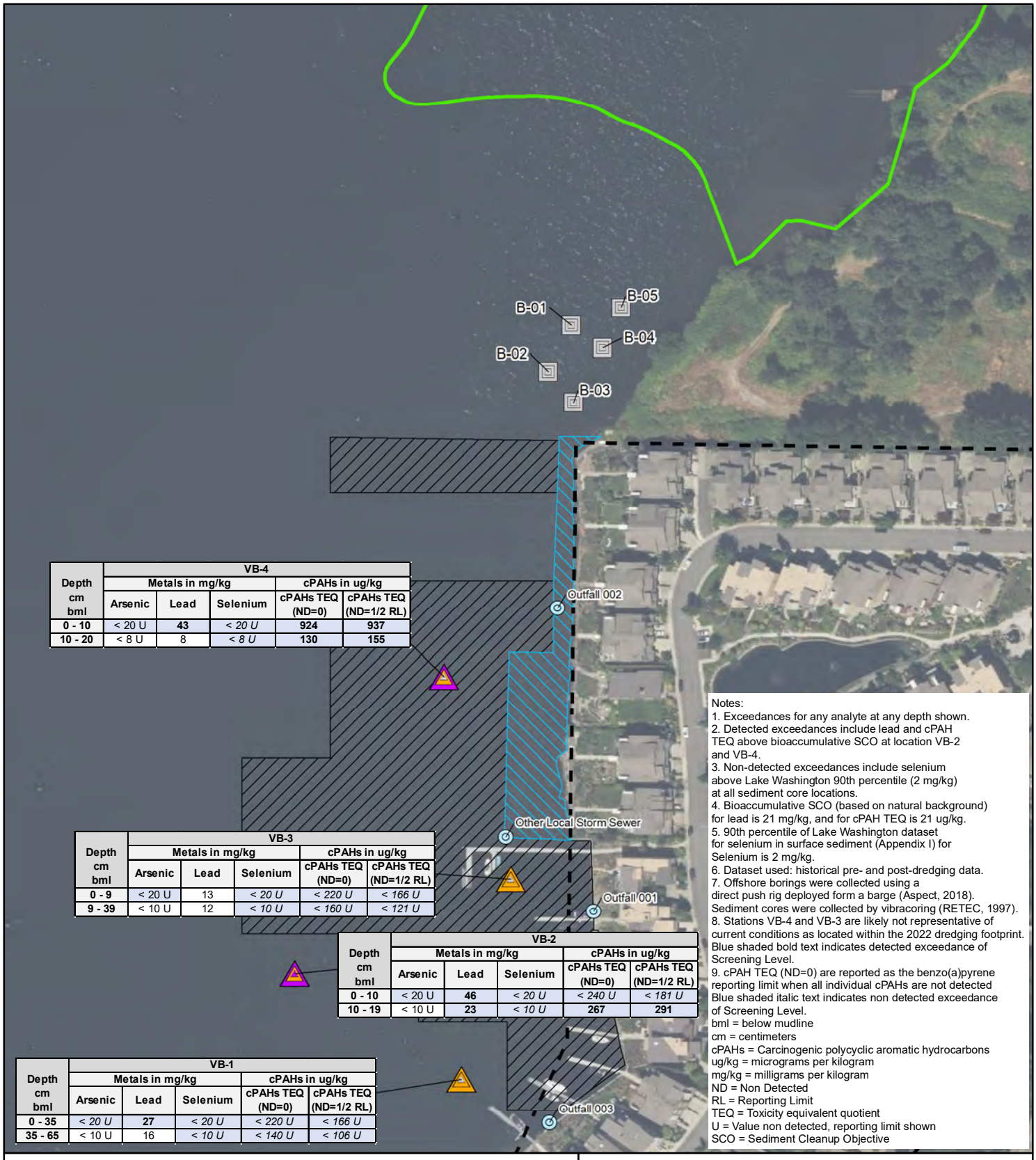
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869 | March 2024

Figure 6-23c

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-23c Interpolated cPAH Concentrations in Surface Sediment.mxd 3/8/2024 5:07:20 AM



Depth cm bml	VB-4				
	Metals in mg/kg			cPAHs in ug/kg	
	Arsenic	Lead	Selenium	cPAHs TEQ (ND=0)	cPAHs TEQ (ND=1/2 RL)
0 - 10	< 20 U	43	*< 20 U*	924	937
10 - 20	< 8 U	8	*< 8 U*	130	155

Depth cm bml	VB-3				
	Metals in mg/kg			cPAHs in ug/kg	
	Arsenic	Lead	Selenium	cPAHs TEQ (ND=0)	cPAHs TEQ (ND=1/2 RL)
0 - 9	< 20 U	13	*< 20 U*	*< 220 U*	*< 166 U*
9 - 39	< 10 U	12	*< 10 U*	*< 160 U*	*< 121 U*

Depth cm bml	VB-2				
	Metals in mg/kg			cPAHs in ug/kg	
	Arsenic	Lead	Selenium	cPAHs TEQ (ND=0)	cPAHs TEQ (ND=1/2 RL)
0 - 10	< 20 U	46	*< 20 U*	*< 240 U*	*< 181 U*
10 - 19	< 10 U	23	*< 10 U*	267	291

Depth cm bml	VB-1				
	Metals in mg/kg			cPAHs in ug/kg	
	Arsenic	Lead	Selenium	cPAHs TEQ (ND=0)	cPAHs TEQ (ND=1/2 RL)
0 - 35	*< 20 U*	27	*< 20 U*	*< 220 U*	*< 166 U*
35 - 65	< 10 U	16	*< 10 U*	*< 140 U*	*< 106 U*

Notes:
1. Exceedances for any analyte at any depth shown.
2. Detected exceedances include lead and cPAH TEQ above bioaccumulative SCO at location VB-2 and VB-4.
3. Non-detected exceedances include selenium above Lake Washington 90th percentile (2 mg/kg) at all sediment core locations.
4. Bioaccumulative SCO (based on natural background) for lead is 21 mg/kg, and for cPAH TEQ is 21 ug/kg.
5. 90th percentile of Lake Washington dataset for selenium in surface sediment (Appendix I) for Selenium is 2 mg/kg.
6. Dataset used: historical pre- and post-dredging data.
7. Offshore borings were collected using a direct push rig deployed form a barge (Aspect, 2018). Sediment cores were collected by vibracoring (RETEC, 1997).
8. Stations VB-4 and VB-3 are likely not representative of current conditions as located within the 2022 dredging footprint. Blue shaded bold text indicates detected exceedance of Screening Level.
9. cPAH TEQ (ND=0) are reported as the benzo(a)pyrene reporting limit when all individual cPAHs are not detected Blue shaded italic text indicates non detected exceedance of Screening Level.
bml = below mudline
cm = centimeters
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
RL = Reporting Limit
TEQ = Toxicity equivalent quotient
U = Value non detected, reporting limit shown
SCO = Sediment Cleanup Objective

Legend

- Soil Boring Lead Sample Location
- Soil Boring Selenium Sample Location
- Soil Boring cPAH Sample Location
- Sediment Core Lead Sample Location
- Sediment Core Selenium Sample Location
- Sediment Core cPAH Sample Location

Exceedance Level

- Exceedance
- Non-detect Exceedance
- No Exceedance
- Outfall
- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Historical Subsurface Sediment Exceedances

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869 | March 2024

Figure 6-24

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 6-24 Subsurface Sediment Exceedance Locations.mxd 3/4/2024 8:21:12 AM

A Northwest

Southeast **A'**

Lake Washington

Elevation Scale is in NAVD88

20 ft

10 ft

0 ft

-10 ft

-20 ft

Direct Contact to Sediment

Stormwater Runoff and Soil Erosion

Soil Erosion to Stormwater

Direct Soil Contact

Ingestion of Fish/Shellfish

Catch Basin

Historical Fill

Groundwater Level

Aquatic Organism Exposure

Stormwater Discharge to Lake Washington

Soil Leaching to Groundwater

Wood Debris

Benthic Organism Exposure

Shallow Alluvium (Interbedded Sand, Sandy Silt, Organic Silt, and Peat)

Groundwater Discharge to Surface Water and Sediment

Deeper Alluvium (Sand and Gravel)

30 ft

20 ft

10 ft

0 ft

-10 ft

-20 ft

Recent Fill

Historical Fill

Shallow Alluvium

Deep Alluvium

Passive Attenuation Zone

Groundwater Flow

Soil Leaching to Groundwater

Nearshore Groundwater Mixing and Discharge

0 50 100 ft

SCALE IS APPROXIMATE

Conceptual Site Model for Migration and Exposure Pathways - Historical Conditions

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Aspect CONSULTING

DEC-2023

PROJECT NO. 05004

BY: DM / TDR

REV BY: ---

FIGURE NO. **7-1**

T:\projects_8\BarbeeMill\Delivered\DraftFinalRIReport\Ai\G1 Historical Conceptual Site Model for Migration and Exposure Pathways.ai

A Northwest

Southeast **A'**

House (Residents)

House (Residents)

House (Residents)

Lake Washington

Direct Contact to Sediment

Ingestion of Fish/Shellfish

Elevation Scale is in NAVD88

20 ft

10 ft

0 ft

-10 ft

-20 ft

30 ft

20 ft

10 ft

0 ft

-10 ft

-20 ft

Aquatic Organism Exposure

Benthic Organism Exposure

Groundwater Discharge to Surface Water and Sediment

Fill for Development (Gravelly Sand with Silt and/or Topsoil)

Historical Fill

Well Graded Gravelly Sand

Silty Sand with Gravel

Groundwater Level

Clear Rock

3% Iron in Sand

Soil Leaching to Groundwater

29% Iron Mixture in Sand

Shallow Alluvium (Interbedded Sand, Sandy Silt, Organic Silt, and Peat)

Deeper Alluvium (Sand and Gravel)

Recent Fill

Historical Fill

Shallow Alluvium

Deep Alluvium

Passive Attenuation Zone

Groundwater Flow

Soil Leaching to Groundwater

Nearshore Groundwater Mixing and Discharge

0 50 100 ft

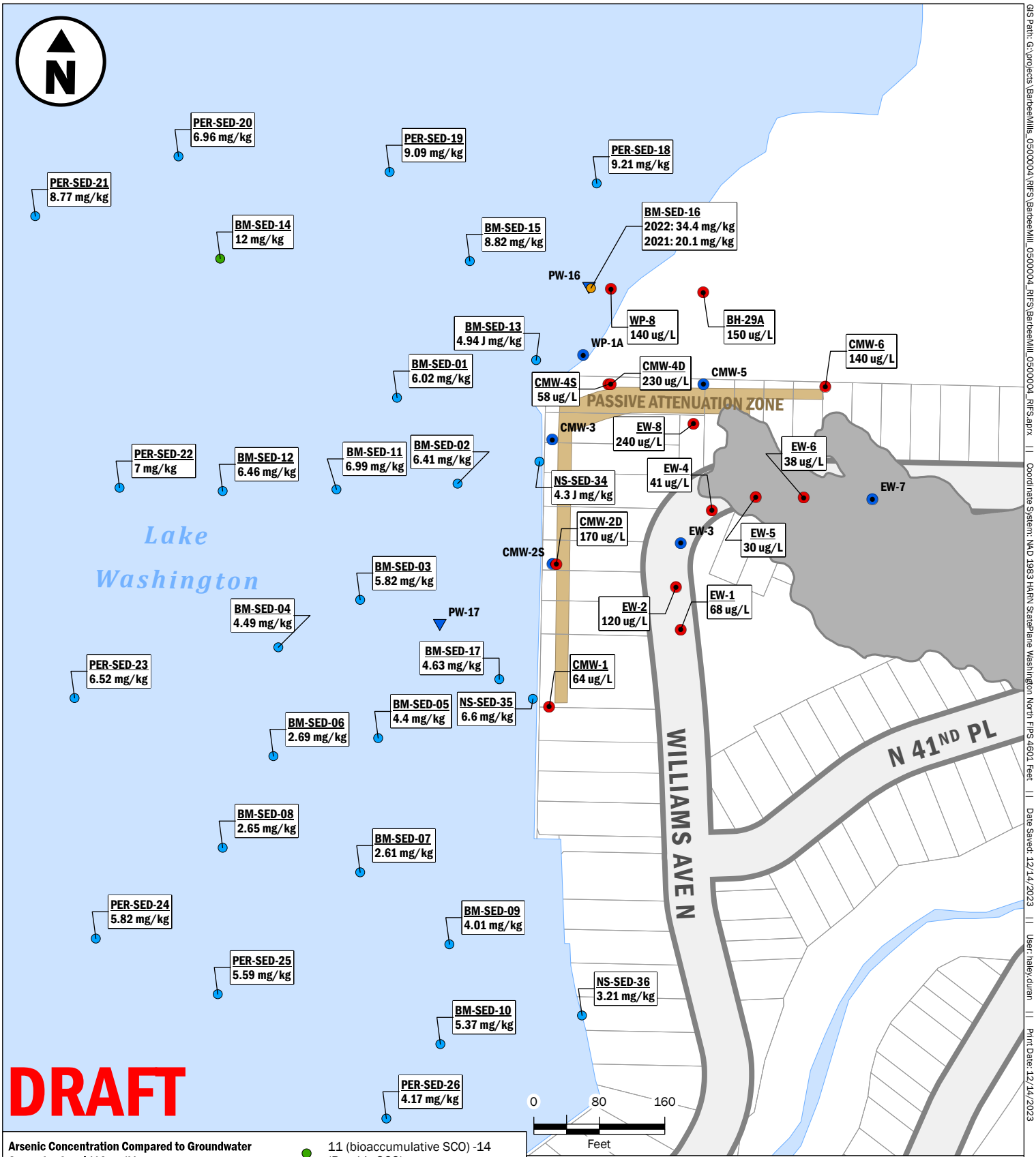
SCALE IS APPROXIMATE

Conceptual Site Model for Migration and Exposure Pathways - Current Conditions

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Aspect Consulting	DEC-2023	BY: DM / TDR	FIGURE NO. 7-2
	PROJECT NO. 05004	REV BY: ---	

T:\projects_8\BarbeeMill\Delivered\DraftFinalRIReport\A1v02 Updated Conceptual Site Model for Migration and Exposure Pathways.ai



DRAFT

Arsenic Concentration Compared to Groundwater Screening Level (16 ug/L)

- Groundwater Sample Above Screening Level
- Groundwater Sample Below Screening Level
- Porewater sample Below Arsenic Screening Level

Arsenic Concentration Compared to Arsenic Sediment Cleanup Objectives (SCO: mg/kg)

- < 11 (bioaccumulative SCO)
- 11 (bioaccumulative SCO) -14 (Benthic SCO)
- >14 (Benthic SCO)
- Arsenic-Contaminated Soil Excavation Area
- Passive Attenuation Zone
- Parcel

Note: 1) Only Shallow Alluvium monitoring wells and well points are shown
2) Sediment and porewater results are from 2021/2022
3) Groundwater results are from January 2023

Current Sediment, Porewater, and Groundwater Conditions in the Estimated Area of Arsenic Plume Discharge

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting	DEC-2023	BY: DIM / HMD	FIGURE NO. 7-3
	PROJECT NO. 050004	REV BY: --- / ---	

GIS Path: G:\projects\BarbeeMills_0500004\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx || Coordinate System: NAD 1983 HARN StatePlane Washington North FIPS 4601 Feet || Date Saved: 12/14/2023 || User: haley.duran || Print Date: 12/14/2023

Notes:
1. Maximum concentration for any location shown.
2. Bioaccumulative SCO (based on natural background) for arsenic is 11 mg/kg.
3. The benthic SCO for arsenic is 14 mg/kg.
4. Regional background for arsenic is 24 mg/kg.
5. The highest value between 2021 and 2022 investigation was reported at the re-occupied station (BM-SED-16)
6. Field duplicates were collected at station PER-SED-21 and BM-SED-03.
SCO = Sediment Cleanup Objective

Legend

- Bioassay Location: Not Toxic
- Historical Sample Location
- 2021/2022 Sample Location

Arsenic Concentration (mg/kg)

- < 11 (bioaccumulative SCO)
- 11 (bioaccumulative SCO) -14 (Benthic SCO)
- >14 (Benthic SCO
- Archived Sample Location
- Outfall

- Barbee Property Boundary
- Quendall Site, Operable Unit 2
- Barbee Site, Sediment Boundary
- Nearshore Sediment Management Area
- Site-wide Sediment Management Area
- Habitat Restoration Area
- 2002 Sediment Removal Area

N

0 100 200 400 Feet

Sediment Risk Screening Areas

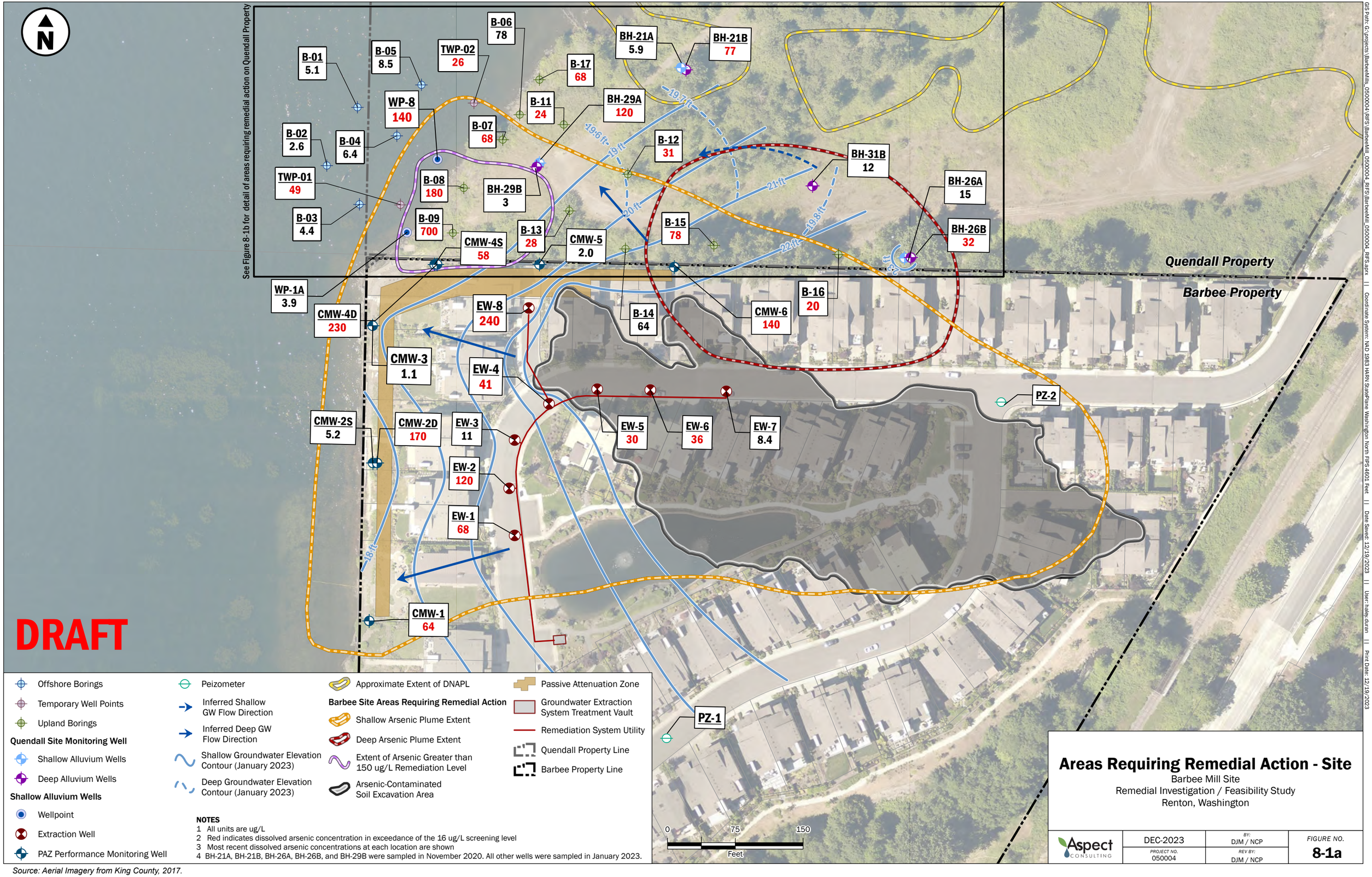
Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Geosyntec consultants

PNG0869 | December 2023

Figure 7-4

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Revisions111723\Figure 7-3 Sediment Management Areas.mxd 12/4/2023 5:31:53 PM



NOTES
1 All units are ug/L
2 Red indicates dissolved arsenic concentration in exceedance of the 16 ug/L screening level
3 Most recent dissolved arsenic concentrations at each location are shown
4 BH-21A, BH-21B, BH-26A, BH-26B, and BH-29B were sampled in November 2020. All other wells were sampled in January 2023.

Source: Aerial Imagery from King County, 2017.

Areas Requiring Remedial Action - Site

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

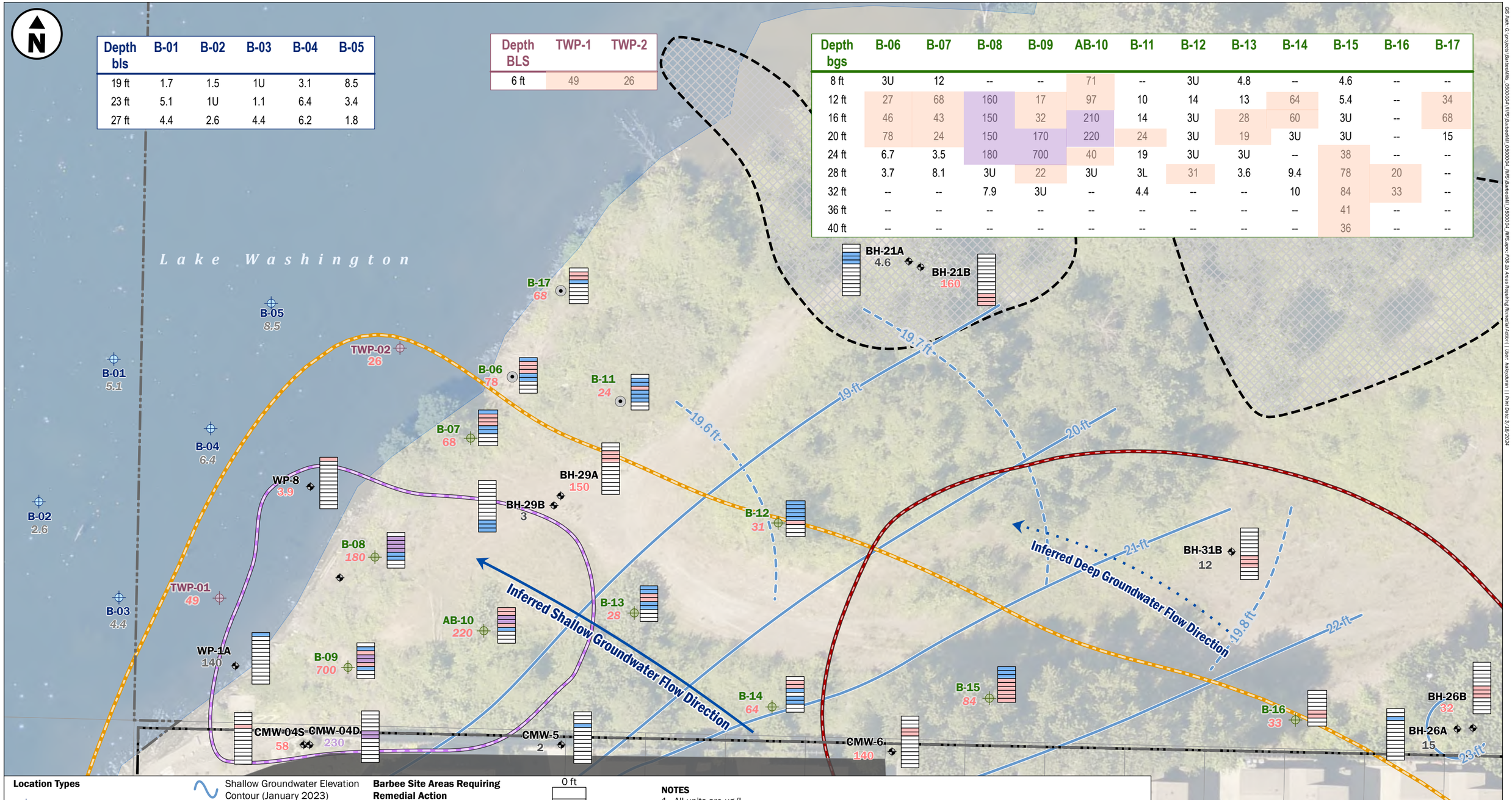
Aspect Consulting	DEC-2023	BY: DJM / NCP	FIGURE NO. 8-1a
	PROJECT NO. 050004	REV BY: DJM / NCP	

GIS Path: G:\projects\BarbeeMills_050004\RIFS\BarbeeMill_050004_RIFS\BarbeeMill_050004_RIFS.aprx || Coordinate System: NAD 1983 HARN StatePlane Washington North FIPS 4601 Feet || Date Saved: 12/19/2023 || User: haley.duran || Print Date: 12/19/2023

Depth bls	B-01	B-02	B-03	B-04	B-05
19 ft	1.7	1.5	1U	3.1	8.5
23 ft	5.1	1U	1.1	6.4	3.4
27 ft	4.4	2.6	4.4	6.2	1.8

Depth BLS	TWP-1	TWP-2
6 ft	49	26

Depth bgs	B-06	B-07	B-08	B-09	AB-10	B-11	B-12	B-13	B-14	B-15	B-16	B-17
8 ft	3U	12	--	--	71	--	3U	4.8	--	4.6	--	--
12 ft	27	68	160	17	97	10	14	13	64	5.4	--	34
16 ft	46	43	150	32	210	14	3U	28	60	3U	--	68
20 ft	78	24	150	170	220	24	3U	19	3U	3U	--	15
24 ft	6.7	3.5	180	700	40	19	3U	3U	--	38	--	--
28 ft	3.7	8.1	3U	22	3U	3L	31	3.6	9.4	78	20	--
32 ft	--	--	7.9	3U	--	4.4	--	--	10	84	33	--
36 ft	--	--	--	--	--	--	--	--	--	41	--	--
40 ft	--	--	--	--	--	--	--	--	--	36	--	--



Location Types

- Offshore Borings
- Temporary Well Points
- Upland Borings
- Monitoring Wells
- Data Not Used for Defining Plume Boundary
- Deep Groundwater Elevation Contour (January 2023)
- Shallow Groundwater Elevation Contour (January 2023)
- Passive Attenuation Zone
- Quendall DNAPL
- Barbee Property Line
- Quendall Property Line

Barbee Site Areas Requiring Remedial Action

- Extent of Arsenic Greater than 150 ug/L Remediation Level
- Deep Arsenic Plume Extent
- Shallow Arsenic Plume Extent

0 ft — Below SL — Exceeds SL — Exceeds REL — 52 ft

NOTES

1 All units are ug/L
2 Highlighted cells indicate exceedance of 16 ug/L SL
3 Deep Arsenic Plume based on extent of arsenic exceeding SL in groundwater greater than 30 feet bgs. BH-31B is included inside the deep plume extent due to a historical exceedance of the screening level (30 ug/L in January 2022)
4 Shallow Arsenic Plume based on extent of arsenic exceeding SL in groundwater less than 30 feet bgs
5 SL = Screening Level, bgs = Below Ground Surface, bls = Below Lake Surface
6 Non-populated cells = sample not collected
7 Vertical datum: NAVD 88
8 Dissolved arsenic concentrations from January 2023 are shown for each monitoring well
9 Grab groundwater results from the 2018 Data Gaps Investigation are presented in tabular form. The maximum result from each location is shown next to the location
10 Sample intervals are 4 feet for B-01 through B-17, TWP-1 and TWP-2.
11 All offshore samples are BLS. All upland samples are BGS.
12 See Section 6.1.1.2 of text for rationale of arsenic plume extent

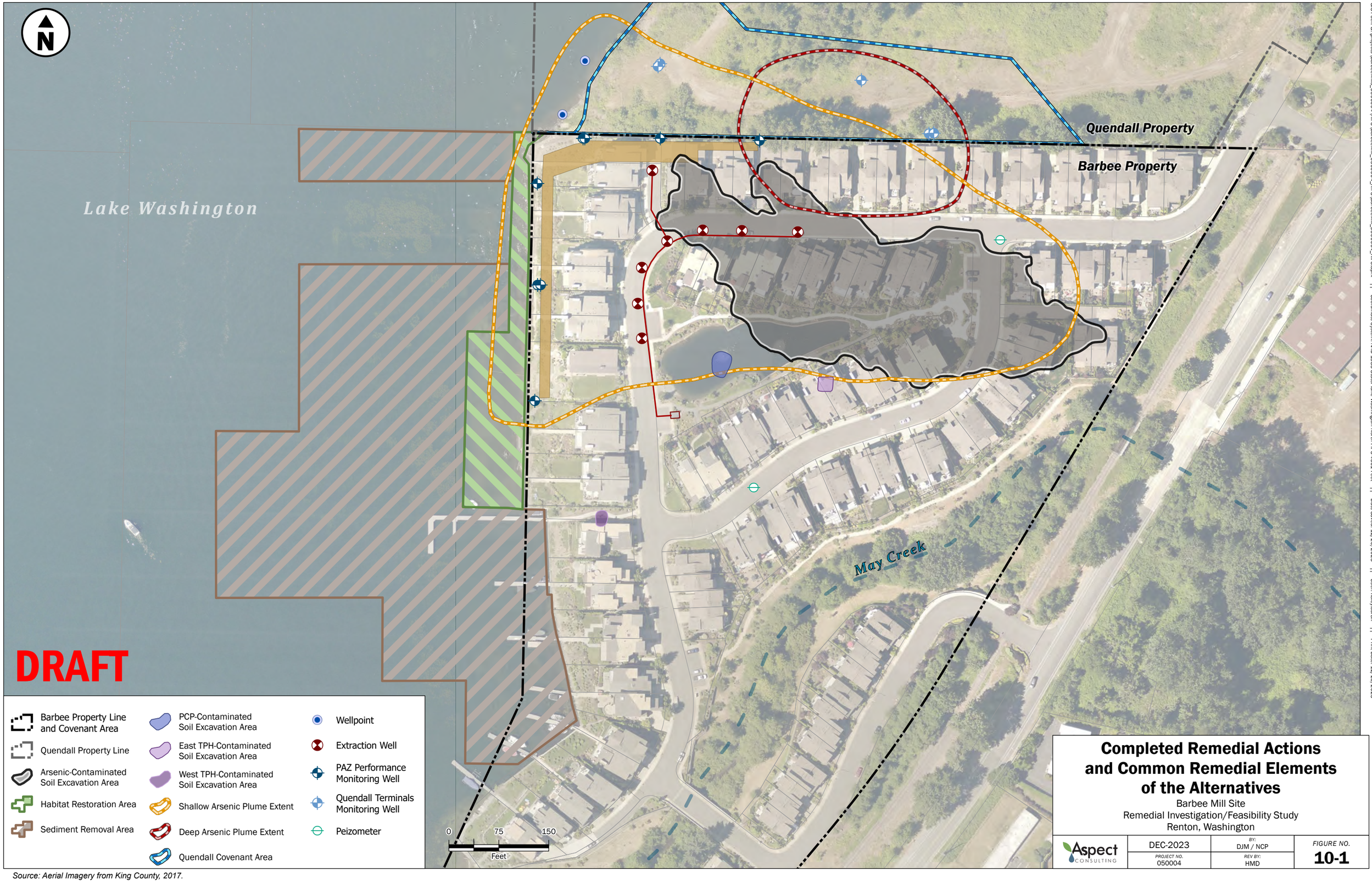
0 25 50 Feet

Areas Requiring Remedial Action - Quendall Property

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect Consulting | MAR-2024 | PROJECT NO. 050004 | BY: JJP / SCC | REVISED BY: DIM / NCP / HMD | FIGURE NO. 8-1b

GIS Path: G:\projects\Barbee Mill\GIS\050004_RIFS\Barbee Mill_050004_RIFS.aprx: F08-1b Areas Requiring Remedial Action\ | User: haleyjurian | | Print Date: 3/18/2024



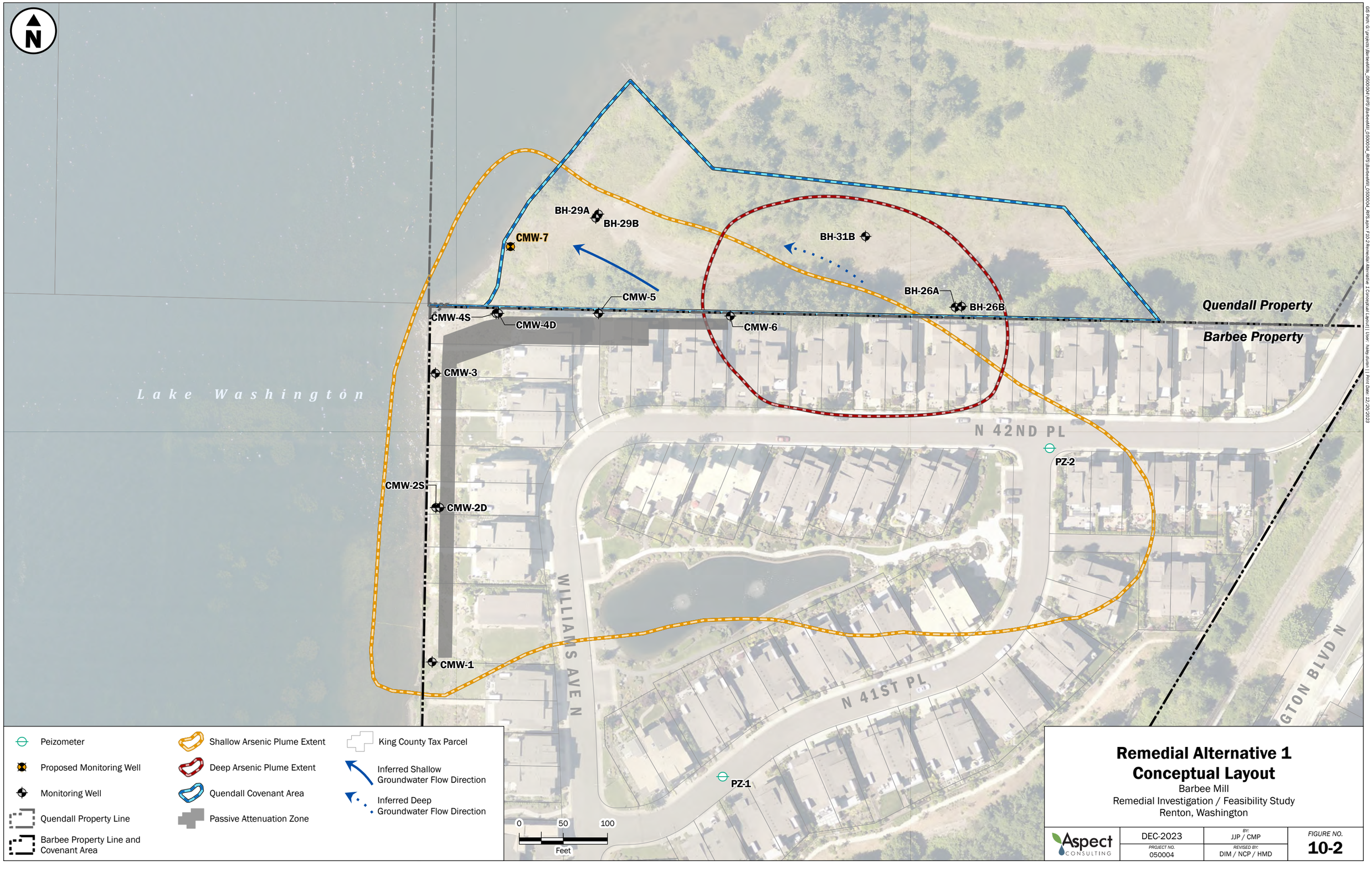
Source: Aerial Imagery from King County, 2017.

Completed Remedial Actions and Common Remedial Elements of the Alternatives

Barbee Mill Site
Remedial Investigation/Feasibility Study
Renton, Washington

Aspect Consulting	DEC-2023	BY: DJM / NCP	FIGURE NO. 10-1
	PROJECT NO. 050004	REV BY: HMD	

GIS Path: G:\projects\BarbeeMills_0500004\RIFS\BarbeeMill_0500004_RIFS\BarbeeMill_0500004_RIFS.aprx || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 12/20/2023 || User: haleyduran || Print Date: 12/20/2023

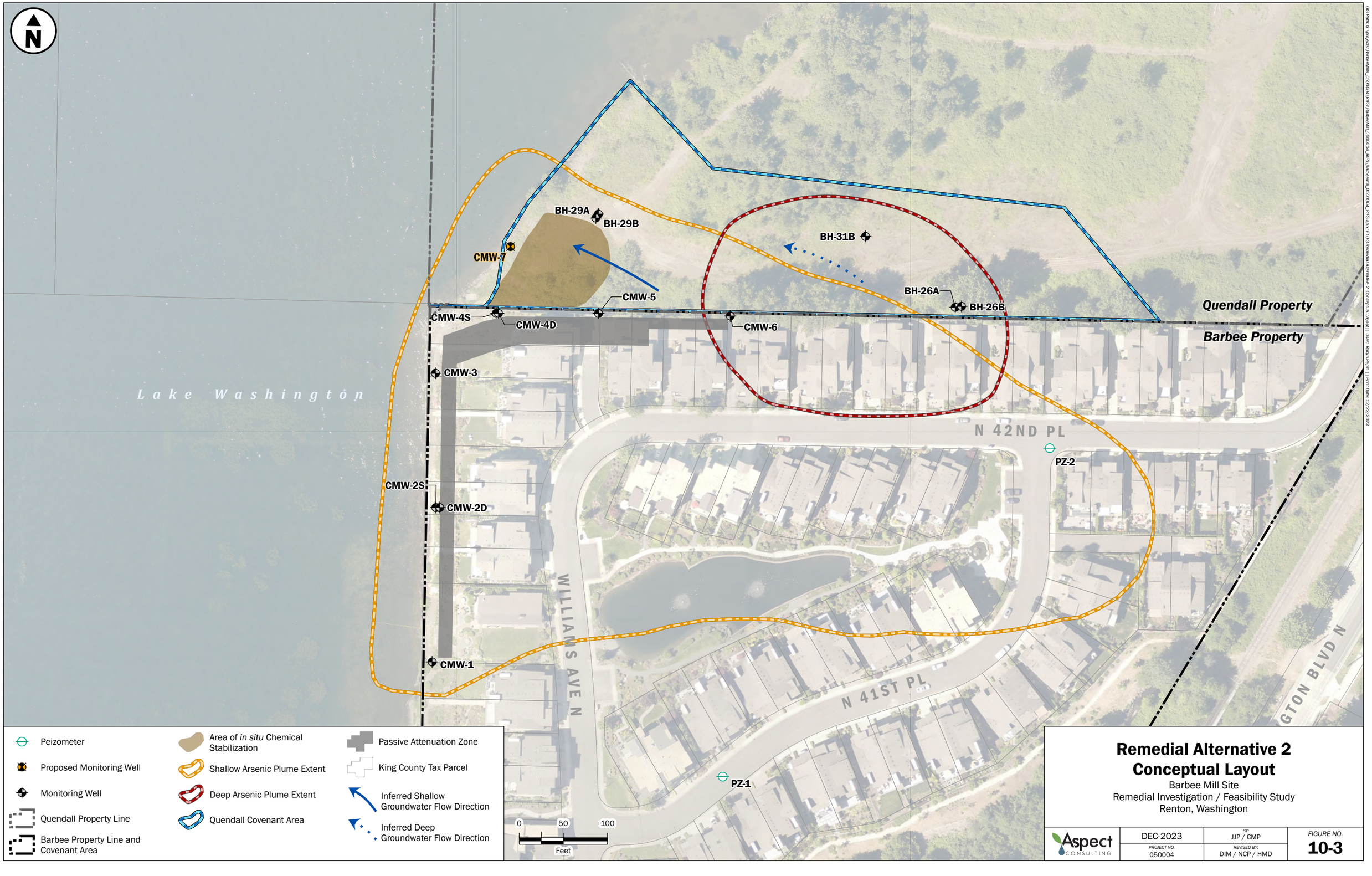


Remedial Alternative 1 Conceptual Layout

Barbee Mill
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect CONSULTING	DEC-2023	BY: JJP / CMP	FIGURE NO. 10-2
	PROJECT NO. 050004	REVISED BY: DIM / NCP / HMD	

GIS Path: G:\projects\Barbee\Mill_050000\04_RI/FS\Barbee\Mill_050000\04_RI/FS.aprx: F10-2 Remedial Alternative 1 Conceptual Layout | User: - haley.dolan | | Print Date: 12/20/2023

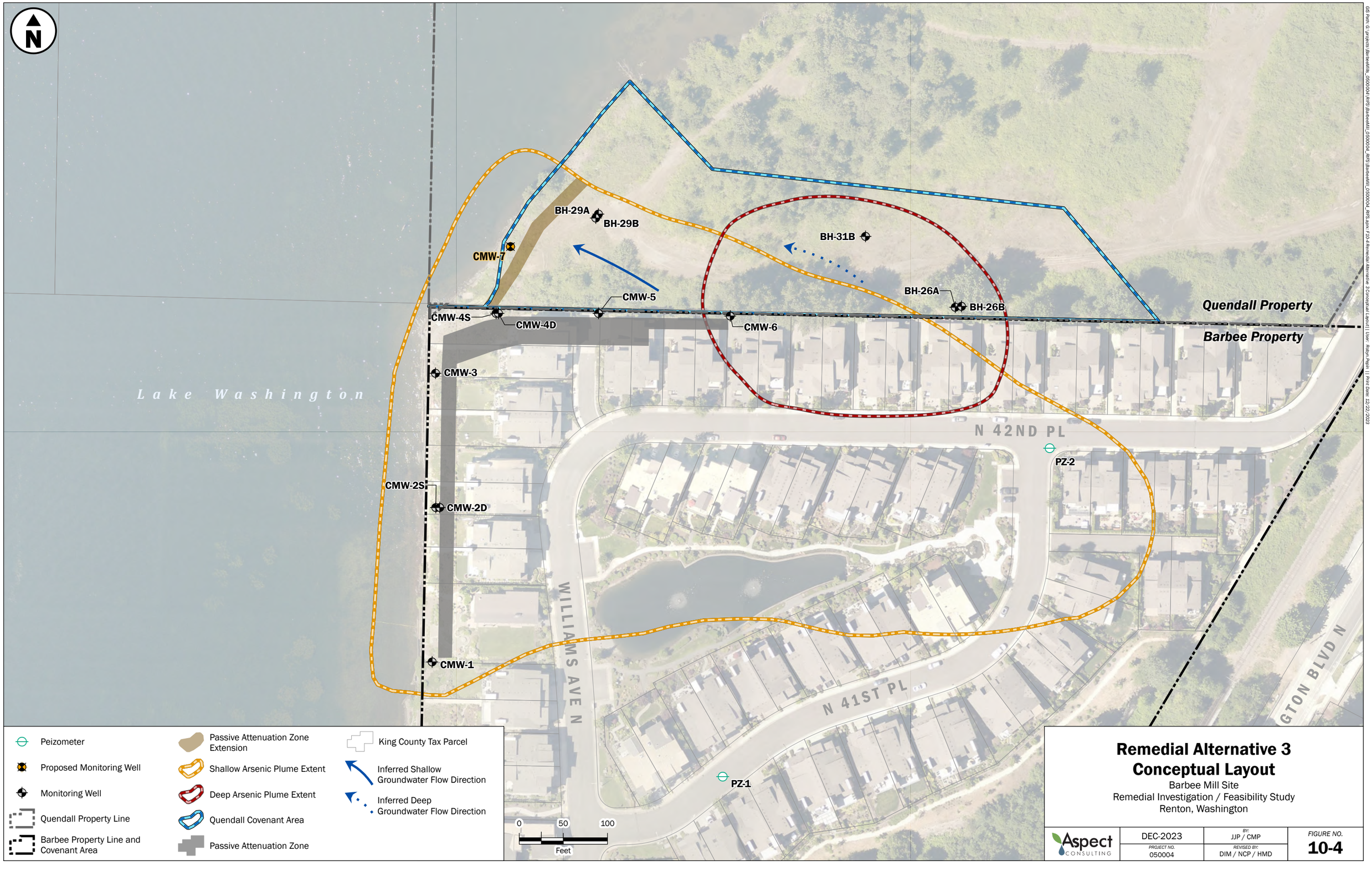


Remedial Alternative 2 Conceptual Layout

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect CONSULTING	DEC-2023	BY: JJP / CMP	FIGURE NO. 10-3
	PROJECT NO. 050004	REVISED BY: DIM / NCP / HMD	

GIS Path: G:\projects\Barbee\Mills_050000\04_RI/FS\Barbee\Mill_050000\04_RI/FS\Barbee\Mill_050000\04_RI/FS.aprx: F10-3 Remedial Alternative 2 Conceptual Layout || User: Ricky.n.Pham || Print Date: 12/22/2023

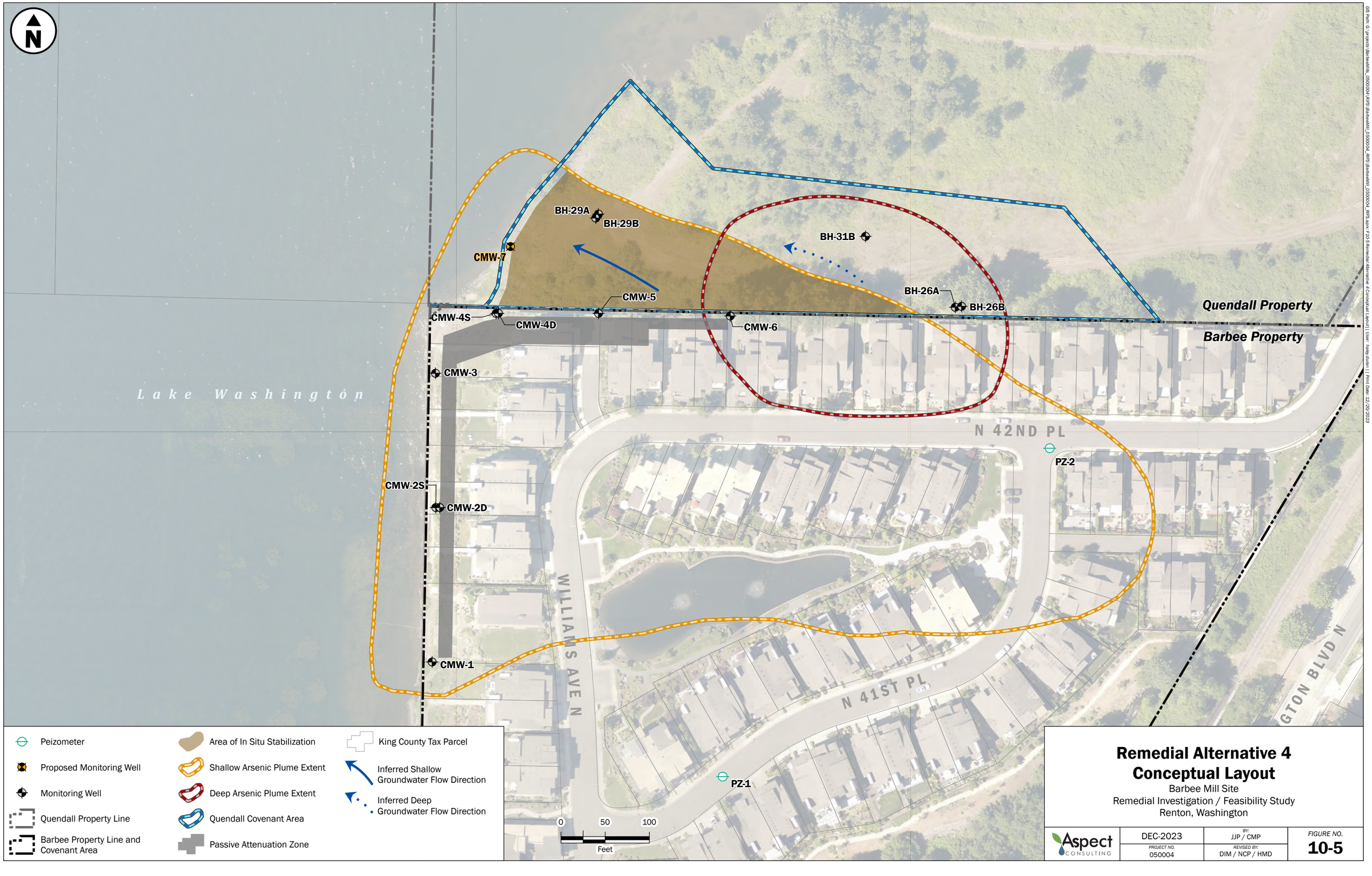


Remedial Alternative 3 Conceptual Layout

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect CONSULTING	DEC-2023	BY: JJP / CMP	FIGURE NO. 10-4
	PROJECT NO. 050004	REVISED BY: DIM / NCP / HMD	

GIS Path: G:\Projects\Barbee\Mill_050000\04_RI/FS\Barbee\Mill_050000\04_RI/FS.aprx: F10-4 Remedial Alternative 3 Conceptual Layout | User: Robyn Pilgrim | Print Date: 12/22/2023



Remedial Alternative 4 Conceptual Layout

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect CONSULTING	DEC-2023	BY: JJP / CMP	FIGURE NO. 10-5
	PROJECT NO. 050004	REVISED BY: DIM / NCP / HMD	

GIS Path: G:\projects\Barbee\Mill_050000\04_RI/FS\Barbee\Mill_050000\04_RI/FS.aprx | F10-5 Remedial Alternative 4 Conceptual Layout | | User: hailey.dolan | | Print Date: 12/20/2023

Remedial Alternative 5 Conceptual Layout

Barbee Mill Site
Remedial Investigation / Feasibility Study
Renton, Washington

Aspect CONSULTING	DEC-2023	BY: JJP / CMP	FIGURE NO. 10-6
	PROJECT NO. 050004	REVISED BY: DIM / NCP / HMD	

GIS Path: G:\projects\Barbee Mill\a_050000\04_RI/FS\BarbeeMill_050000\04_RI/FS\BarbeeMill_050000\04_RI/FS.aprx: F10-6 Remedial Alternative 5 Conceptual Layout | User: Robyn Pepin | | Print Date: 12/22/2023

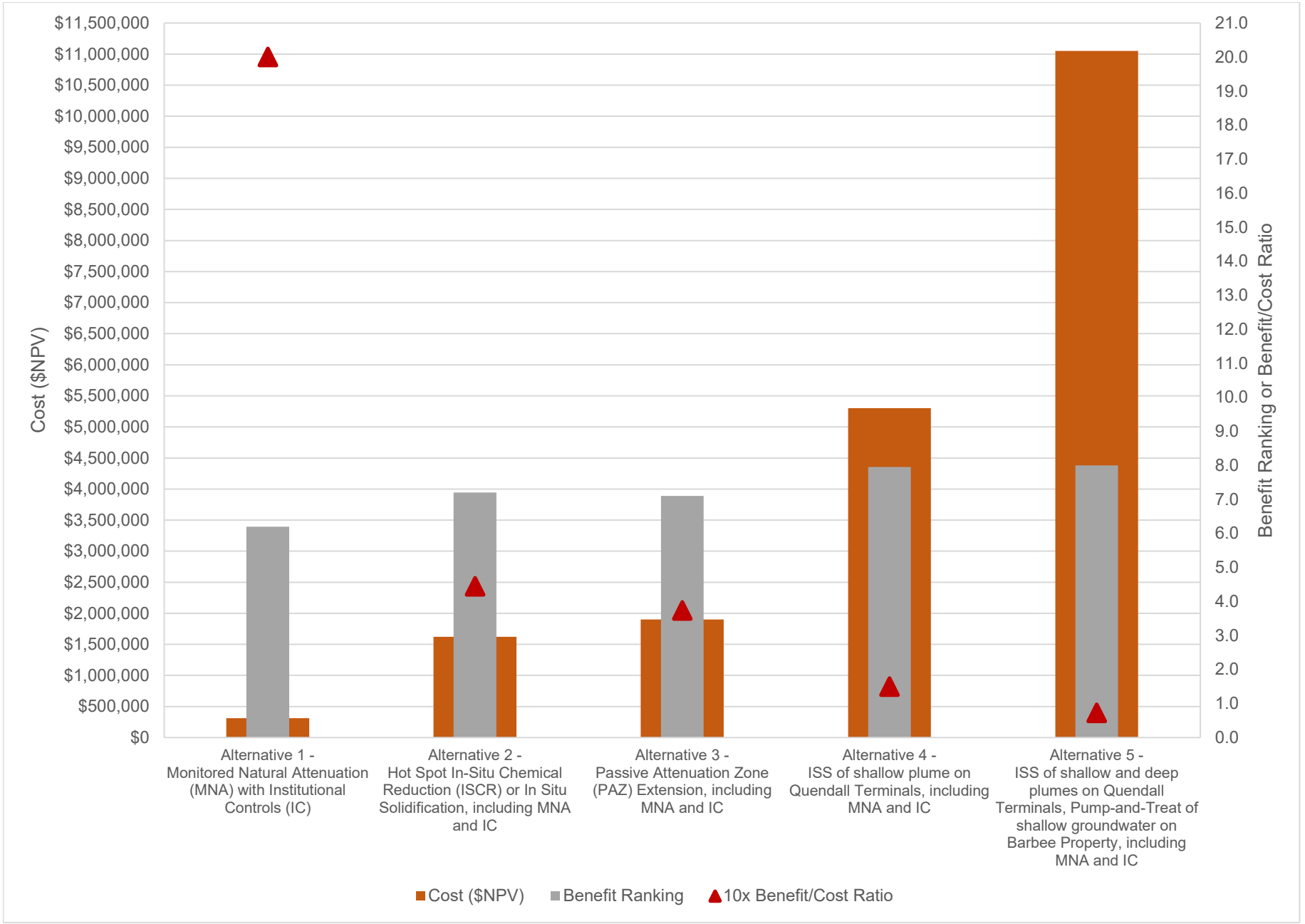


Figure 11-1. Disproportionate Cost Summary

Project 050004, Barbee Mill Site, Renton Washington

APPENDIX A

Selected Information from the Quendall Site RI & FS Reports

Attachments

Quendall RI:

Attachment A1 – Quendall RI Figures 3.1-12-16 – Groundwater Elevation Contour Maps, Shallow and Deep Aquifers, November 2008 and September 2009

Attachment A2 – Quendall RI Figure 5.2-17 – Deep Groundwater Arsenic Concentrations

Attachment A3 – Quendall RI Figure 5.2-16 – Shallow Groundwater Arsenic Concentrations

Attachment A4 – Quendall RI Figure 5.4-19 – Wood Debris and Surface Bulk Sediment Indicator Parameters (TOC, TVS, and Percent Wood by Volume)

Attachment A5 – Quendall RI Figure 5.4-4 – Surface Bulk Sediment Dry Weight cPAH (Benzo[a]Pyrene Equivalent) Concentrations

Quendall FS:

Attachment A6 – Quendall FS Figure 3-6 – Approximate Extents of Benzene, Naphthalene, cPAHs, and Arsenic in the Shallow Aquifer

ATTACHMENT A1

Quendall RI Figures 3.1-12-16 – Groundwater Elevation Contour Maps, Shallow and Deep Aquifers, November 2008 and September 2009

Legend

BH-22 *22.55* — Monitoring Well with Data from September 2009 (Aspect)

20 — Groundwater Elevation Contour (September 2009)

Inferred Direction of Groundwater Flow

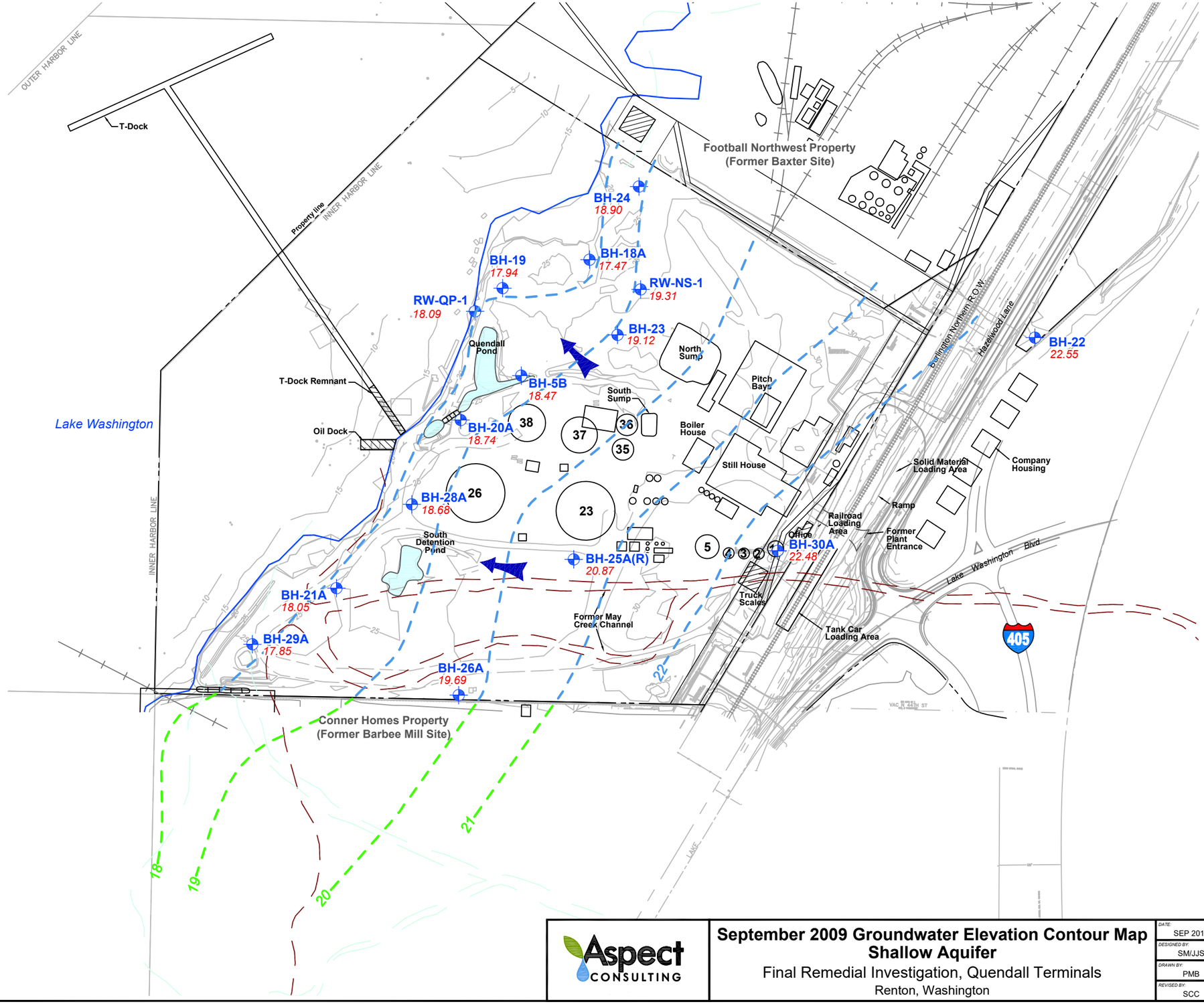
20 — Groundwater Elevation Contour for adjacent Connor Homes Property (former Barbee Mill Site)

Detention Ponds

Existing Structures

Historical Structures

Note: Elevations in feet (NAVD 88)



Aspect CONSULTING

September 2009 Groundwater Elevation Contour Map Shallow Aquifer

Final Remedial Investigation, Quendall Terminals

Renton, Washington

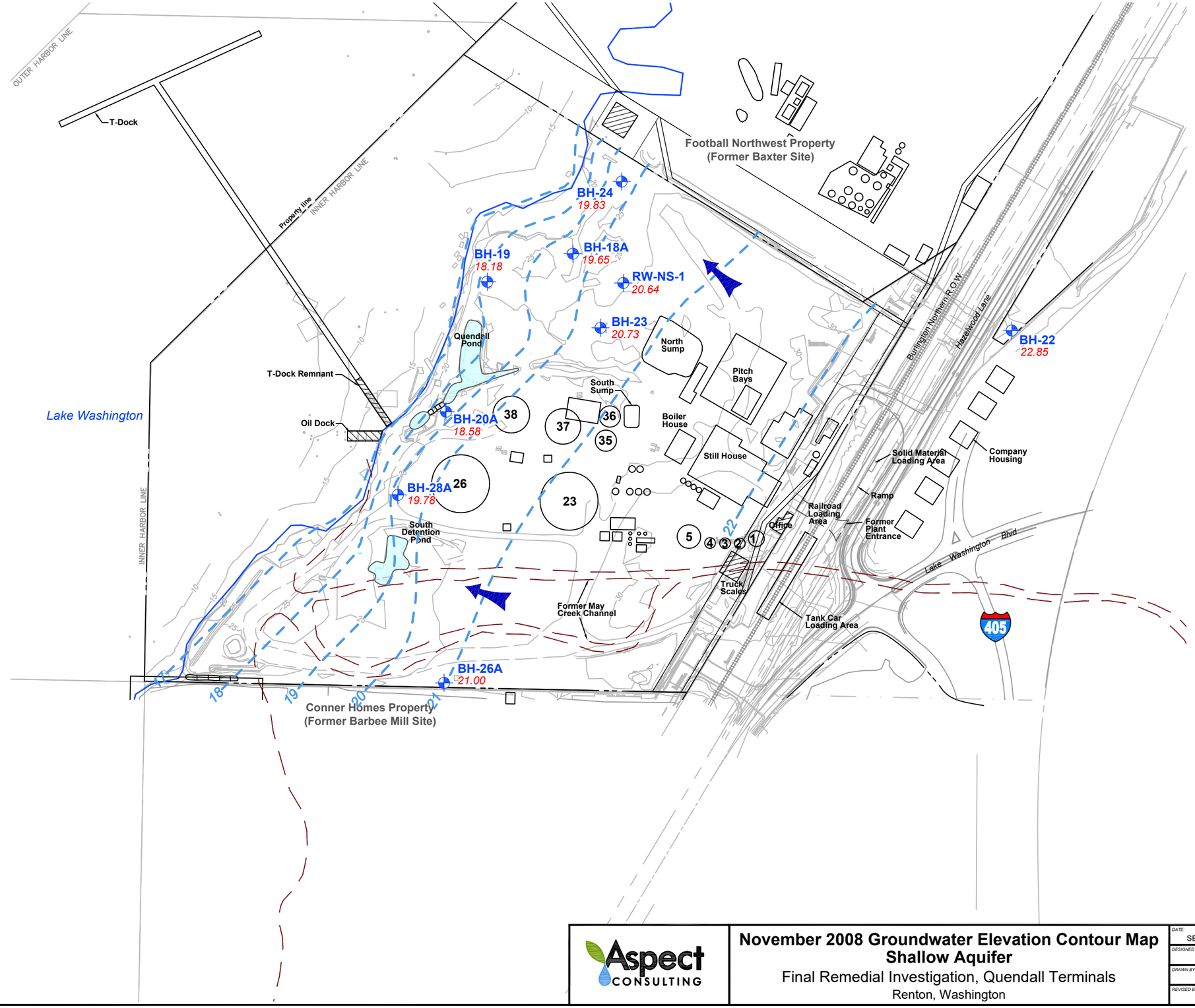
DATE: SEP 2012	PROJECT NO. 020027
DESIGNED BY: SM/JJS	
DRAWN BY: PMB	FIGURE NO. 3.1-12
REVISED BY: SCC	

C:\AD Path: Q:\Quendall\020027 Quendall Terminals\2012-09 RI Final Report\020027-3112.dwg Figure 3.1-12 (11 x 17) || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Sep 10, 2012 4:13pm || User: scudd

Legend

- **BH-24** / *19.83* — Monitoring Well with Data from November 2008 (Aspect)
- *19* — Groundwater Elevation Contour (November 2008)
- Inferred Direction of Groundwater Flow
- Detention Ponds
- Existing Structures
- Historical Structures

Note: Elevations in feet (NAVD 88)



Aspect CONSULTING

November 2008 Groundwater Elevation Contour Map Shallow Aquifer

Final Remedial Investigation, Quendall Terminals

Renton, Washington

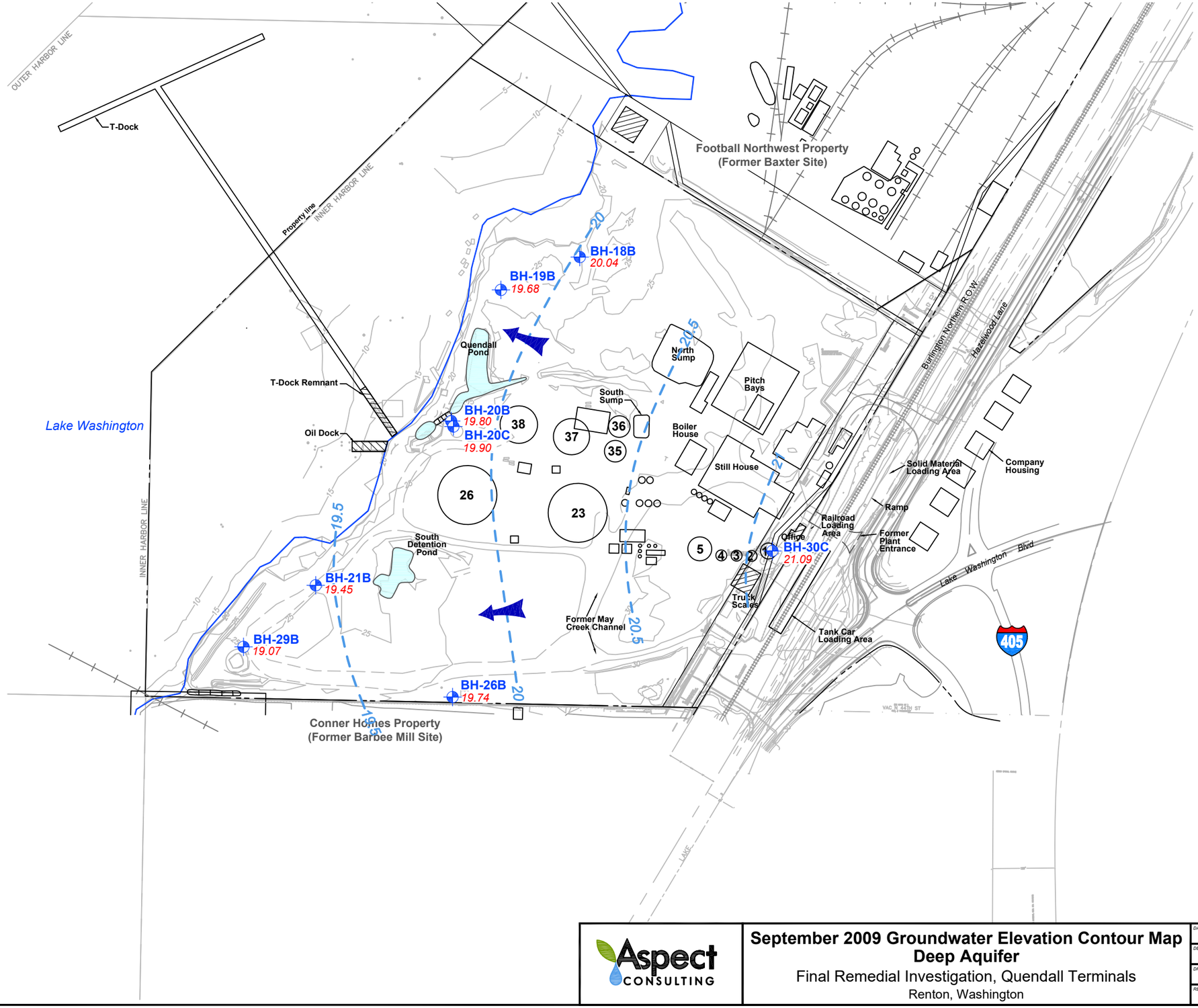
DATE: SEP 2012	PROJECT NO. 020027
DESIGNED BY: SM	
DRAWN BY: PMB	FIGURE NO. 3.1-13
REVISED BY: SCC	

C4D Path: Q:\Quendall\020027 Quendall Terminals\2012-09 RI Final Report\020027-3113.dwg Figure 3.1-13 (11 x 17) || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Sep 10, 2012 4:18pm || User: scudd

Legend

- BH-19B / 19.68 — Monitoring Well with Data from September 2009 (Aspect)
- 20 — Groundwater Elevation Contour (September 2009)
- Inferred Direction of Groundwater Flow
- Detention Ponds
- Existing Structures
- Historical Structures

Note: Elevations in feet (NAVD 88).



September 2009 Groundwater Elevation Contour Map
Deep Aquifer
Final Remedial Investigation, Quendall Terminals
Renton, Washington

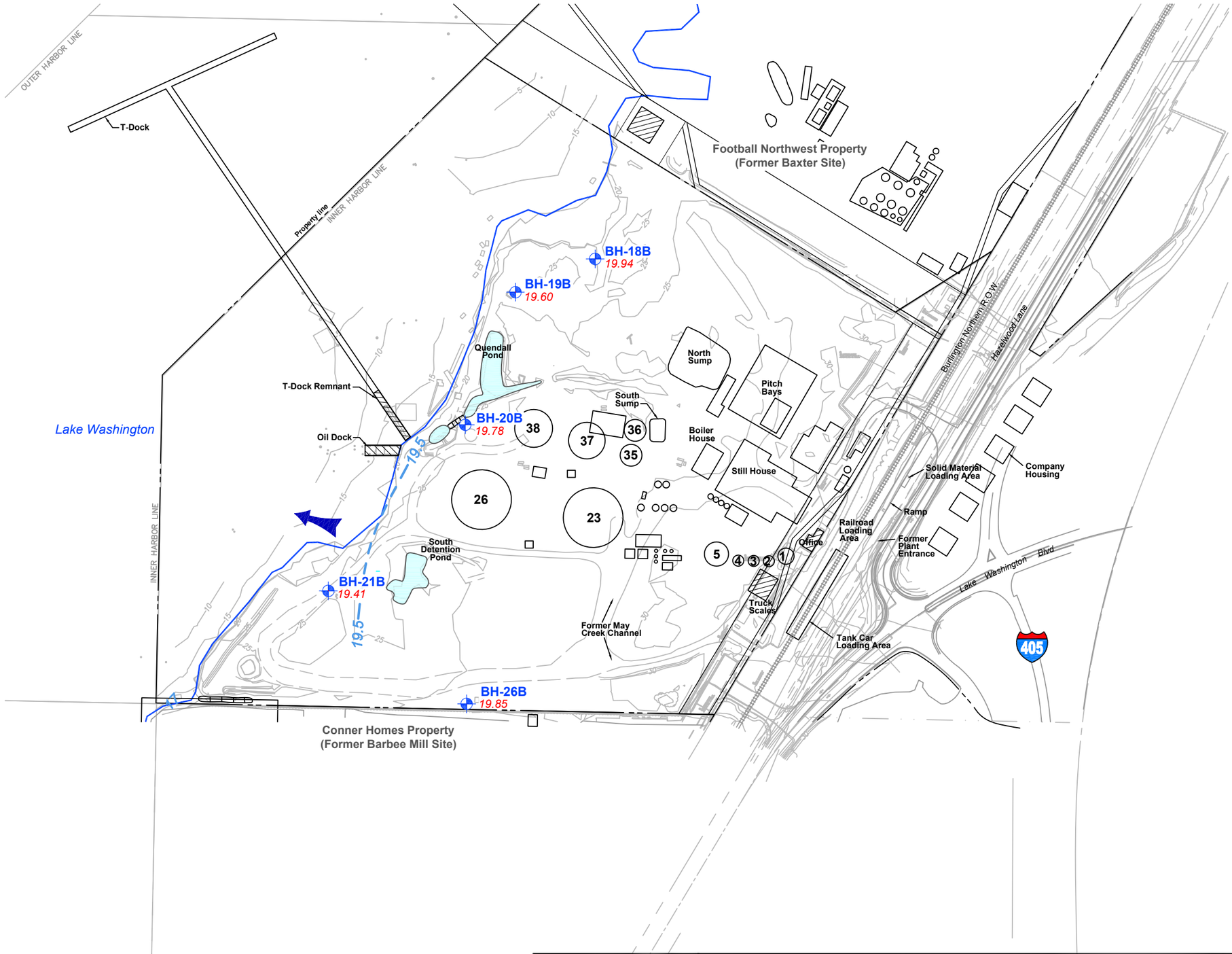
DATE: SEP 2012	PROJECT NO. 020027
DESIGNED BY: SM/JJS	
DRAWN BY: PMB	FIGURE NO. 3.1-14
REVISED BY: SCC	

CAD Path: Q:\Quendall\020027 Quendall Terminals\2012-09 RI Final Report\020027-3114.dwg Figure 3.1-14 (11 x 17) || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Sep 10, 2012 4:23pm || User: scudd

Legend

- BH-19B 19.60 — Monitoring Well with Data from November 2008 (Aspect)
- 19.5 — Groundwater Elevation Contour (November 2008)
- Inferred Direction of Groundwater Flow
- Detention Ponds
- Existing Structures
- Historical Structures

Note: Elevations in feet (NAVD 88)



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Aspect CONSULTING

November 2008 Groundwater Elevation Contour Map Deep Aquifer

Final Remedial Investigation, Quendall Terminals

Renton, Washington

DATE: SEP 2012	PROJECT NO. 020027
DESIGNED BY: SM/JJS	
DRAWN BY: PMB	FIGURE NO. 3.1-15
REVISED BY: SCC	

CAD Path: Q:\Quendall\020027 Quendall Terminals\2012-09 RI Final Report\020027-3115.dwg Figure 3.1-15 (11 x 17) || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Sep 10, 2012 4:27pm || User: scudd

ATTACHMENT A2

Quendall RI Figure 5.2-17 – Deep Groundwater Arsenic Concentrations

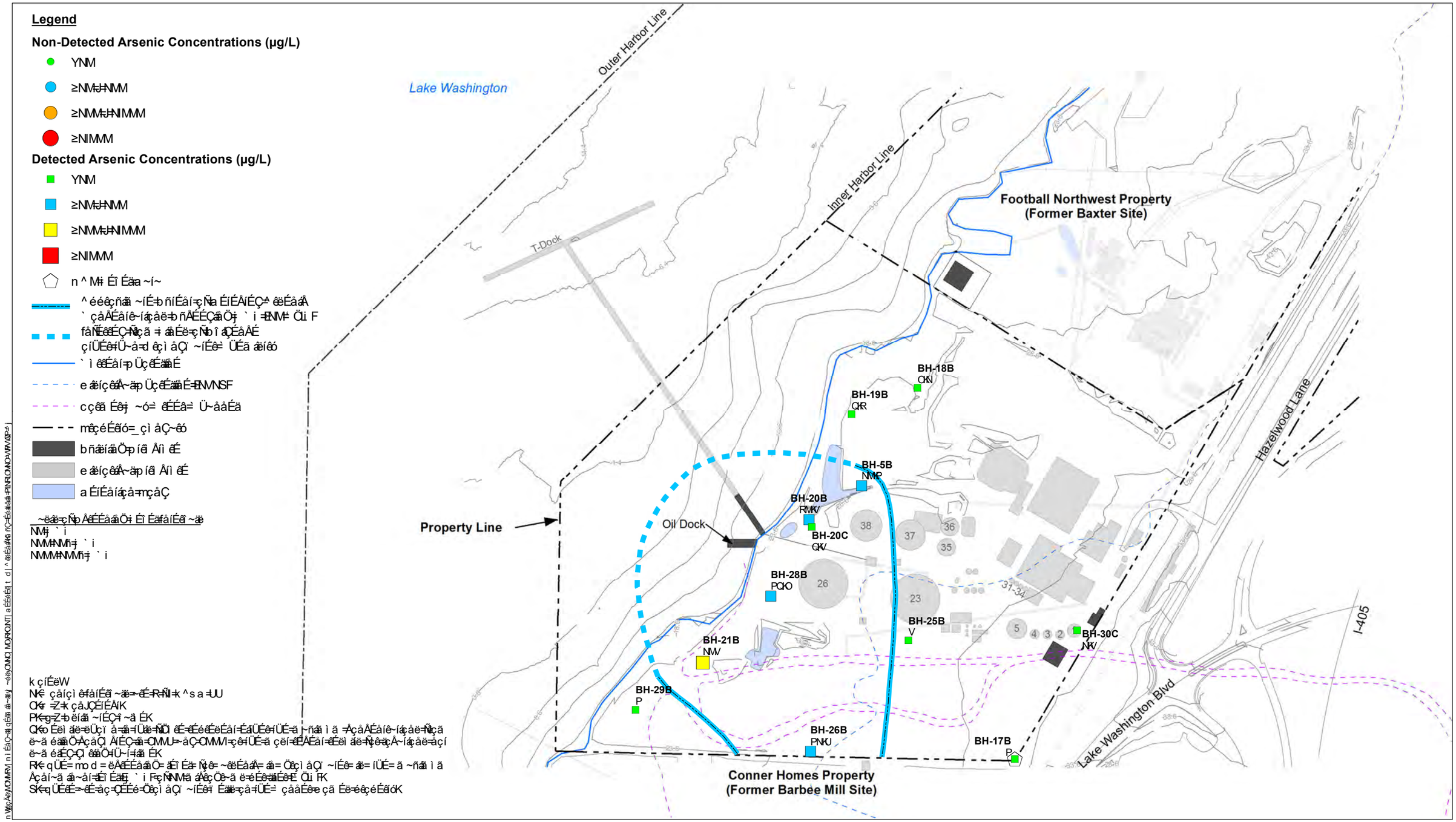

Figure 5.2-17
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ATTACHMENT A3

Quendall RI Figure 5.2-16 - Shallow Groundwater Arsenic Concentrations

Legend

Non-Detected Arsenic Concentrations (µg/L)

- YNM
- ≥NMVHNMM
- ≥NMMHNIMMM
- ≥NIMMM

Detected Arsenic Concentrations (µg/L)

- YNM
- ≥NMVHNMM
- ≥NMMHNIMMM
- ≥NIMMM
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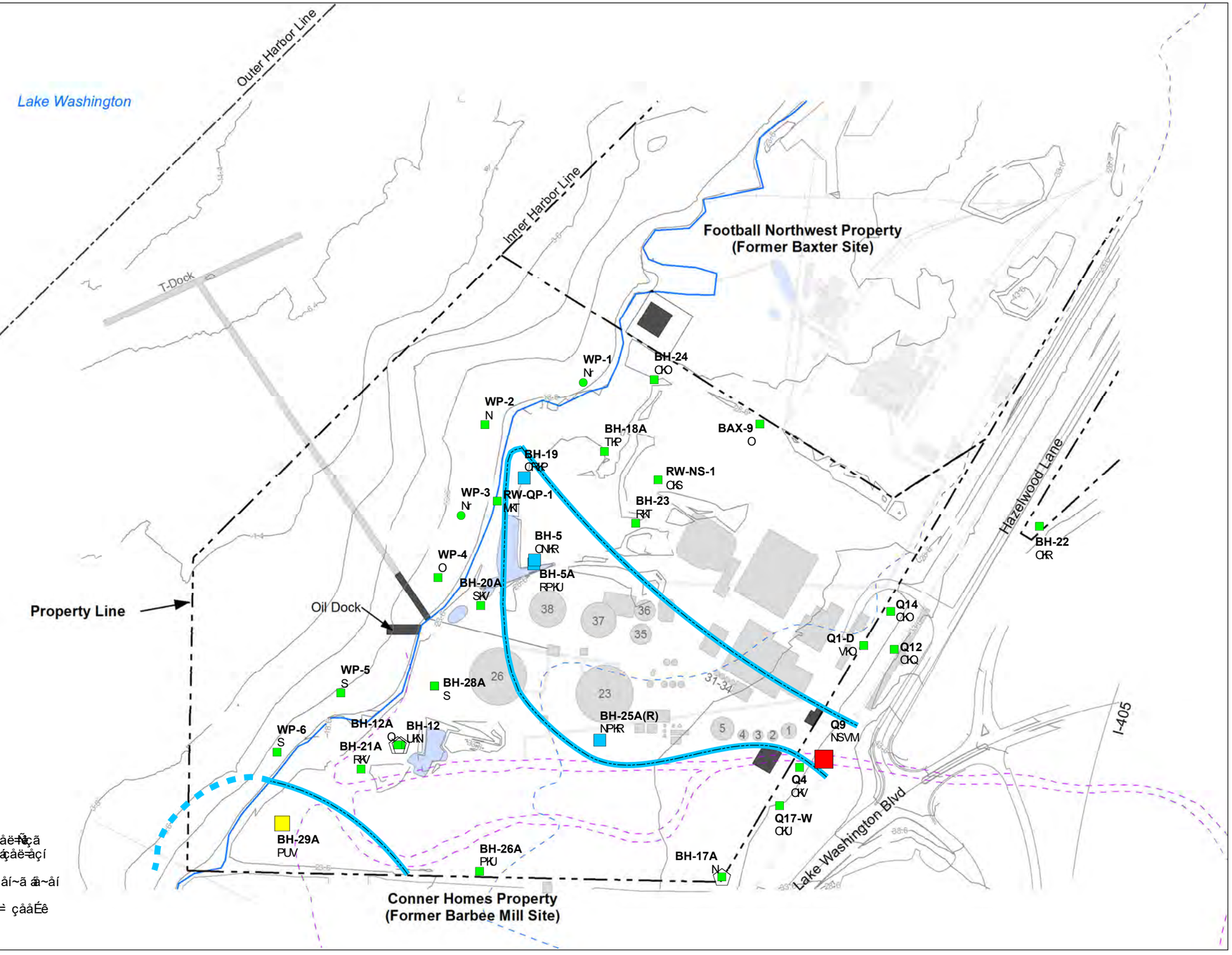

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Figure 5.2-16
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ATTACHMENT A4

Quendall RI Figure 5.4-19 - Wood Debris and Surface Bulk Sediment Indicator Parameters (TOC, TVS, and Percent Wood by Volume)

Legend

- Bulk Sediment Sample Location

  Location Name – WD-08-SS
  TOC (%) – 9.39
  TVS/Organic Matter (%) – 23.33
  Wood Debris (% volume) – 20-30

- Approximate Extent of Area Exceeding 9.8% TOC or 50% Wood by Volume
- Current Shoreline
- Historical Shoreline (1916)
- Former May Creek Channel
- Property Boundary
- Existing Structure
- Historical Structure
- Detention Pond
- Sand Placement Grid
- Dry Dock Concrete

TD-CT-4 NA NA <5
TD-CT-3 NA NA <5
TD-CT-2 6.83 27.36 30-40
TD-CT-1 6.07 12.16 30
Lake Washington
TD-SO-4 5.54 9.27 5-10
TD-SO-3 2.89 16.68 35
TD-SO-2 11.5 18.65 20
TD-SO-1 13.3 15.98 25
Outer Harbor Line
TD-CT-5 NA NA 0
TD-14-SS 5.12 13.39 0
TD-13-SS 6.77 19.2 10
TD-09-SS 6.82 32.61 40
TD-11-SS 8.54 25.8 40
TD-SO-5 3.52 6.55 5
TD-12-SS 6.04 15.4 5
TD-15-SS 4.28 9.78 5
NS-16-SS 7.1 48.88 20-30
SS-06-SS 3.04 45.89 50-60
Inner Harbor Line
TD-10-SS 4.14 10.27 5
Football Northwest Property (Former Baxter Site)
TD-CT-6 NA NA 0
TD-07-SS 7.4 19.18 50
T-Dock
TD-08-SS 9.4 45.66 30-40
TD-SO-6 1.37 3.24 75
SS-05-SS 5.14 31.62 5
NS-11-SS 0.722 1.3 <5
SS-04-SS 5.08 38.22 10
SS-03-SS 4.41 31.47 10
NS-12-SS 5.35 41.7 20-30
TD-SO-7 20.9 30.55 40-50
WD-09-SS 7.39 53.73 50
SS-02-SS 6.94 27.82 10
TD-CT-7 NA NA 0
WD-08-SS 9.39 23.33 20-30
SS-01-SS 13 53.62 40-50
TD-SO-8 8.19 32.67 60
WD-07-SS 4.85 42.35 30
NS-07-SS 6.47 47.35 <5
NS-06-SS 16.9 48.08 50-60
NS-03-SS 7.74 6.67 20
Hazelwood Lane
TD-CT-8 NA NA 0
WD-06-SS 8.38 30.98 20
WD-05-SS 8.53 38.29 40-50
Oil Dock
TD-SO-9 24 35.2 60
NS-02-SS 23 40.36 100
WD-04-SS 15.6 47.13 70-80
NS-01-SS 35.1 69.83 100
I-405
WD-03-SS 9.93 38.99 20
WD-02-SS 5.78 40.08 60
WD-01-SS 4.39 14.82 10-20
TD-CT-9 NA NA 40
Property Line
Lake Washington Blvd
Conner Homes Property (Former Barbee Mill Site)

Notes:
1. Contour intervals are 5 ft, NAVD 88.
2. TOC = Total Organic Carbon
3. TVS = Total Volatile Solids
4. NA = Not Applicable. Sample either unplanned or not collected due to wood debris.

Q:\Jobs\020059_Quendall_Terminals\Maps\2012_0215.4-19_Surface_Wood_Bulk_SE_TOC_TVS.mxd epipkin 3/15/2012 11:48:54 AM

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Figure 5.4-19
Wood Debris and Surface Bulk Sediment Indicator Parameters (TOC, TVS, and Percent Wood by Volume)
Remedial Investigation, Quendall Terminals

ATTACHMENT A5

Quendall RI Figure 5.4-4 – Surface Bulk Sediment Dry Weight cPAH (Benzo[a]Pyrene Equivalent) Concentrations

Legend

Detected Dry Weight cPAH (B[a]P Equivalent) Concentrations (mg/kg)

- YMKNR
- ≥MKNR=JHNKR
- ≥NKR=JHNR
- ≥NR=JHNRM
- ≥NRM

Historical Detected Dry Weight cPAH (B[a]P Equivalent) Concentrations (mg/kg)

- YMKNR
- ≥MKNR=JHNKR
- ≥NKMR=JHNR
- ≥NR=JHNRM
- ≥NRM

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- ^éééçñãà ~ÍÉ÷bñíÉåí=çÑa ÉíÉÅíÉÇ=Åm^e = çåÅÉåíê~íáçåë bñÅÉÉÇåÖ=NMMÑ=VMB ∓ éééÉê² çåÑÇÉåÅÉ÷ ãà á
- fåÑÉëëÉÇ=Ñçã =e æëíçêÅ~äæa ~í~
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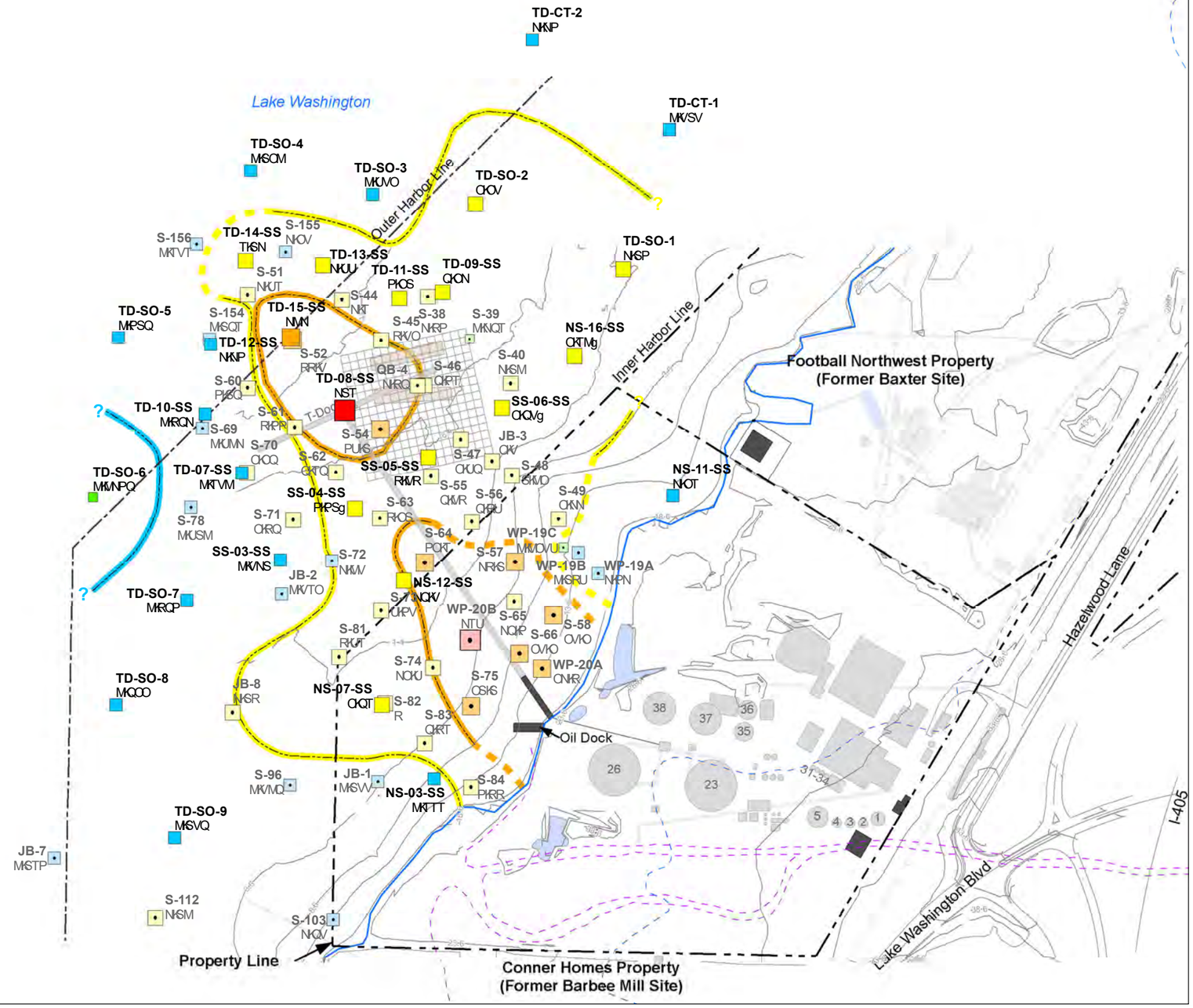
- e æëíçêÅ~äp ÜçÉ~ãåÉ=ENVNSF
- cçêã Éêj ~ó= ëÉÉå= Ü~åÅÉä
- mêçéÉãó=_çì åÇ~êó
- bñäëíåÖ=píã ÅÍì ëÉ
- e æëíçêÅ~äp íã ÅÍì ëÉ
- aÉíÉåíçå=mçåÇ
- p~åÇ=mä~ÅÉã Éåí=dêåÇ
- aêó=a çÅâ= çåÅëÉíÉ

k çíÉëW
NK= çåíçì êåíÉã ~ä=~ÉÉ=R÷Ñì=k ^s a =UUK
CK=r =Z=k çåJa ÉíÉÅí
PK=g=Z÷b ëíãà ~ÍÉÇ~s ~à É
CK=qÜÉ÷Çêó=r ÉåÜÜí=mo d =ëÅëÉÉåëÖ=ëÍ Éà¶êÅm^e ë~ãà=ëì ëÑ¥ÅÉ÷Ài ãà=ëÉÇà Éåí=çÑMKNR ã ææÖê~ã ë=éÉê÷åæçÊê~ã =Ëà ÖÌåÇÑ=Çêó=r ÉåÜÜí=æ=íÜÉ÷VM=éÉêÅÉåí=r ééÉê÷ÅçåÑÇÉåÅÉ÷ææ á çå÷íÜÉ÷ã É~å=çÑëåÉJëéÉÅëÑÅ~ÅåÖêçì åÇ=ë~ã éåÉë=ÅçæÉÅíÉÇ=Çì êëÖ=íÜÉ÷OMV=o f=ÑÉåÇ åì ÉëíåÖ~íçåK
RK=qÜÉ÷Üëíçëêå~æëí~íçåë=ëÜçï å=çå÷íÜë=ÑÜÜ ëÉ÷r ÉëÉ÷ë~ã éåÉÇ=Åó=o ÉíÉÅ÷Ëëå=NVVS=>åÇ NVVTF=>åÇ=åÄÜçêëÑã=OMMO=>åÇ=OMMPFK



ANCHOR QEA

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Figure 5.4-4
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ATTACHMENT A6

Quendall FS Figure 3-6 – Approximate Extents of Benzene, Naphthalene, cPAHs, and Arsenic in the Shallow Aquifer

LEGEND

- Subsurface Core Location
- Grab Sample Location
- Well Location

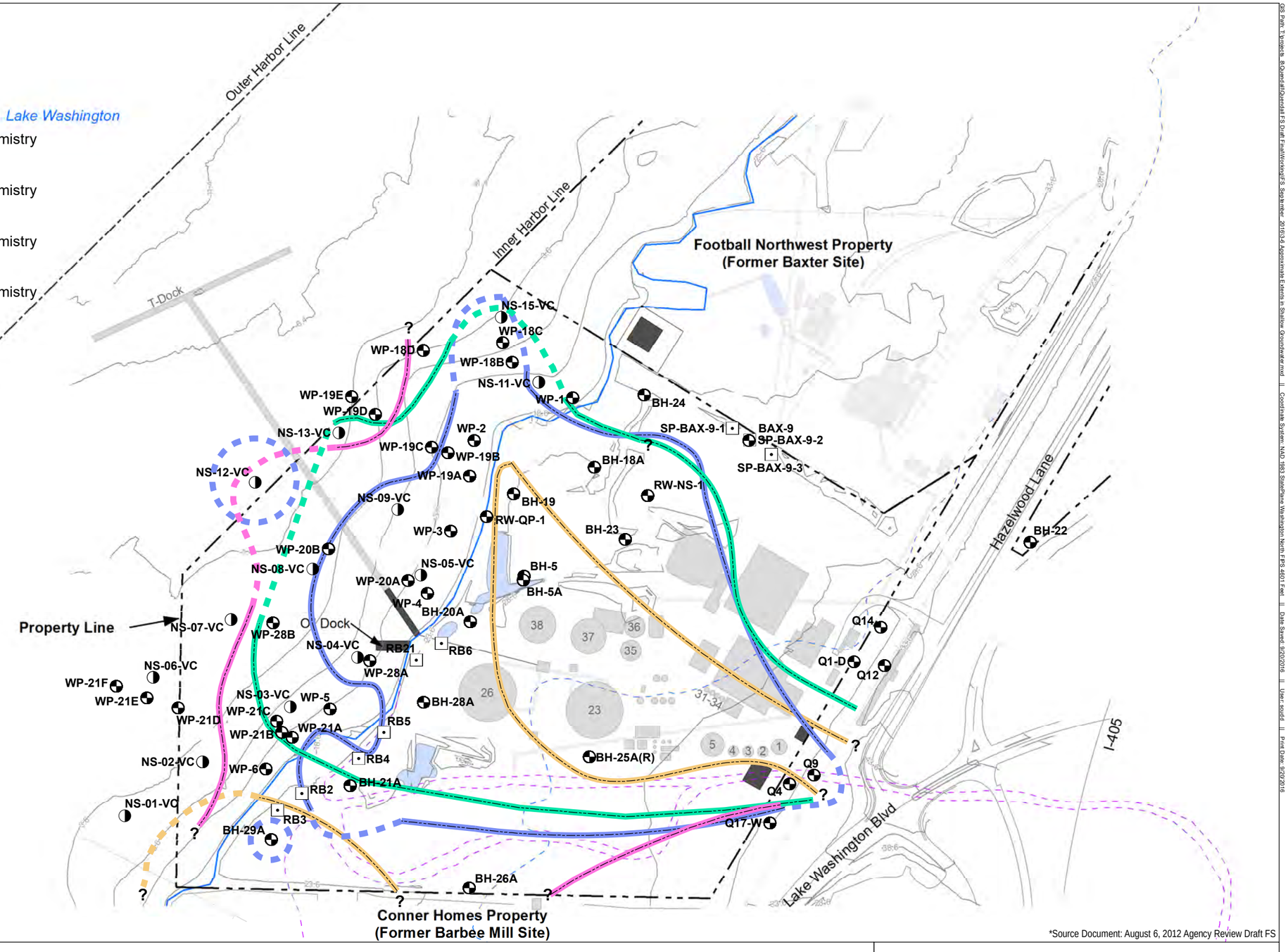
Benzene Detected
- Above MCL (5 µg/L)
- Inferred from Lines of Evidence other than Groundwater Chemistry

Naphthalene Detected
- Above PRG (1.7 µg/L)
- Inferred from Lines of Evidence other than Groundwater Chemistry

cPAHs (Benzo[a]Pyrene Equivalents) Detected
- Above MCL (0.2 µg/L)
- Inferred from Lines of Evidence other than Groundwater Chemistry

Arsenic Detected
- Above MCL (10 µg/L)
- Inferred from Lines of Evidence other than Groundwater Chemistry

- Current Shoreline
- Historical Shoreline (1916)
- Former May Creek Channel
- Property Boundary
- Existing Structure
- Historical Structure
- Detention Pond



*Source Document: August 6, 2012 Agency Review Draft FS

Notes:
1. Contour Intervals are 5 ft, NAVD 88.
2. See Figures 5.2-1, 5.2-8, 5.2-14, and 5.2-16 of the RI Report for basis of approximate extents (Anchor QEA and Aspect 2012). Naphthalene extent has been adjusted from the RI Report based on its lower PRG for the FS (lower PRG based on cancer risk of 10^{-5}). Estimated extents do not consider dispersion.

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Feet

Approximate Extents of Benzene, Naphthalene, cPAHs, and Arsenic in the Shallow Aquifer

Quendall Terminals Feasibility Study Report
Renton, Washington

Aspect CONSULTING | ANCHOR QEA

FIRM: ANCHOR QEA
DRAWN BY: EBP

FIGURE NO. 3-6

GIS Path: T:\projects_8\Quendall\Quendall FS Draft Final\Working\FS_September_2016\3-6_Approximate Extents in Shallow Groundwater.mxd | Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet | Date Saved: 9/20/2016 | User: scurtl | Print Date: 9/20/2016

APPENDIX B

Boring Logs Grouped by Original Deliverable Document

Attachments

Attachment B1 – Monitoring Well Logs for Product Pumping Feasibility Investigation, Woodward-Clyde, 1992

- Monitoring Well Logs BH-21 A/B

Attachment B2 – Boring Logs for Initial Soil and Groundwater Sampling, Retec, 1996

- Monitoring Well Logs RMW 01 – 05
- Soil Boring Logs RSB-03, -05, -08

Attachment B3 – Boring Logs, Retec 1997.

- Vibracore Boring Logs VB-1 through VB-8

Attachment B4 – Boring Logs for Independent Remedial Action Plan, Upland Areas, Hart Crowser, 2000

- Strataphobe Logs HC-1 through HC-57
- Monitoring Well Logs HCMW-1S/D, 2 through 4, and 5S/D
- Test Pit Logs TP-1 through TP-7

Attachment B5 – Test Pits and Boring Logs in Former Pan Abode Area, Aspect, 2006.

- Test Pits AA13, AA15, AA17, Y14, Y16, Y18, and TP-PA6
- Soil Borings PY-17 and PAA-17

Attachment B6 – Test Pits for Assessment of Environmental Conditions, Urban Redevelopment, 2006

- Test Pit Logs TP- 1 through TP-8

Attachment B7 – Engineering Design Report. Barbee Mill Groundwater Remediation, Aspect, 2006.

- Figure 6 – Passive Attenuation Zone – Cross Section A-A'

Attachment B8 – Passive Attenuation Zone Performance Monitoring Wells, Aspect, 2010b.

- Monitoring Well Logs CMW-1, 2S/D, 3, 4S/D, 5, and 6
- Extraction Well Logs EW-1 through EW-8
- Piezometer Logs PZ-1 and PZ-2
- Wellpoint Logs WP-1A and WP-8

Attachment B9 – Select Field Logs for Quendall Draft FS, Aspect and Anchor, 2012

- Monitoring Well Logs BH-29 A/B
- Monitoring Well Logs BH-26 A/B

Attachment B10 – Boring Logs for Data Gaps Memo, Aspect, 2018

- Offshore borings B-01 through B-05

- Upland borings B-06 through B-17

Attachment B11 – Monitoring Well Logs for RI Data Report, Aspect, 2023

- Monitoring Well Log BH-31B

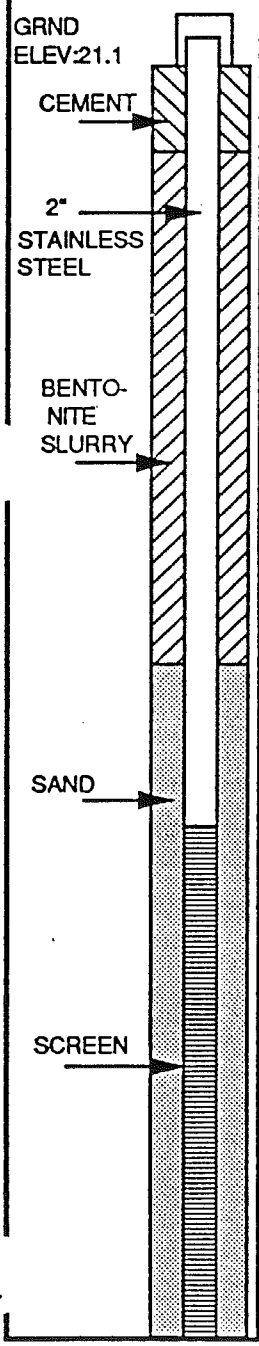
ATTACHMENT B1

Monitoring Well Logs for Product Pumping Feasibility Investigation, Woodward-Clyde, 1992.

- Monitoring Well Logs BH-21 A/B

DRILLING LOG	PROJECT QUENDALL	PROJECT NUMBER 86004S	SHEET 1 OF 2 SHEETS
LOCATION	N197049 E1661797	TOTAL NUMBER SAMPLES	0
DRILLING AGENCY	SOIL SAMPLING SERVICE	DEPTH TO WATER BELOW GRD SURFACE	
HOLE NO.	BH-21A	DATE HOLE STARTED	12/27/88
		COMPLETED	12/27/88
NAME OF DRILLER	Terry Asberry	DRILLING METHOD	HOLLOW STEM AUGER
TOTAL DEPTH OF HOLE	20'	INSPECTOR	WARREN PERKINS

ELEV. T. O. C: 22.56
GRND ELEV:21.1



DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
0					Loose-dense, wet, brown silt and gravel with wood chips	NO SAMPLES STRATIGRAPHY FROM BH-21B
3					Very stiff, gray-white, wet silty clay	fill, decomposed gypsum? ash?
8.5					Very dense, saturated, gray, medium to fine sand (10-20% silt).	
13					sand and silt	creosote odor and sheen

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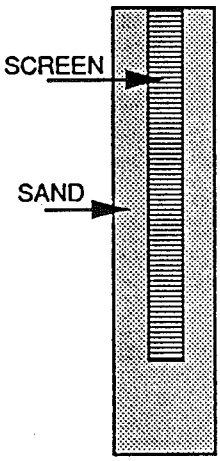
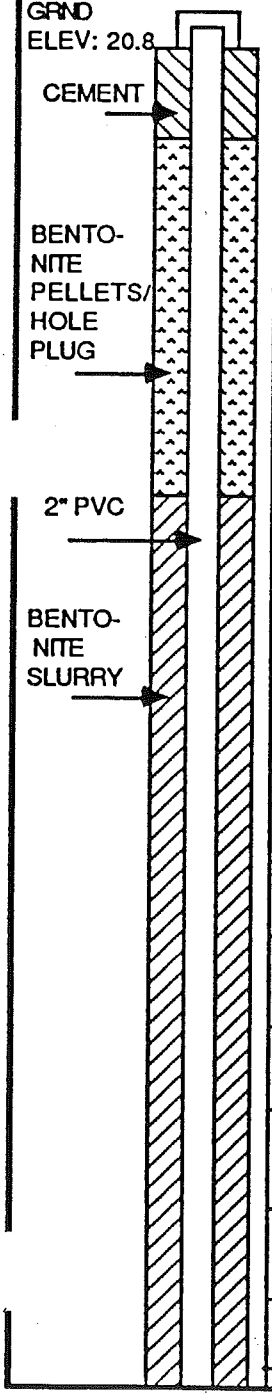
DRILLING LOG (Cont. Sheet) | HOLE NO. BH-21A | SHEET 2 OF 2 SHEETS



DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
16						
17						
18						
19					Stiff, saturated, gray-brown sandy SILT.	
20					TOTAL DEPTH = 20 FT	
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						

DRILLING LOG	PROJECT QUENDALL	PROJECT NUMBER 86004S	SHEET 1 OF 4 SHEETS
LOCATION	N197050.4929 E1661792.3072	TOTAL NUMBER SAMPLES	16
DRILLING AGENCY	SOIL SAMPLING SERVICE	DEPTH TO WATER BELOW GRD SURFACE	
HOLE NO.	BH-21B	DATE HOLE STARTED	12/23/88
		COMPLETED	12/27/88
NAME OF DRILLER	Terry Asberry	DRILLING METHOD	HOLLOW STEM AUGER
TOTAL DEPTH OF HOLE	54.5 ft	INSPECTOR	WARREN PERKINS

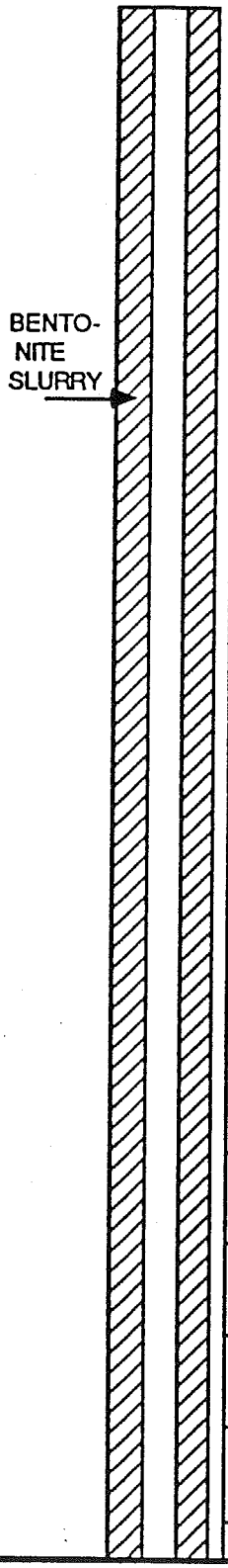


DPT (FT)	S T	B/FT	SAMP NO.	% REC	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
1		59	000	60	Loose-dense, wet, brown SILT and gravel with wood chips	FILL
2		55	015	60		
					2.5'	
3		45	030	80	Very stiff, wet gray-white, silty CLAY	FILL, Decomposed gypsum?
4						
5		50	045	70	FILL	
6		36	060	40		
7						
8		53	075	0		
9		68	090	40	9.0'	
10					Very dense, saturated, gray, medium to fine SAND (10-20% silt)	
11						
12						
13		67	130	5	sand and silt, gradational contact from sand above to silt below	creosote odor and sheen
14						
15						

HC011685

DRILLING LOG (Cont. Sheet) | HOLE NO. BH-21B

SHEET 2 OF 4 SHEETS



DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
16						
17						
18						
19		12	180	5	Stiff, saturated, gray-brown sandy SILT.	
20						
21						
22						
23						
24		16	230	80	24'	
25					Very stiff, saturated, gray-brown, peaty SILT.	
26					26'	
27						
28						
29		28	280	70	very stiff, saturated, gray sandy SILT to silty SAND (20-30% silt).	
30						
31						
32						

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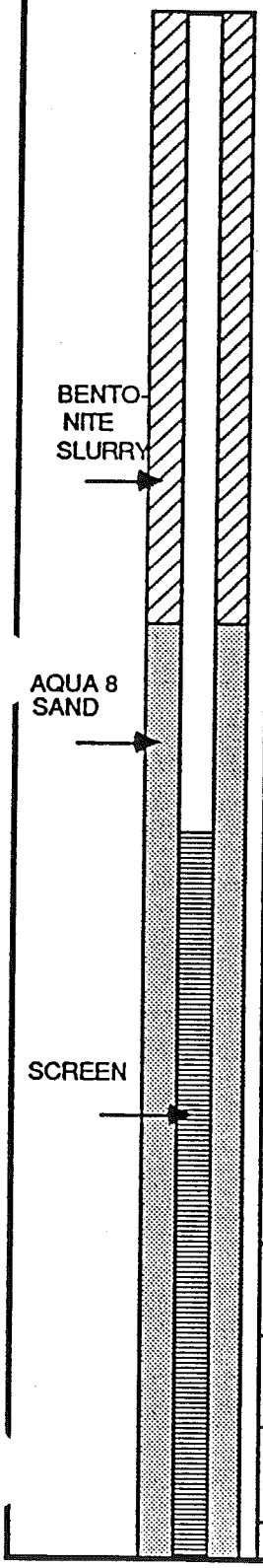
DRILLING LOG (Cont. Sheet)

HOLE NO. BH-21B

SHEET 3 OF 4 SHEETS



DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
33		48	330	1		trace of gravelly silt in sand trap
34						
35						
36						
37						
38		35	380	60	Very stiff, saturated, gray sandy SILT	silty gravel sluff at top of sample
39						
40						
41						
42					42 ?	
43		44	430	70	Medium dense, saturated gray to yellow-brown, silty SAND.	
44						
45						
46						
47						
48		8	480	40		
49						

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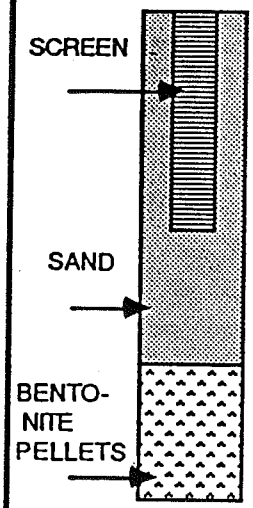
DRILLING LOG (Cont. Sheet)

HOLE NO. BH-21B

SHEET 4 OF 4 SHEETS



DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
50					Medium dense, saturated, gray to yellow-brown silty SAND.	
51						
52						
53	X	17	530	45		
54	X				54' sandy GRAVEL	
55					TOTAL DEPTH = 54.5 FT	
56						
57						
58						
59						
60						

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HC011688

ATTACHMENT B2

Boring Logs for Initial Soil and Groundwater Sampling, Retec, 1996

- Monitoring Well Logs RMW 01 – 05
- Soil Boring Logs RSB-03, -05, -08

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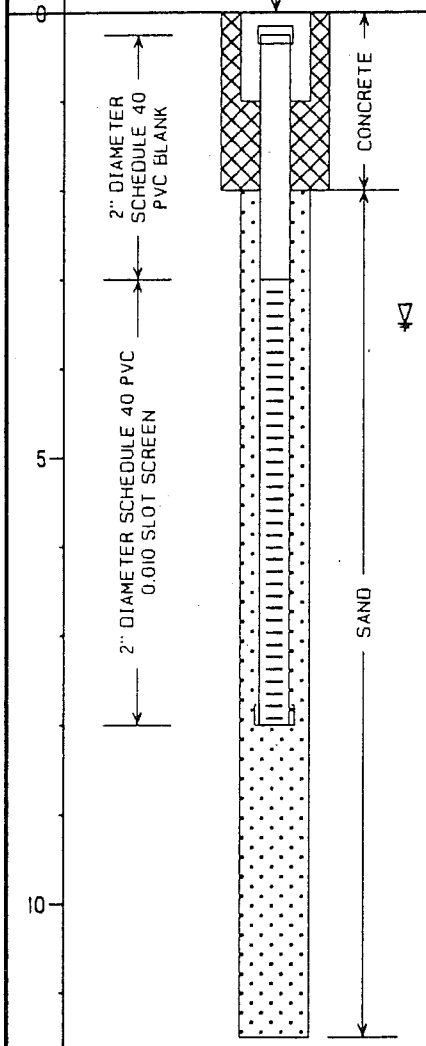
WELL INSTALLATION LOG
Monitoring Well RMW-01

1011 S.W. Klickitat Way
Suite #207
Seattle, Washington 98134
(206) 624-9349
www.thermoretec.com

PROJECT NO: *3-2438-110 JAG*		CLIENT: *Confidential*
LOCATION: *Seattle, Washington; Barbee Marine Truck Yard*		DRILLING CO.: *Cascade Drilling Company*
START DATE: *07/09/96* TIME: *08:00*	BORE HOLE ID:	DRILLER:
COMPLETION DATE: *07/09/96* TIME: *08:25*	TOTAL DEPTH: *11.5 feet bgs*	RIG TYPE:
WATER LEVEL DURING DRILLING: *3.5' bgs*	TOP OF CASING: *0.25 foot bgs*	METHOD: *Hollow-stem Auger*
SURFACE ELEV.: *Ground Surface*	MP ELEV.: *Ground Surface*	LOGGED BY: *Anthony Como*



DEPTH (in feet)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0			ASPHALT	SS		23 8 7	100	0
	SM		SILTY SAND; 5Y 4/1; fine-grained, well graded; some silty clay lenses; dry to slightly moist.					
			2.5'-4.0' – Same as above; with few pieces of fine gravel; small pieces of wood (organic material); moist to wet at 3.5' bgs.	SS		3 5 9	100	0
5	SM		SILTY SAND; 5Y 4/1; fine-grained, well graded; few pieces of fine gravel; wet.	SS		2 2 2	100	0
			7.5'-8.5' – Same as above; with more fine to medium gravel; wet.	SS		3 4 9	100	0
	SC		CLAYEY SAND; 5Y 4/1 some 5Y 5/3; fine-grained; with silt; few pieces of organic material (roots; few pieces of medium gravel; wet.					
10	SM		SILTY SAND; 5Y 4/1; fine-grained; with some clay and fine to medium gravel; wet.	SS		3 2 1	53	0
			Total depth = 11.5 feet bgs.					
15								

REMARKS: PID #1 Background = 0.0 ppm
SS – 2½" x 18" Dames & Moore Sampler
■ – Collected Sample
▩ – Uncollected Sample

WELL INSTALLATION LOG
Monitoring Well RMW-02

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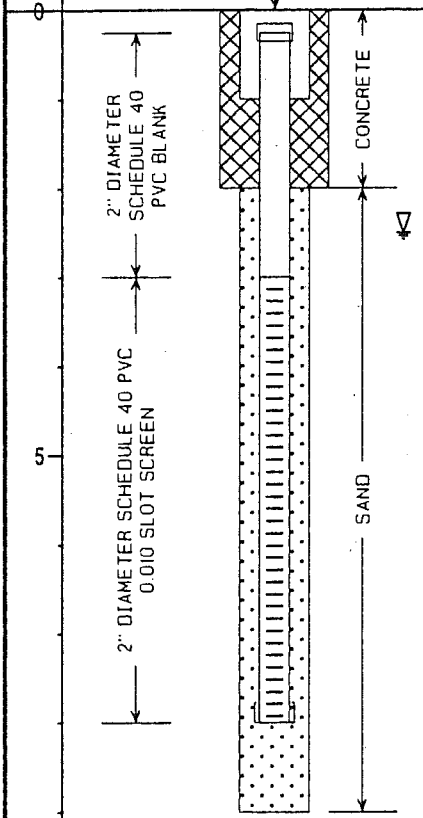
PROJECT NO: *3-2438-110 JAG*		CLIENT: *Confidential*
LOCATION: *Seattle, Washington; Barbee Mill Lumber Storage*		DRILLING CO.: *Cascade Drilling Company*
START DATE: *07/09/96* TIME: *09:12*	BORE HOLE ID: *8 inches*	DRILLER:
COMPLETION DATE: *07/09/96* TIME: *09:30*	TOTAL DEPTH: *9.0 feet bgs*	RIG TYPE:
WATER LEVEL DURING DRILLING: *2.5' bgs*	TOP OF CASING: *0.25 foot bgs*	METHOD: *Hollow-stem Auger*
SURFACE ELEV.: *Ground Surface*	MP ELEV.: *Ground Surface*	LOGGED BY: *Anthony Como*



DEPTH (in feet)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	SAMPLE DATA: TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0	SM		ASPHALT SILTY SAND; 5Y 2.5/1; fine-grained; organic material (pieces of wood, roots); dry.	SS		15 21 26/1	73	0
	SM		SILTY SAND; 5Y 4/1; fine-grained; some fine to medium gravel; moist.					
			2.5'-4.0' – No recovery; encountered large piece of wood; wet at 2.5' bgs.	SS			0	
5			*5.0'-6.5'* – No recovery; sawdust.	SS			0	
	ML		SILT; 5Y 2.5/1; silt, clay, fine-grained sand, wood, sawdust; wet.	SS		2 2 2	20	0
10			Total depth = 9.0 feet bgs.					
15								

REMARKS: PID #1 Background = 0.0 ppm.
SS – 2½" x 18" Dames & Moore Sampler
▣ – Sample

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WELL INSTALLATION LOG
Monitoring Well RMW-03

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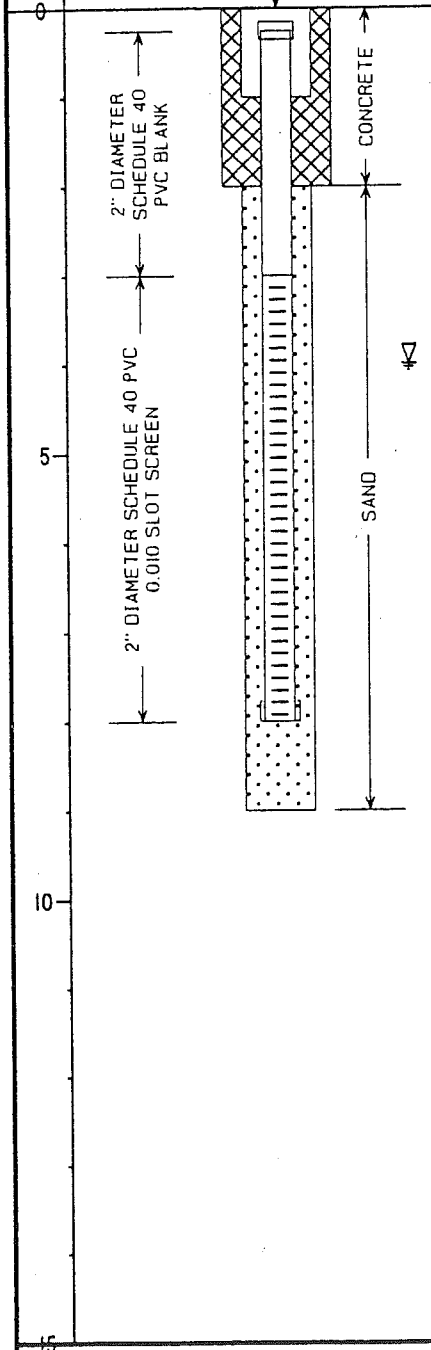
PROJECT NO: *3-2438-110 JAG*		CLIENT: *Confidential*
LOCATION: *Seattle, Washington; Barbee Marine Truck Yard*		DRILLING CO.: *Cascade Drilling Company*
START DATE: *07/09/96* TIME: *11:20*	BORE HOLE ID: *8 inches*	DRILLER:
COMPLETION DATE: *07/09/96* TIME: *11:35*	TOTAL DEPTH: *9.0 feet bgs*	RIG TYPE:
WATER LEVEL DURING DRILLING: *4.0' bgs*	TOP OF CASING: *0.25 foot bgs*	METHOD: *Hollow-stem Auger*
SURFACE ELEV.: *Ground Surface*	MP ELEV.: *Ground Surface*	LOGGED BY: *Anthony Como*



DEPTH (in feet)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	SAMPLE DATA TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0	SM		ASPHALT SILTY SAND; 5Y 4/1; fine-grained, some medium-grained, well graded; dry to slightly moist.	SS		11 11 12	80	0
			2.5'-3.0' - Same as above.	SS		3 2 3	100	0
	ML SM CH		CLAYEY SILT; 2.5Y 3/1; some fine-grained sand; organic material (roots). SILTY SAND; 5Y 4/1; fine- to medium-grained, well graded; wet. SILTY CLAY; 5Y 5/1; moist to wet; medium to high plasticity.					
5	MH CH		CLAYEY SILT/SILTY CLAY; 5Y 4/1; some organic material; moist to wet; medium to high plasticity.	SS		2 2 2	100	0
			7.5'-9.0' - Same as above; wet.	SS		2 2 5	100	0
			Total depth = 9.0 feet bgs.					
10								
15								

REMARKS: PID #1 Background = 0.0 ppm
Collected 7.5' sample with split spoon.
SS - 2½" x 18" Dames & Moore Sampler
▨ - Sample

WELL INSTALLATION LOG
Monitoring Well RMW-04

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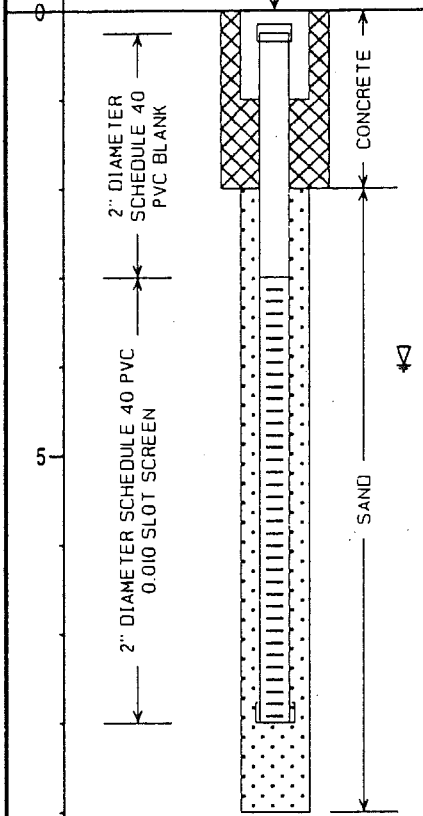
PROJECT NO: *3-2438-110 JAG*		CLIENT: *Confidential*
LOCATION: *Seattle, Washington; Barbee Mill*		DRILLING CO.: *Cascade Drilling Company*
START DATE: *07/09/96* TIME: *13:40*	BORE HOLE ID: *8 inches*	DRILLER:
COMPLETION DATE: *07/09/96* TIME: *13:55*	TOTAL DEPTH: *9.0 feet bgs*	RIG TYPE:
WATER LEVEL DURING DRILLING: *4.0' bgs*	TOP OF CASING: *0.25 foot bgs*	METHOD: *Hollow-stem Auger*
SURFACE ELEV.: *Ground Surface*	MP ELEV.: *Ground Surface*	LOGGED BY: *Anthony Como*



DEPTH (in feet)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0			ASPHALT	SS		14 14 20	100	
	SM		SILTY SAND; 5Y 4/1 and 2.5Y 3/2; fine- to medium-grained sand and gravel, poorly graded; dry; slight hydrocarbon-like odor.					
			2.5'-3.0' – Same as above; dry to moist.	SS		5 13 13	100	
	SM		SILTY SAND; 5Y 4/1; fine- to medium-grained, well graded; some fine gravel; wet; slight hydrocarbon-like odor.					
5	SM		SILTY SAND; 5Y 4/1; fine- to medium-grained, some coarse; few pieces of fine gravel; wet; very slight hydrocarbon-like odor.	SS		6 6 6	100	
			7.5'-9.0' – Same as above; with some organic material (roots).	SS		2 2 2	100	
			Total depth = 9.0 feet bgs.					
10								
15								

REMARKS: SS – 2½" x 18" Dames & Moore Sampler
⊠ – Sample

WELL INSTALLATION LOG
Monitoring Well RMW-05

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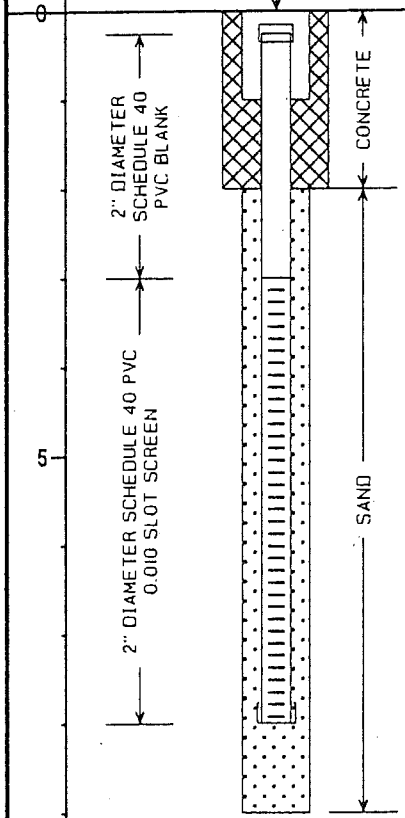
PROJECT NO: *3-2438-110 JAG*		CLIENT: *Confidential*
LOCATION: *Seattle, Washington Barbee Mill*		DRILLING CO.: *Cascade Drilling Company*
START DATE: *07/09/96* TIME: *14:35*	BORE HOLE ID: *8 inches*	DRILLER:
COMPLETION DATE: *07/09/96* TIME: *14:45*	TOTAL DEPTH: *9.0 feet bgs*	RIG TYPE:
WATER LEVEL DURING DRILLING: *' bgs*	TOP OF CASING: *0.25 foot bgs*	METHOD: *Hollow-stem Auger*
SURFACE ELEV.: *Ground Surface*	MP ELEV.: *Ground Surface*	LOGGED BY: *Anthony Como*



DEPTH (in feet)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	SAMPLE DATA: TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0	SM		ASPHALT SILTY SAND; 5Y 3/1; fine- to medium-grained, some coarse, well graded; with fine to medium gravel; dry.					
	SM		SILTY SAND; 5Y 4/1; fine-grained, some medium, well graded; wet. *5.0'-6.5'* - Same as above. *7.5'-8.0'* - Same as above.					
	MH CH		CLAYEY SILT/SILTY CLAY; 5Y 4/1, with some 2.5Y 4/2; some organic material (roots); moist to wet; medium to high plasticity.					
			Total depth = 9.0 feet bgs.					

REMARKS: RMW-05 placed in new boring 5 feet south of RSB-07. All lithologic descriptions are taken from boring log for RSB-07.

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BORING LOG
RSB-03

1011 S.W. Klickitat Way
Suite #207
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(206) 624-9349
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PROJECT NO: *3-2438-110 JAG*		CLIENT: *Confidential*
LOCATION: *Seattle, Washington; Barbee Marine Truck Yard*		DRILLING CO.: *Cascade Drilling Company*
START DATE: *07/09/96* TIME: *10:25*	BORE HOLE ID: *8 inches*	DRILLER:
COMPLETION DATE: *07/09/96* TIME: *10:35*	BORING DEPTH: *9.0 feet bgs*	RIG TYPE:
WATER LEVEL DURING DRILLING: *3.0' bgs*	*SURFACE ELEV.:* *Ground Surface*	METHOD: *Hollow-stem Auger*
DATE MEASURED: *07/09/96*	M. P. ELEVATION: *Ground Surface*	LOGGED BY: *Anthony Como*

DEPTH (in feet)	SAMPLE DATA: TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION
0	SS		5 8 28	73	0	SM		ASPHALT SILTY SAND: 5Y 4/1; fine-grained, some medium-grained, well graded; some fine to medium gravel, with few coarse pieces of gravel; dry.
	SS		5 8 18	100	0	SW SM		SAND INTERBEDDED WITH SILTY SAND: 5Y 4/1; fine- to medium-grained, well graded sand; silty fine-grained sand with some clay; thin layer of organic material at 3.0' bgs; moist to wet at 3.0' bgs.
5	SS		5 8 9	80	0	SM		SILTY SAND: 5Y 4/1; fine-grained, some medium-grained, well graded; few pieces of fine to medium gravel; some thin interbedded silty clayey fine sand lenses; wet.
	SS		2 2 2	100	0	SM		SILTY SAND: 5Y 4/1; fine- to medium-grained, well graded; interbedded thin lenses of 2.5Y 3/2 clayey silt; wet.
10								Total depth = 9.0 feet bgs.
15								

REMARKS: Borehole backfilled with Pure Gold Medium Bentonite Chips.
PID #1 Background = 0.0 ppm
SS - 2½" x 18" Dames & Moore Sampler
▣ - Sample

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BORING LOG
RSB-05

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PROJECT NO: *3-2438-110 JAG*		CLIENT: *Confidential*
LOCATION: *Seattle, Washington; Barbee Mill*		DRILLING CO.: *Cascade Drilling Company*
START DATE: *07/09/96* TIME: *12:45*	BORE HOLE ID: *8 inches*	DRILLER:
COMPLETION DATE: *07/09/96* TIME: *12:58*	BORING DEPTH: *9.0 feet bgs*	RIG TYPE:
WATER LEVEL DURING DRILLING: *4.5' bgs*	*SURFACE ELEV.:* *Ground Surface*	METHOD: *Hollow-stem Auger*
DATE MEASURED: *07/09/96*	M. P. ELEVATION: *Ground Surface*	LOGGED BY: *Anthony Como*

DEPTH (in feet)	SAMPLE DATA: TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION
0	SS	⊠	15 21 21/1	87	0	SM		SILTY SAND: 2.5Y 4/3, some 5Y 4/1; fine-grained, some medium-grained; dry.
	SS	⊠	12 20 9	100		SM		SILTY SAND: 2.5Y 4/3; fine- to coarse-grained, poorly graded; fine to coarse gravel; dry to slightly moist; wet at 4.5' bgs.
5	SS	⊠	2 2 5	73		MH CH		CLAYEY SILT/SILTY CLAY: 5Y 4/1; some organic material (roots); medium to high plasticity.
	SS	⊠	2 2 4	100		ML CL		CLAYEY SILT/SILTY CLAY: 5Y 4/1; with fine-grained sand and interbedded lenses of fine- to medium-grained sand; wet.
10								Total depth = 9.0 feet bgs.
15								

REMARKS: Backfilled using Pure Gold Medium Bentonite to 1.0' bgs, completed with Quickcrete.
SS - 2½" x 18" Dames & Moore Sampler
⊠ - Sample

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BORING LOG
RSB-08

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Suite #207
Seattle, Washington 98134
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www.thermoretec.com

PROJECT NO: *3-2438-110 JAG*		CLIENT: *Confidential*
LOCATION: *Seattle, Washington; Barbee Mill*		DRILLING CO.: *Cascade Drilling Company*
START DATE: *07/09/98* TIME: *16:20*	BORE HOLE ID: *8 inches*	DRILLER:
COMPLETION DATE: *07/09/98* TIME: *16:35*	BORING DEPTH: *9.0 feet bgs*	RIG TYPE:
WATER LEVEL DURING DRILLING: *3.5' bgs*	*SURFACE ELEV.:* *Ground Surface*	METHOD: *Hollow-stem Auger*
DATE MEASURED: *07/09/98*	M. P. ELEVATION: *Ground Surface*	LOGGED BY: *Anthony Como*

DEPTH (in feet)	SAMPLE DATA: TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION
0	SS		15 22 25	100	0	SM		ASPHALT SILTY SAND; 5Y 4/1 and some 2.5Y 4/2; fine-grained, well graded; some fine- to medium-grained sand and gravel; dry.
	SS		5 4 5	73	0	SM ▽		SILTY SAND; 5Y 4/1; fine- to medium-grained, well graded; some fine gravel; moist to wet at 3.5' bgs.
5	SS		2 2 2	100	0	SM		SILTY SAND; 2.5Y 2.5/1; fine-grained; with clay; organic material (roots); few pieces of fine gravel; wet.
	SS		2 2 3	100	0	SM		SILTY SAND; 5Y 4/1; fine- to medium-grained, well graded; wet.
						CL ML		SILTY CLAY/CLAYEY SILT; 2.5Y 4/2; some organic material; moist to wet.
10								Total depth = 9.0 feet bgs.
15								

REMARKS: Borehole backfilled with Pure Gold Medium Bentonite Chips.
SS - 2½" x 18" Dames & Moore Sampler
▣ - Sample

ATTACHMENT B3

Boring Logs, Retec 1997.

- Vibracore Boring Logs VB-1 through VB-8

CORING LOG
VB-1

1011 S.W. Klickitat Way
Suite #207
Seattle, Washington 98134
(206) 624-9349

PROJECT NO.: *3-2438-424 JAG*		CLIENT: *Port Quendall*
LOCATION: *Renton, Washington;*		RIG TYPE: *4 in. ID 12 ft. Tubes*
START DATE: *01/24/97* TIME: *12:57*	RECOVERY LENGTH: *4.0 feet*	METHOD: *Vibracore*
COMPLETION DATE: *01/24/97* TIME: *13:02*	DRIVE LENGTH: *8.8 feet*	FIELD LOG BY: *DT*
DEPTH TO MUD: *14.25 feet*	SURFACE ELEVATION: *feet (MSL)*	LAB LOG BY: *JG/SB*

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE: TYPE	DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	INTERPRETED *IN-SITU* PROFILE: LITHOLOGY	U.S.C.S.	DEPTH (in feet)
0	SAMP		0.3	2.0	ML		SLIGHTLY SANDY SILT; Dark brown; with 20% wood.		ML	0
	SAMP		0.3	2.0	ML					
				0.3						
	ARCH		0.3		SP					
				0.3						
5							CLAYEY SILT; Dark brown; with 5% to 10% wood fibers.			5
							WOOD;		SP	
							SAND; Gray; fine-grained; eith interbedded thin (0.5" to 1") silt with wood.			
							Total depth = 8.8 feet bgs.			
10										10
15										15
20										20

REMARKS: SAMP - Laboratory Sample
ARCH - Archived Sample
No sheen or odor throughout core.

CORING LOG
VB-2

1011 S.W. Klickitat Way
Suite #207
Seattle, Washington 98134
(206) 624-9349

PROJECT NO.: *3-2438-424 JAG*		CLIENT: *Port Quendall*
LOCATION: *Renton, Washington;*		RIG TYPE: *4 in. ID 12 ft. Tubes*
START DATE: *01/24/97* TIME: *11:59*	RECOVERY LENGTH: *8 feet*	METHOD: *Vibracore*
COMPLETION DATE: *01/24/97* TIME: *12:04*	DRIVE LENGTH: *10 feet*	FIELD LOG BY: *DT*
DEPTH TO MUD: *19 feet*	SURFACE ELEVATION: *feet (MSL)*	LAB LOG BY: *JG/SB*

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE: TYPE	DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	INTERPRETED *IN-SITU* PROFILE: LITHOLOGY	U.S.C.S.	DEPTH (in feet)
0	SAMP		0.3	0.3	ML		SLIGHTLY SANDY SILT; Dark brown; with 50% wood (up to 2" fragments)		ML	0
	SAMP		0.3	0.3	SP		SAND; Gray; well sorted; medium-grained.		SP	
				0.3			SILTY SAND; Gray; fine-grained with thin silty wood layer (<1").			
	ARCH		0.3	0.3	CL		SAND; Gray; medium-grained; with interbedded gray silt lenses.		CL	
5				0.3	SP		SILTY CLAY; Grayish-black; with yellowish-brown vegetation (5%).		SP	5
				0.6	CL		SILTY CLAY; Gray.			
				0.3			SAND; Gray; fine to medium-grained; well sorted.		CL	
				0.3	ML		SILTY CLAY; Gray; very stiff.			
10							SANDY CLAYEY SILT; Dark gray to black.		ML	10
							Total depth = 10.0 feet bgs.			
15										15
20										20

REMARKS: SAMP – Laboratory Sample
ARCH – Archived Sample
No sheen or odor throughout core.

CORING LOG
VB-3

1011 S.W. Klickitat Way
Suite #207
Seattle, Washington 98134
(206) 624-9349

PROJECT NO.: *3-2438-424*		CLIENT: *Port Quendall*
LOCATION: *Renton, Washington;*		RIG TYPE: *4 in. ID 12 ft. Tubes*
START DATE: *01/24/97* TIME: *14:43*	RECOVERY LENGTH: *4.0 feet*	METHOD: *Vibracore*
COMPLETION DATE: *01/24/97* TIME: *14:46*	DRIVE LENGTH: *9.5 feet*	FIELD LOG BY: *DT*
DEPTH TO MUD: *7.3 feet*	SURFACE ELEVATION: *feet (MSL)*	LAB LOG BY: *JG/SB*

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE: TYPE	DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	INTERPRETED *IN-SITU* PROFILE: LITHOLOGY	U.S.C.S.	DEPTH (in feet)
0	SAMP		0.3				<u>WOOD WASTE</u>: Black-brown; with some silt.			0
	SAMP		0.3		SP					
	ARCH		0.3							
5										5
							<u>SAND</u>: Gray; fine- to medium-grained; thin interbedded layers of brown-black silt with vegetation.		SP	
10							Total depth = 9.5 feet bgs.			10
15										15
20										20

REMARKS: SAMP – Laboratory Sample
ARCH – Archived Sample
Freefall of vibracore observed during sampling. Thickness of wood waste layer is estimated.

CORING LOG
VB-4

1011 S.W. Klickitat Way
Suite #207
Seattle, Washington 98134
(206) 624-9349

PROJECT NO.: *3-2438-424*		CLIENT: *Port Quendall*
LOCATION: *Renton, Washington;*		RIG TYPE: *4 in. ID 12 ft. Tubes*
START DATE: *01/24/97* TIME: *15:37*	RECOVERY LENGTH: *7.3 feet*	METHOD: *Vibracore*
COMPLETION DATE: *01/24/97* TIME: *15:45*	DRIVE LENGTH: *9 feet*	FIELD LOG BY: *DT*
DEPTH TO MUD: *9.8 feet*	SURFACE ELEVATION: *feet (MSL)*	LAB LOG BY: *JG/SB*

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE: TYPE	DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	INTERPRETED *IN-SITU* PROFILE: LITHOLOGY	U.S.C.S.	DEPTH (in feet)
0	SAMP		0.2				WOOD WASTE: Dark-brown silt with 70% wood.			0
	SAMP		0.3	NM						
	ARCH		0.3							
					ML		CLAYEY SILT: Dark brown; with 10% wood.		ML	
5					SP		SAND: Gray; fine- to medium-grained.		SP	5
							SAND: Gray; medium- to coarse-grained; with gravel lense (from 29 to 35" by lab measurement.			
10							Total depth = 9.0 feet bgs.			10
15										15
20										20

REMARKS: SAMP - Laboratory Sample
ARCH - Archived Sample
No sheen or odor throughout core.

CORING LOG
VB-5

1011 S.W. Klickitat Way
Suite #207
Seattle, Washington 98134
(206) 624-9349

PROJECT NO.: *3-2438-424 JAG*		CLIENT: *Port Quendall*
LOCATION: *Renton, Washington;*		RIG TYPE: *4 in. ID 12 ft. Tubes*
START DATE: *01/24/97* TIME: *17:13*	RECOVERY LENGTH: *6.3 feet*	METHOD: *Vibracore*
COMPLETION DATE: *01/24/97* TIME: *17:13*	DRIVE LENGTH: *11 feet*	FIELD LOG BY: *DT*
DEPTH TO MUD: *18.7 feet*	SURFACE ELEVATION: *feet (MSL)*	LAB LOG BY: *JG/SB*

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE: TYPE	DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	INTERPRETED *IN-SITU* PROFILE: LITHOLOGY	U.S.C.S.	DEPTH (in feet)
0	SAMP		0.3		SP		SILTY SAND; Gray-brown; fine-grained; with 5% wood.		SP	0
					SW		SAND; Yellow; fine-grained; well sorted.			
	ARCH		0.3				SAND; Gray; coarse-grained with gravel.		SW	
					CL		SILTY CLAY; Gray.		CL	
					GP				GP	
					SW		COBBLES; Up to 3".			
5					GP					5
							SAND; Gray; fine- to medium-grained; with gravel.		SW	
10							SANDY GRAVEL; Gray.		GP	10
							Total depth = 11.0 feet bgs.			
15										15
20										20

REMARKS: SAMP – Laboratory Sample
ARCH – Archived Sample
No sheen or odor throughout core.

CORING LOG

VB-8

1011 S.W. Klickitat Way
Suite #207
Seattle, Washington 98134
(206) 624-9349

PROJECT NO.: *3-2438-424 JAG*		CLIENT: *Port Quendall*
LOCATION: *Renton, Washington;*		RIG TYPE: *4 in. ID 12 ft. Tubes*
START DATE: *01/24/97* TIME: *16:38*	RECOVERY LENGTH: *1.5 feet*	METHOD: *Vibracore*
COMPLETION DATE: *01/24/97* TIME: *16:40*	DRIVE LENGTH: *11.0 feet*	FIELD LOG BY: *DT*
DEPTH TO MUD: *5.8 feet*	SURFACE ELEVATION: *feet (MSL)*	LAB LOG BY: *JG/SB*

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE: TYPE	DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	INTERPRETED *IN-SITU* PROFILE: LITHOLOGY	U.S.C.S.	DEPTH (in feet)
0	SAMP		0.3				WOOD WASTE; Brown; with 5% fine-grained sand.			0
5										5
10							Total depth = 11.0 feet bgs.			10
15										15
20										20

REMARKS: SAMP – Laboratory Sample
ARCH – Archived Sample

CORING LOG
VB-8 Duplicate

1011 S.W. Klickitat Way
Suite #207
Seattle, Washington 98134
(206) 624-9349

PROJECT NO.: *3-2438-424 JAG*		CLIENT: *Port Quendall*
LOCATION: *Renton, Washington;*		RIG TYPE: *4 in. ID 12 ft. Tubes*
START DATE: *01/24/97* TIME: *16:54*	RECOVERY LENGTH: *1.0 feet*	METHOD: *Vibracore*
COMPLETION DATE: *01/24/97* TIME: *16:56*	DRIVE LENGTH: *11.0 feet*	FIELD LOG BY: *DT*
DEPTH TO MUD: *5.8 feet*	SURFACE ELEVATION: *feet (MSL)*	LAB LOG BY: *JG/SB*

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE: TYPE	DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	INTERPRETED *IN-SITU* PROFILE: LITHOLOGY	U.S.C.S.	DEPTH (in feet)
0	SAMP		0.3	2.0			WOOD WASTE: Brown; with 5% sand and one piece metal debris.			0
5										5
10							Total depth = 11.0 feet bgs.			10
15										15
20										20

REMARKS: SAMP – Laboratory Sample
ARCH – Archived Sample

ATTACHMENT B4

Boring Logs for Independent Remedial Action Plan, Upland Areas, Hart Crowser, 2000

- Strataphobe Logs HC-1 through HC-57
- Monitoring Well Logs HCMW-1S/D, 2 through 4, and 5S/D
- Test Pit Logs TP-1 through TP-7

Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.
Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 – 4	Very soft	0 – 2	<0.125
Loose	4 – 10	Soft	2 – 4	0.125 – 0.25
Medium dense	10 – 30	Medium stiff	4 – 8	0.25 – 0.5
Dense	30 – 50	Stiff	8 – 15	0.5 – 1.0
Very dense	>50	Very stiff	15 – 30	1.0 – 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptable moisture
Damp	Some perceptable moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptable moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 – 5
Slightly (clayey, silty, etc.)	5 – 12
Clayey, silty, sandy, gravelly	12 – 30
Very (clayey, silty, etc.)	30 – 50

Legends

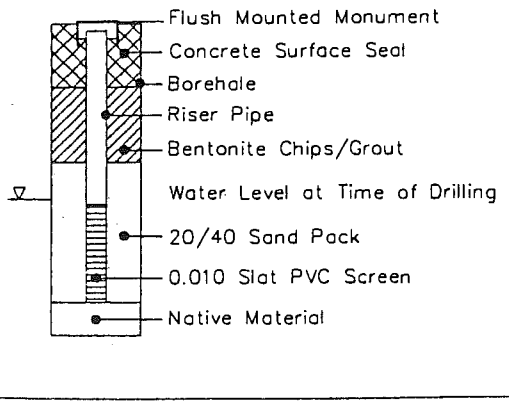
Sampling Test Symbols

BORING SAMPLES		TEST PIT SAMPLES	
⊠	Split Spoon	⊠	Grab (Jar)
⧅	Shelby Tube	⧅	Shelby Tube
▥	Cuttings	⧄	Bag
▯	Core Run		
*	No Sample Recovery		
P	Tube Pushed, Not Driven		

Test Symbols

GS	Grain Size Classification
CN	Consolidation
TUU	Triaxial Unconsolidated Undrained
TCU	Triaxial Consolidated Undrained
TCD	Triaxial Consolidated Drained
QU	Unconfined Compression
DS	Direct Shear
K	Permeabilty
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits
	Water Content in Percent Liquid Limit Natural Plastic Limit
PID	Photoionization Reading
CA	Chemical Analysis

Groundwater Observations



494610\A-1FLUSH 1=1

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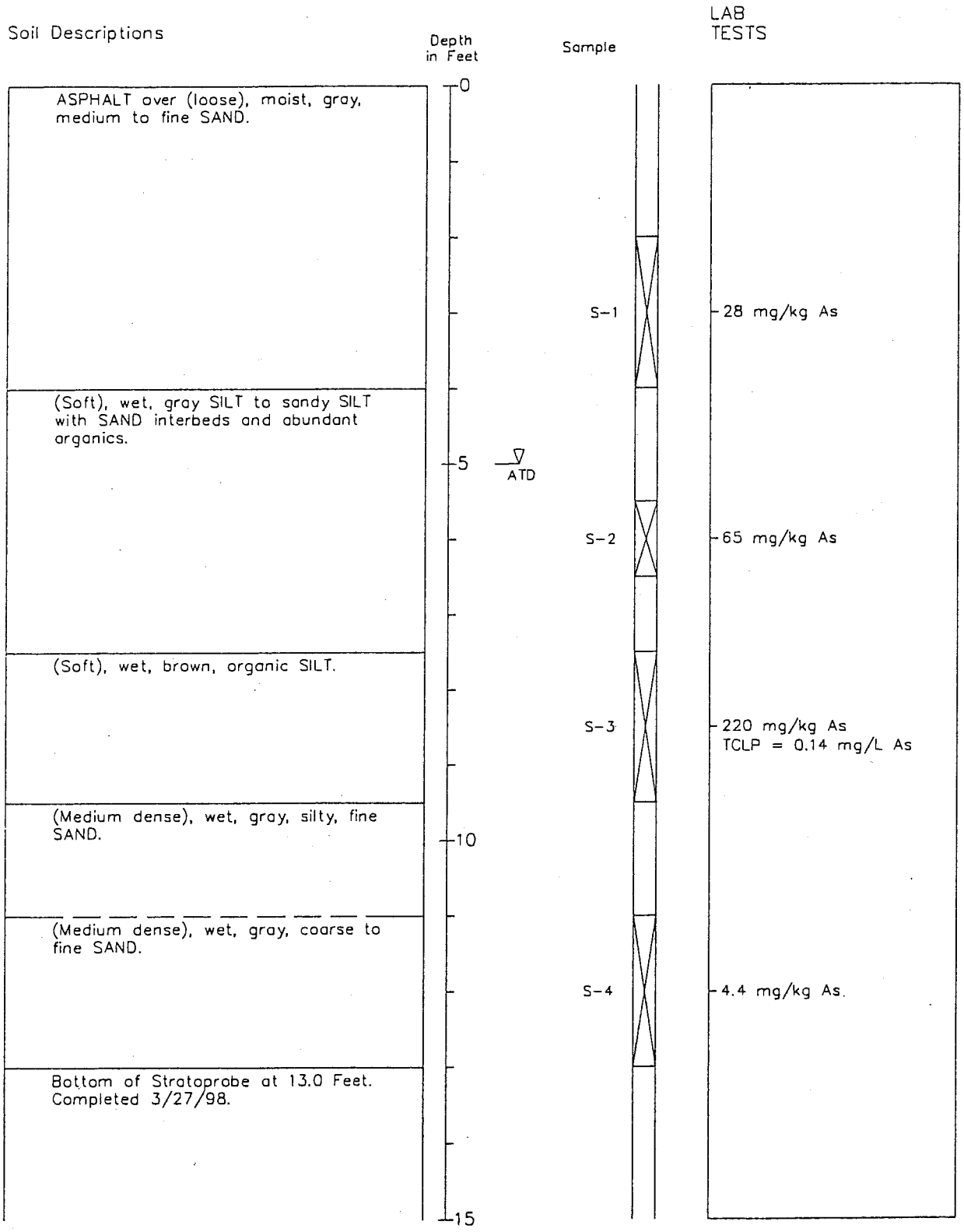
J-4946-10 11/98

Figure A-1

Strataprobe Log HC-1



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic
5. TCLP = Toxicity Characteristic Leaching Procedure.

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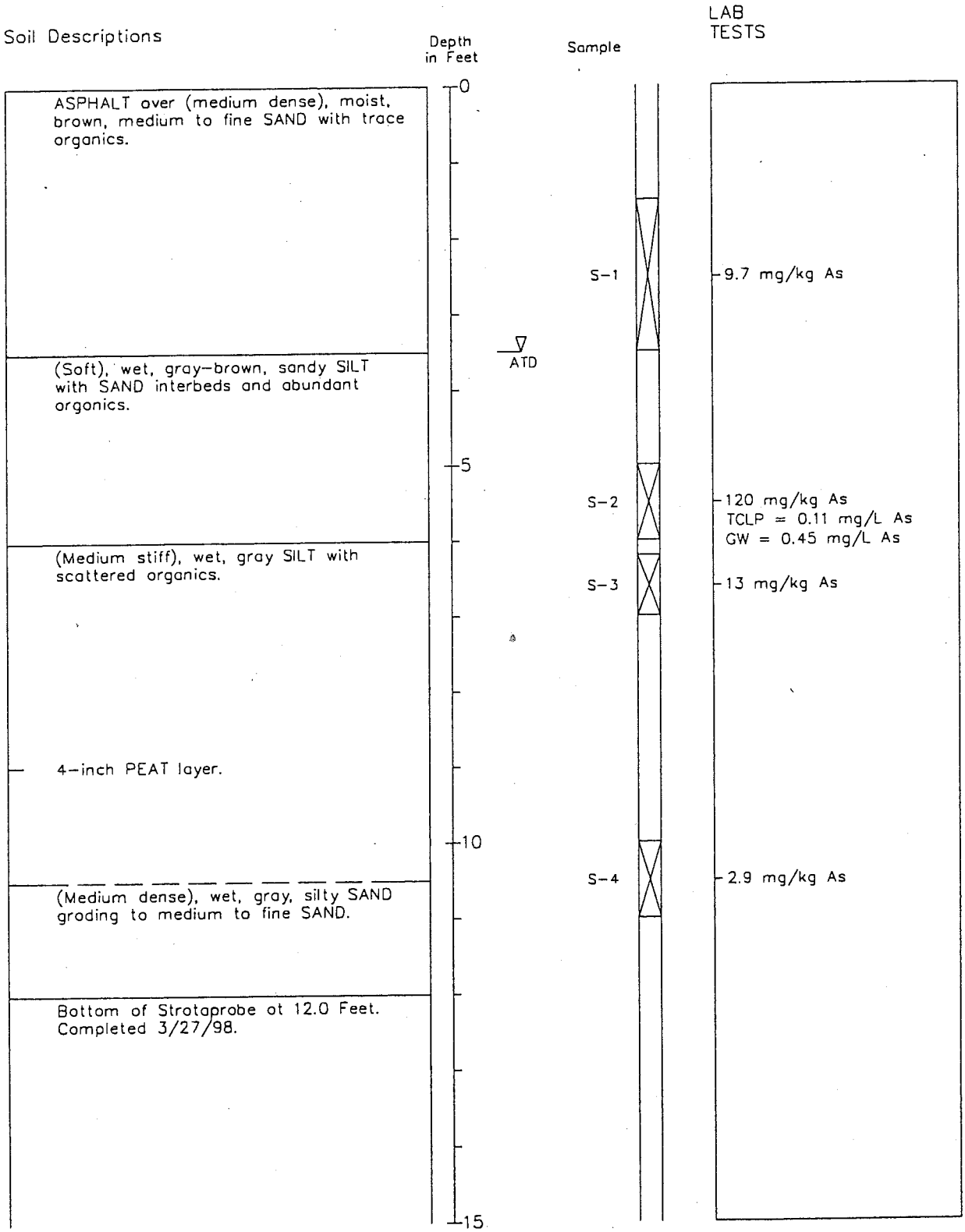
Figure A-2

1=1 ACAD LOG

Strataprobe Log HC-2



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic
5. TCLP = Toxicity Characteristic Leaching Procedure.
6. Groundwater (GW) sample collected from 5 to 7 feet.

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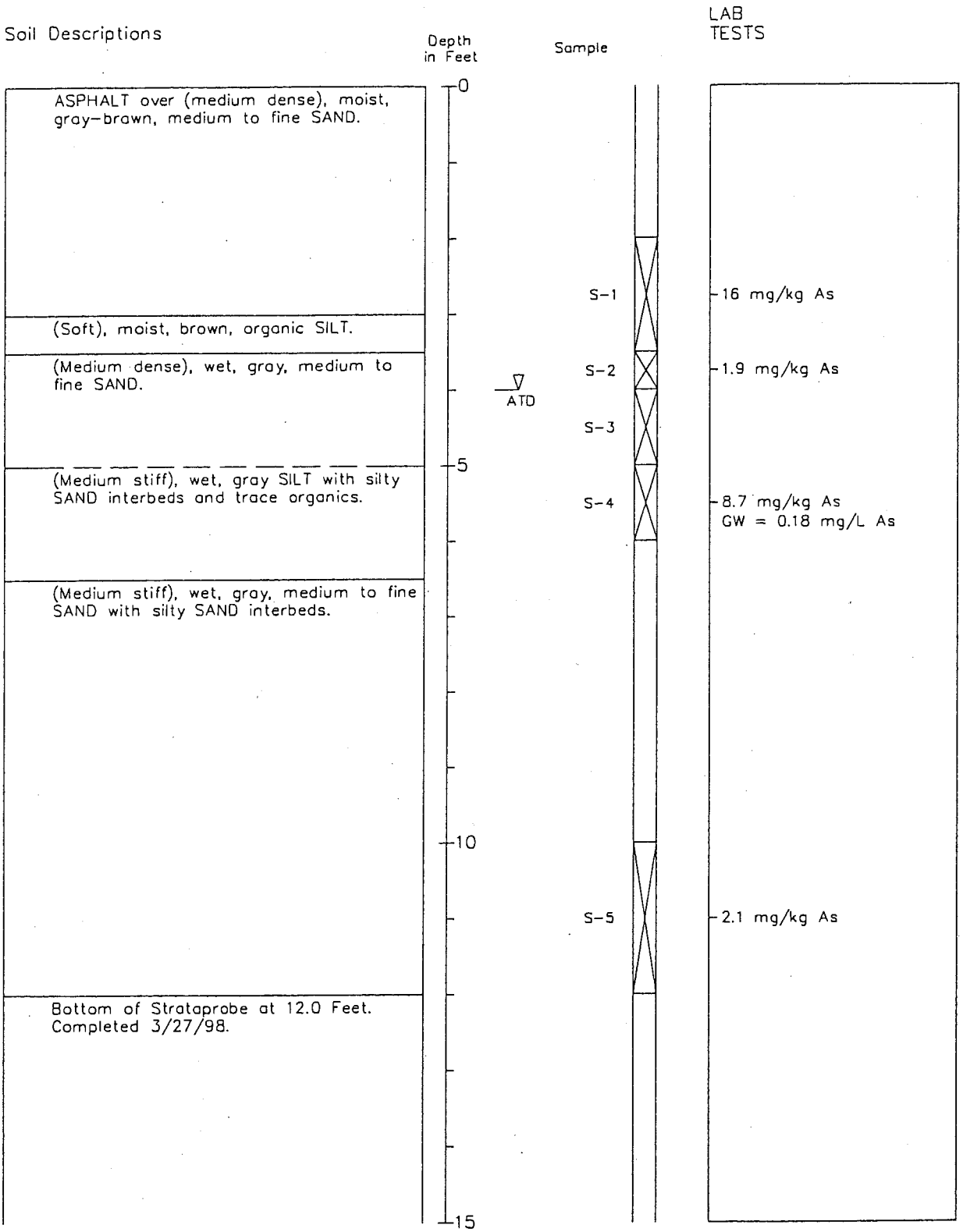
Figure A-3

1=1 ACAD LOG

Strataprobe Log HC-3



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic
5. Groundwater (GW) sample collected from 5 to 7 feet.

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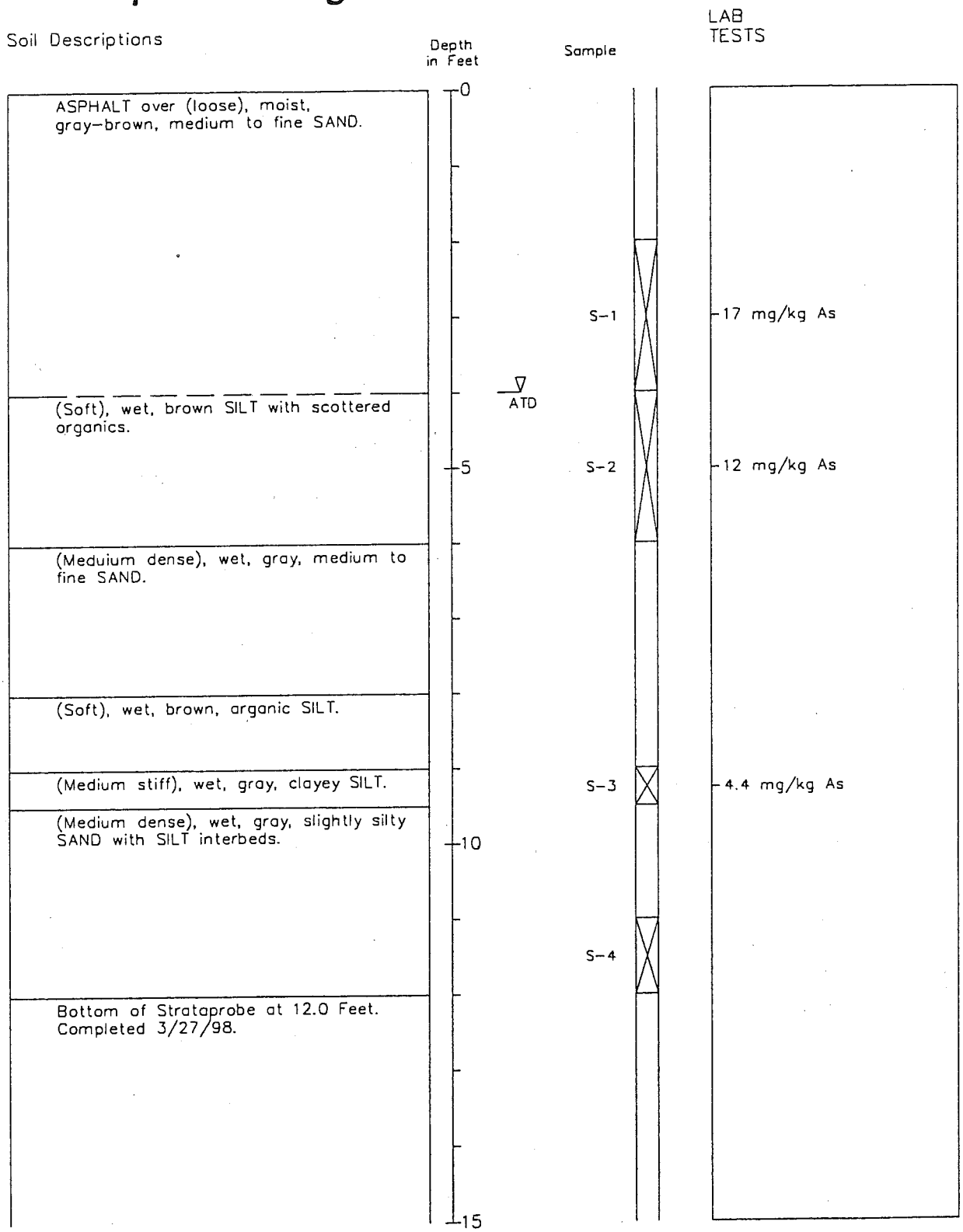
J-4946 3/98

Figure A-4

1=1 ACAD LOG

Strataprobe Log HC-4



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic

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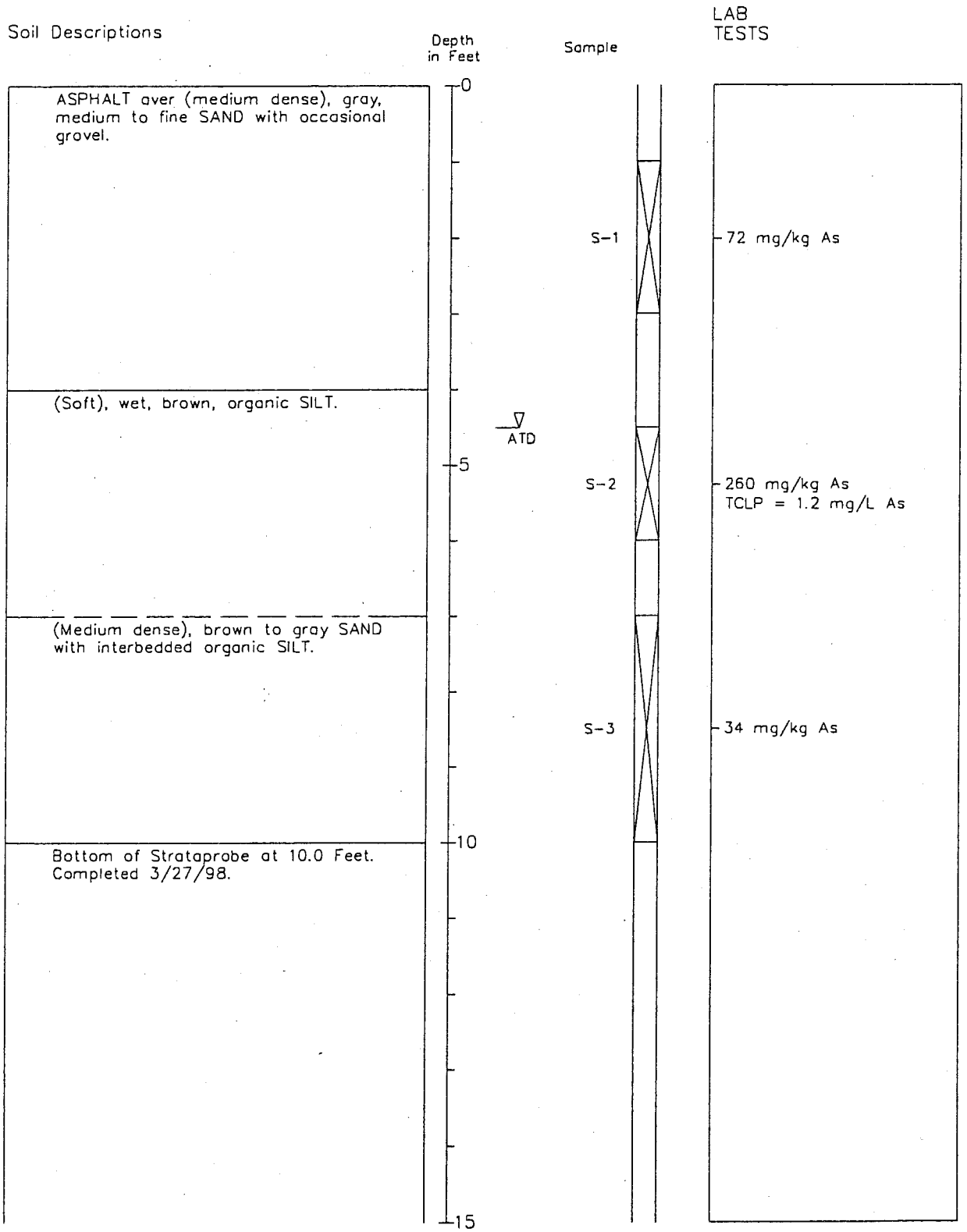
J-4946 3/98

Figure A-5

1=1 ACAD LOG

Strataprobe Log HC-5



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic
5. TCLP = Toxicity Characteristic Leaching Procedure.

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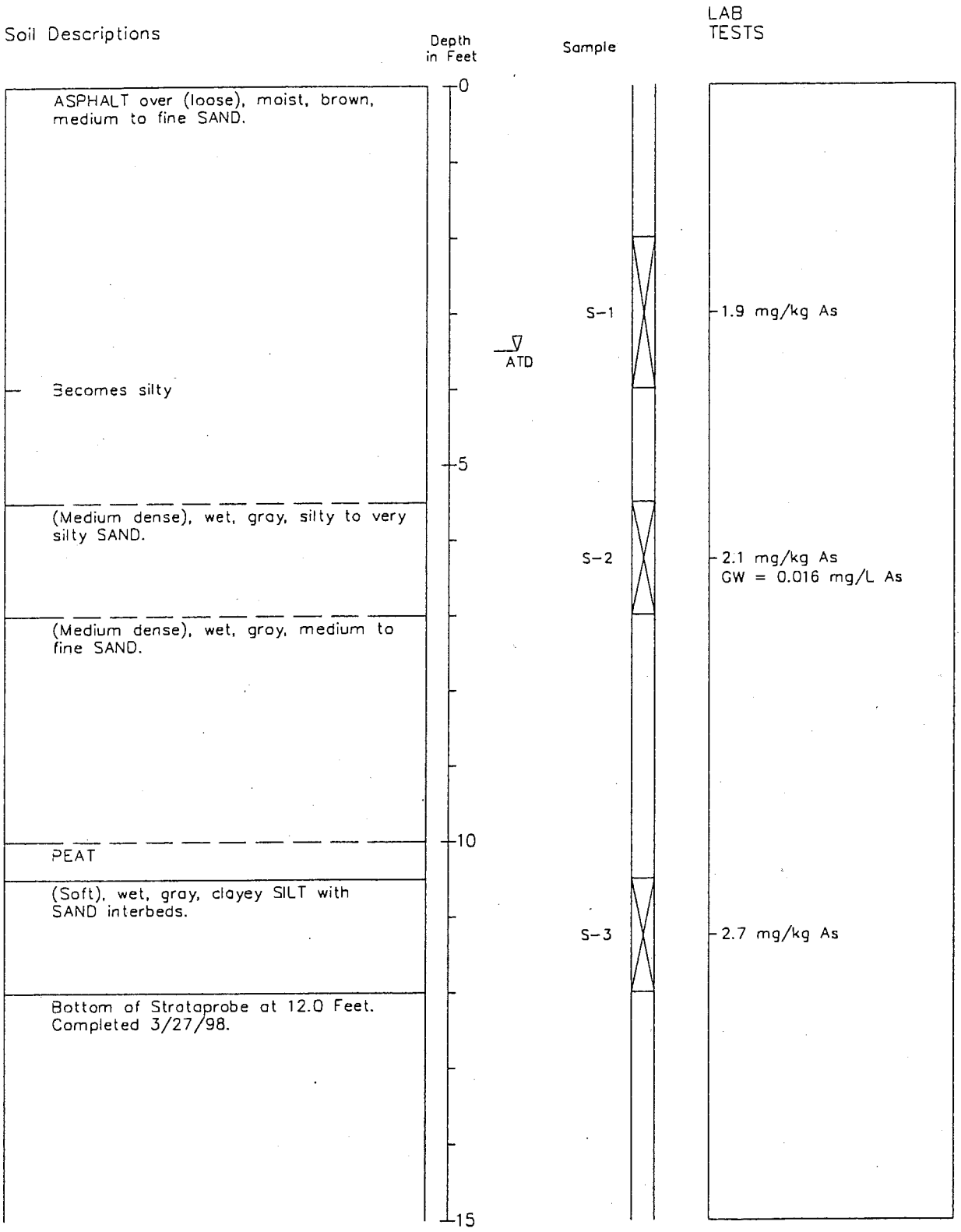
J-4946 3/98

Figure A-6

1=1 ACAD LOG

Strataprobe Log HC-6



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic
5. Groundwater (GW) sample collected from 5 to 7 feet.

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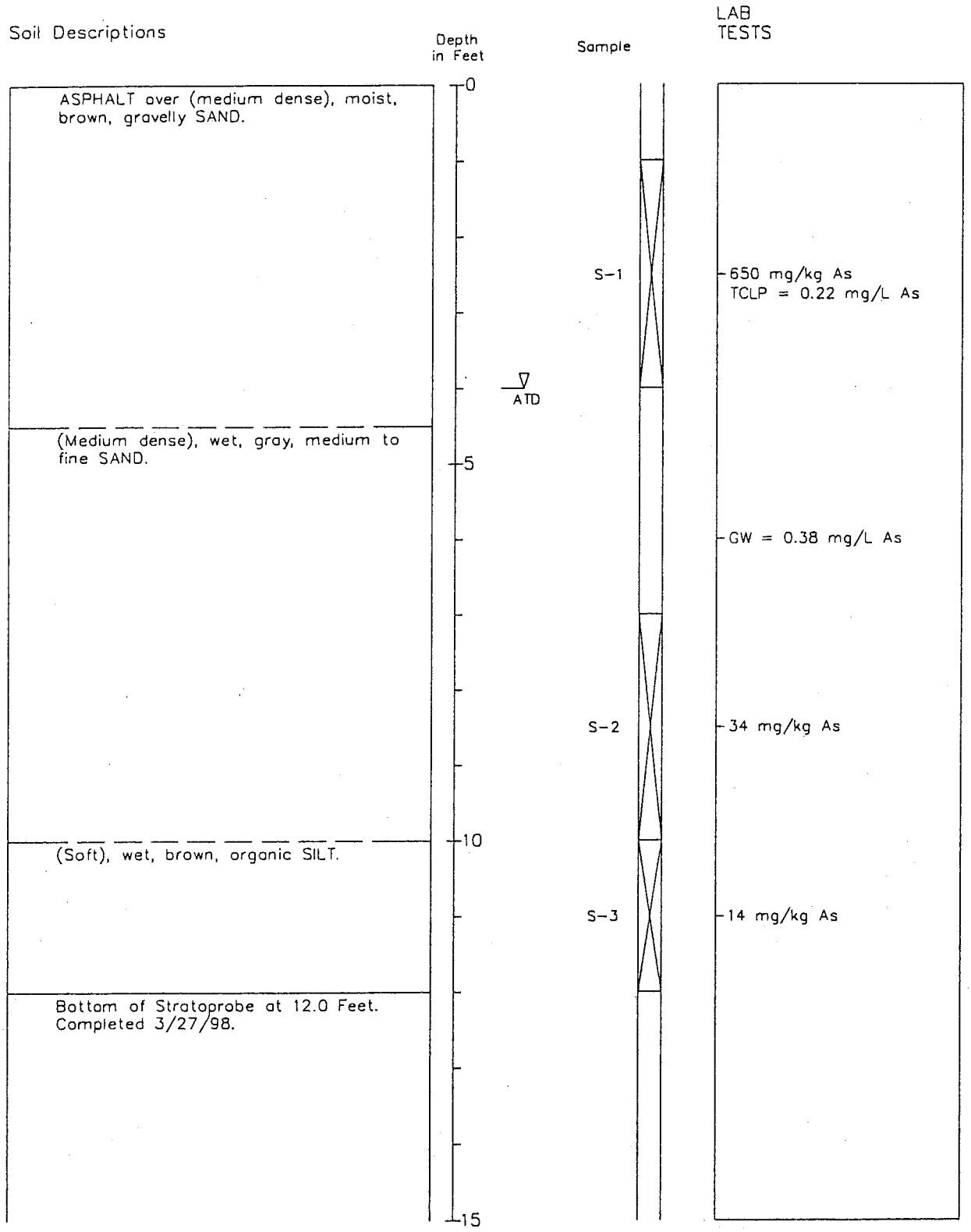
J-4946 3/98

Figure A-7

1=1 ACAD LOG

Strataprobe Log HC-7



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic
5. TCLP = Toxicity Characteristic Leaching Procedure.
6. Groundwater (GW) sample collected from 5 to 7 feet.

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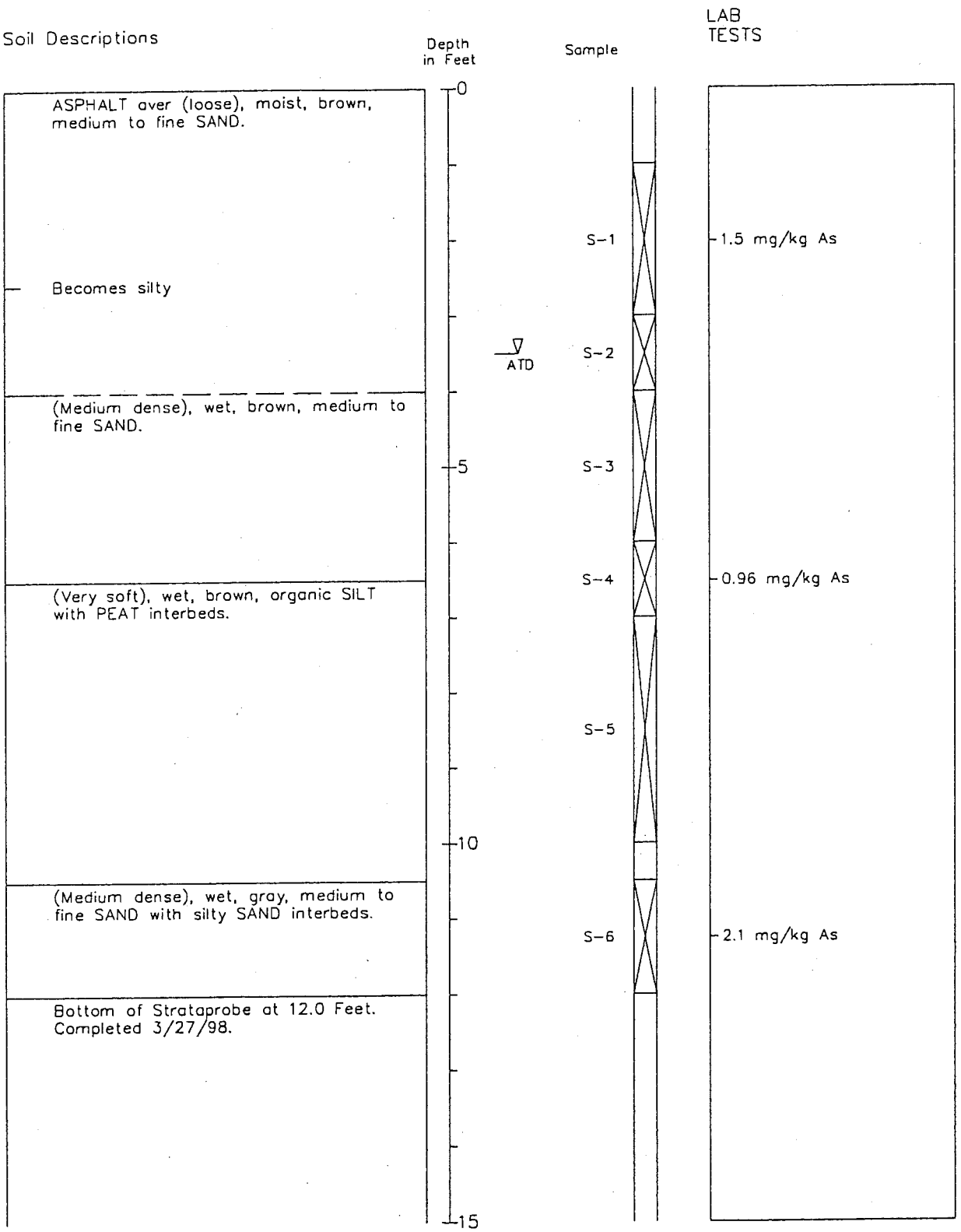
J-4946 3/98

Figure A-8

1=1 ACAD LOG

Strataprobe Log HC-8



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic

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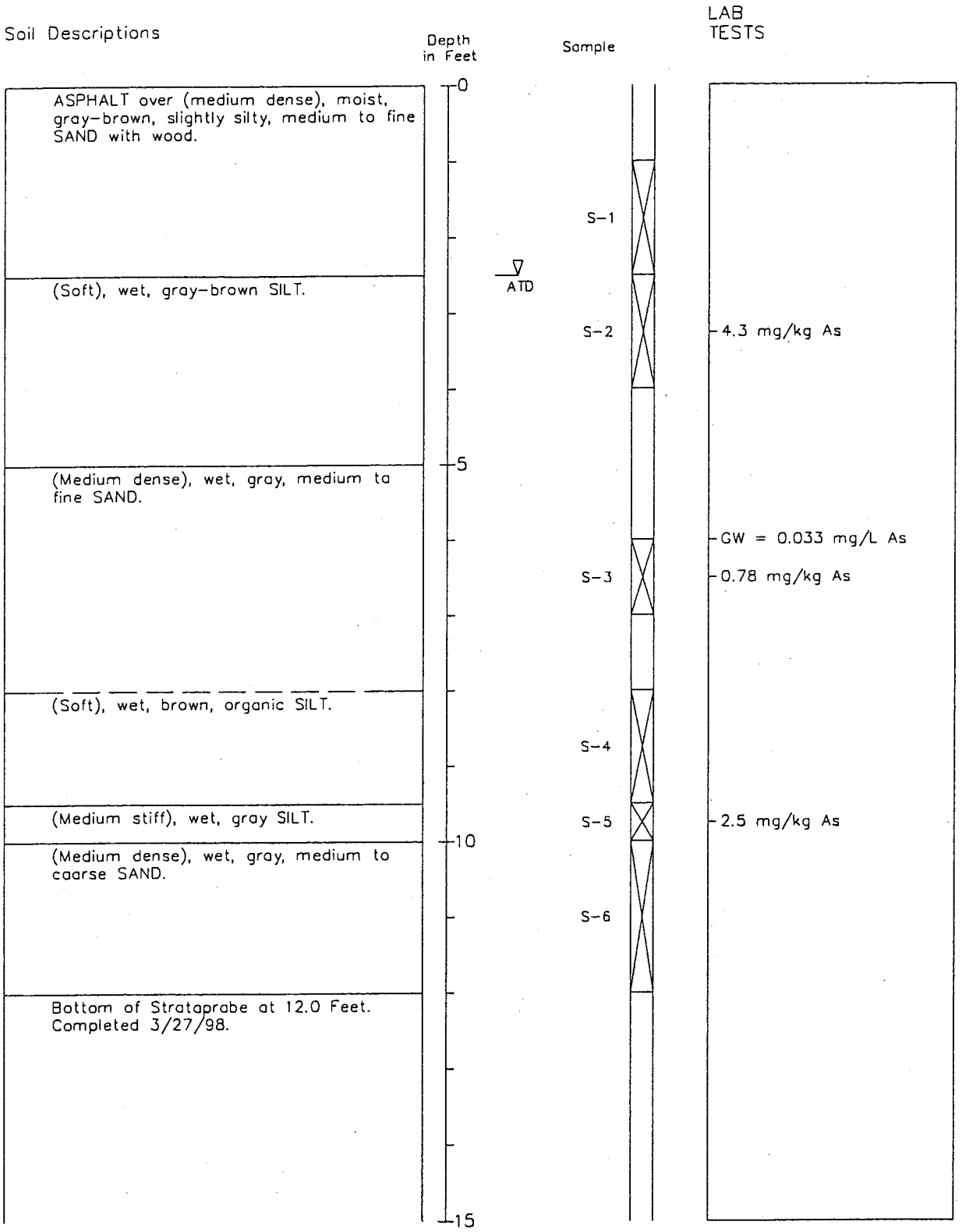
Figure A-9

1=1 ACAD LOG

Strataprobe Log HC-9



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic
5. Groundwater (GW) sample collected from 5 to 7 feet.

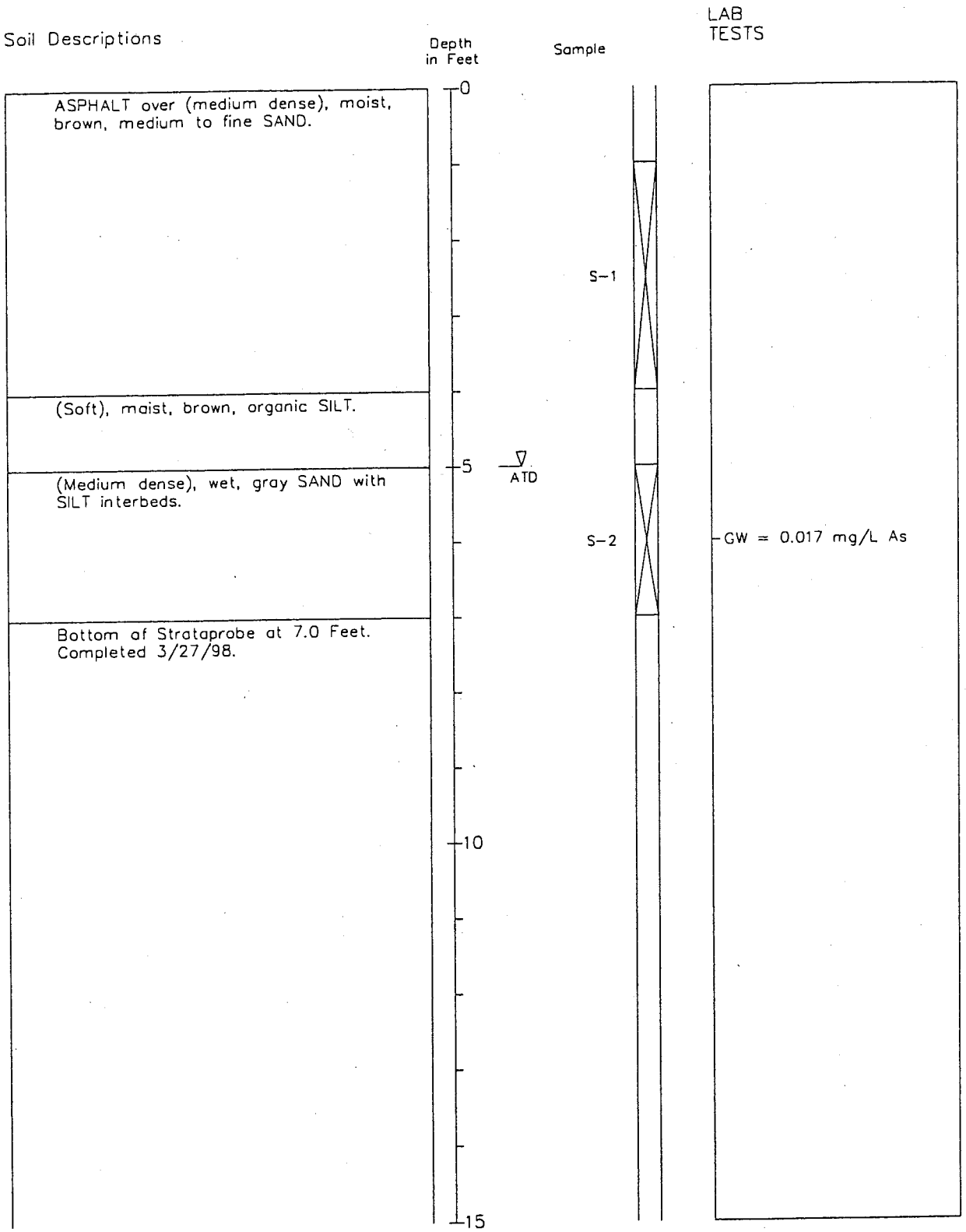
HARTCROWSER

J-4946 3/98

Figure A-10

1=1 ACAD LOG

Strataprobe Log HC-10



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic
5. Groundwater (GW) sample collected from 5 to 7 feet.

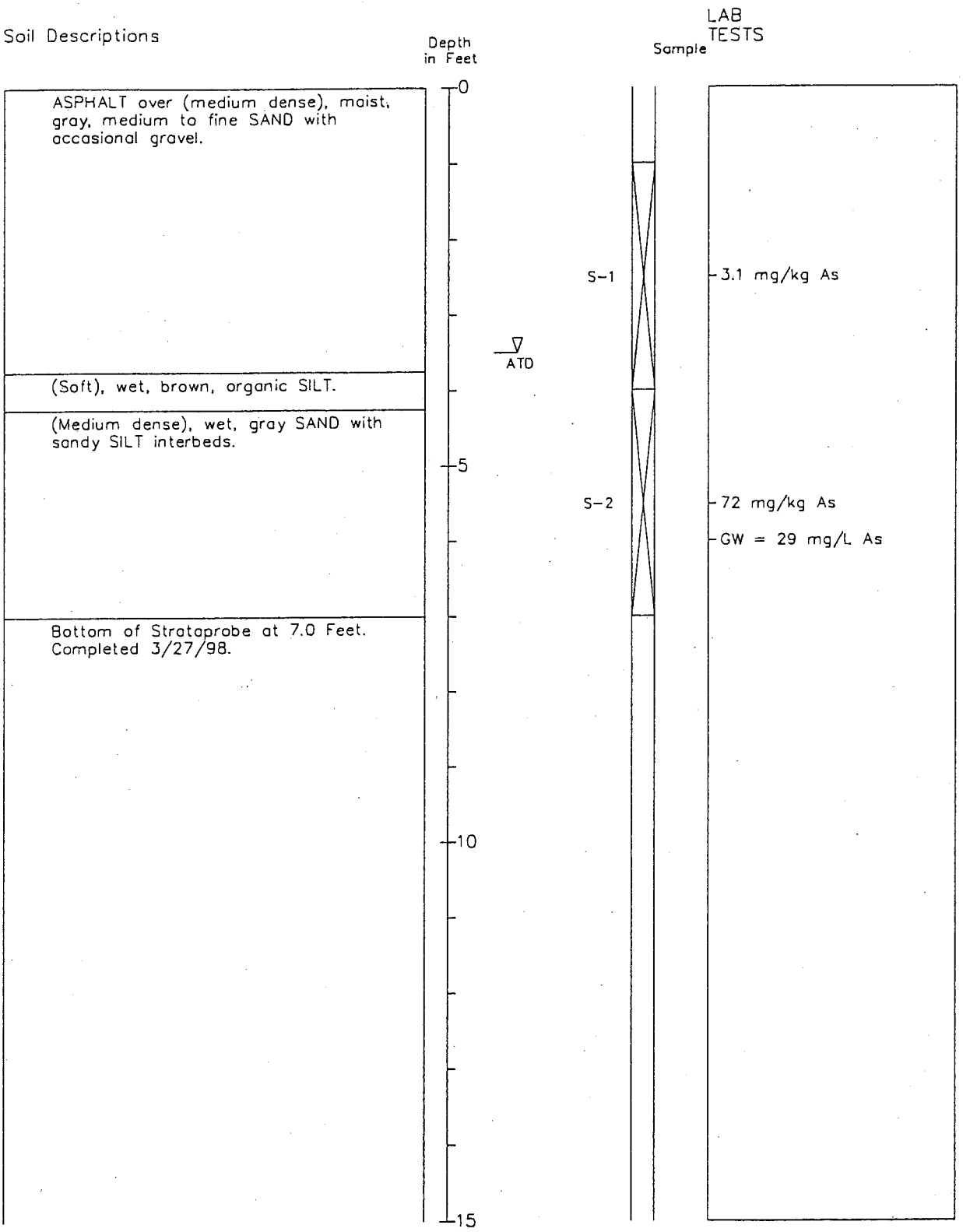
HARTCROWSER

J-4946 3/98

Figure A-11

1=1 ACAD LOG

Strataprobe Log HC-11



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. As = Arsenic
5. Groundwater (GW) sample collected from 5 to 7 feet.

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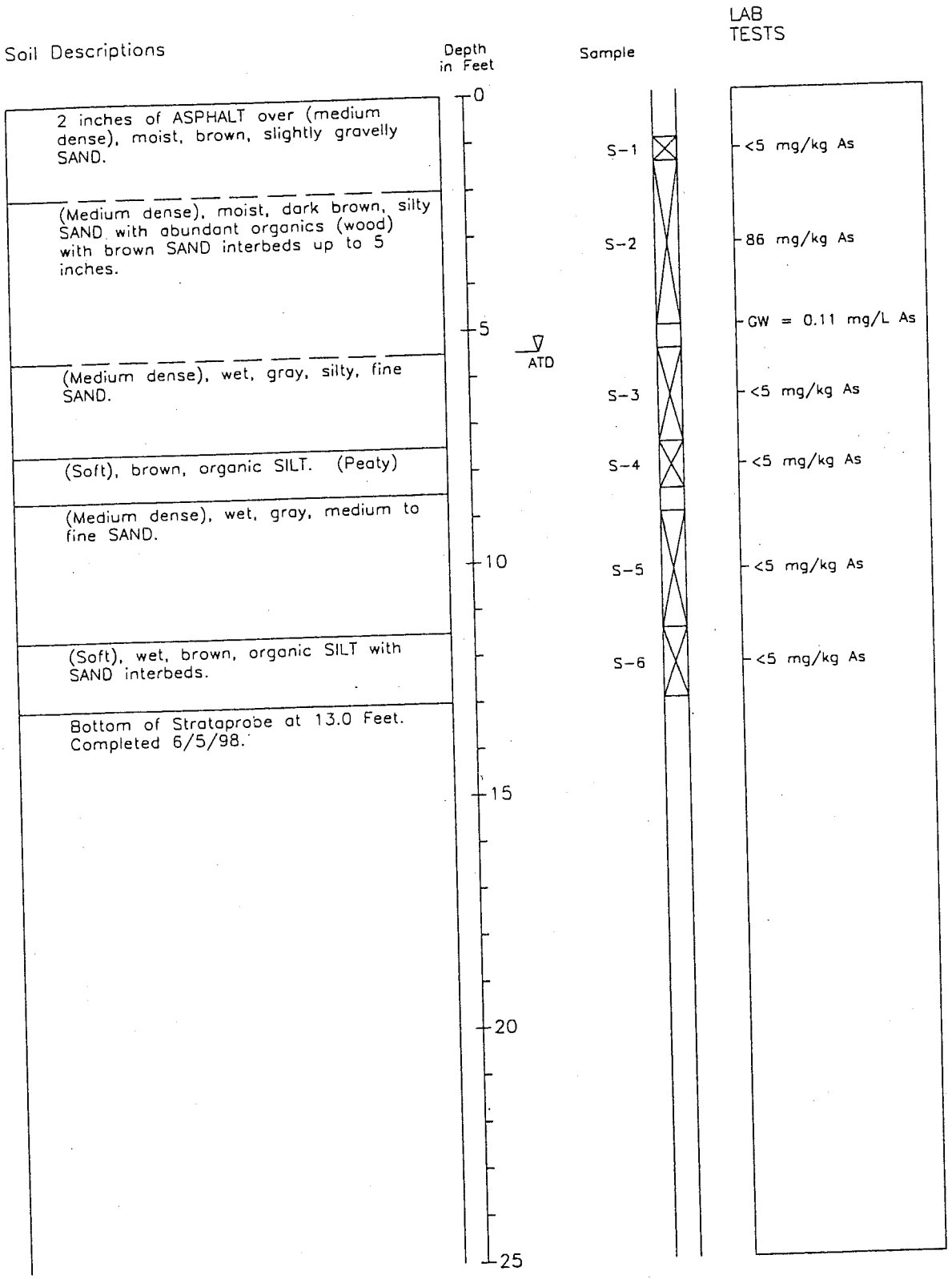
Figure A-12

I=1 ACAD LOG

Strataprobe Log HC-12



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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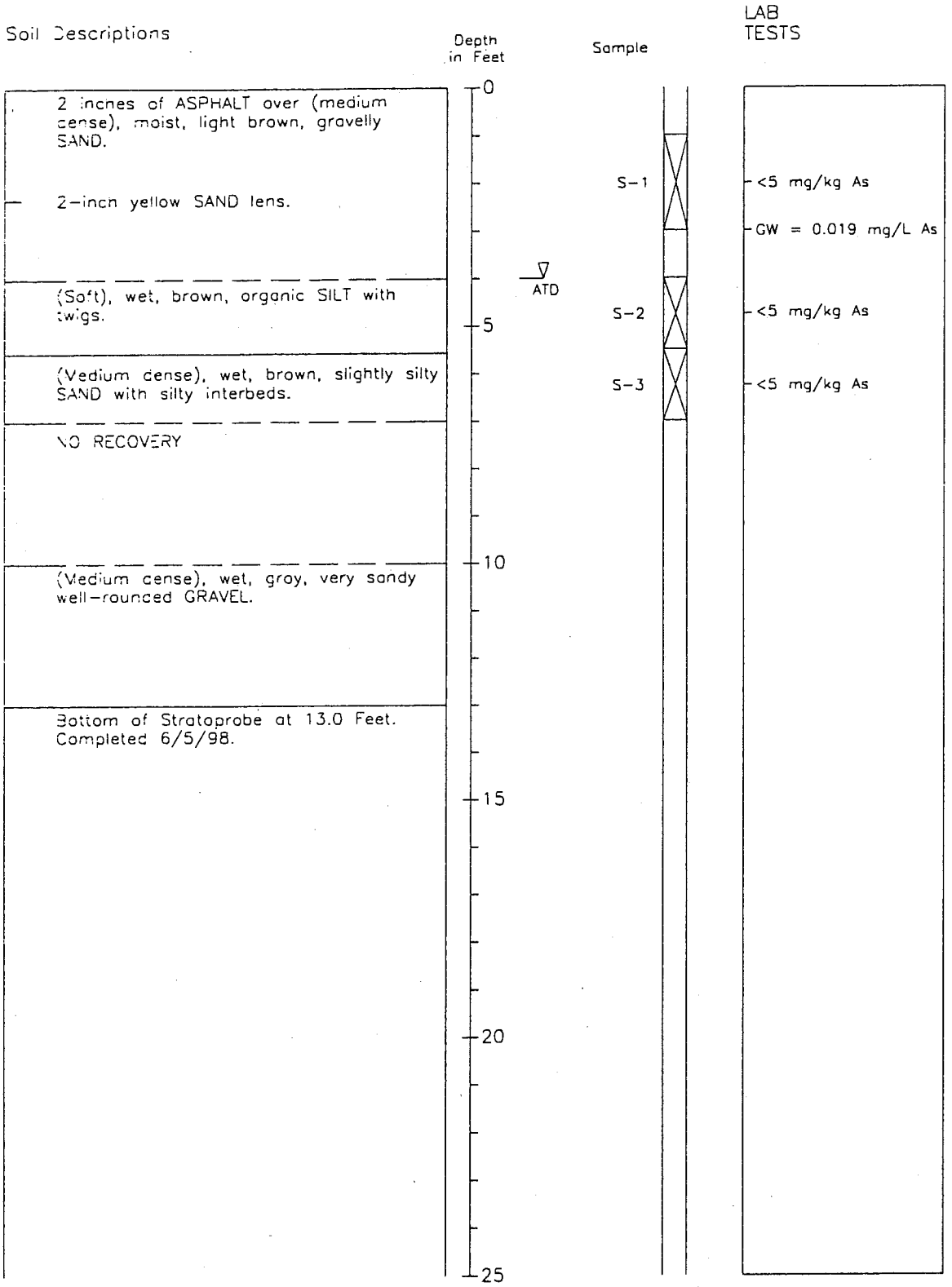
Figure A-13

1=1 ACAD LOG

Strataprobe Log HC-13



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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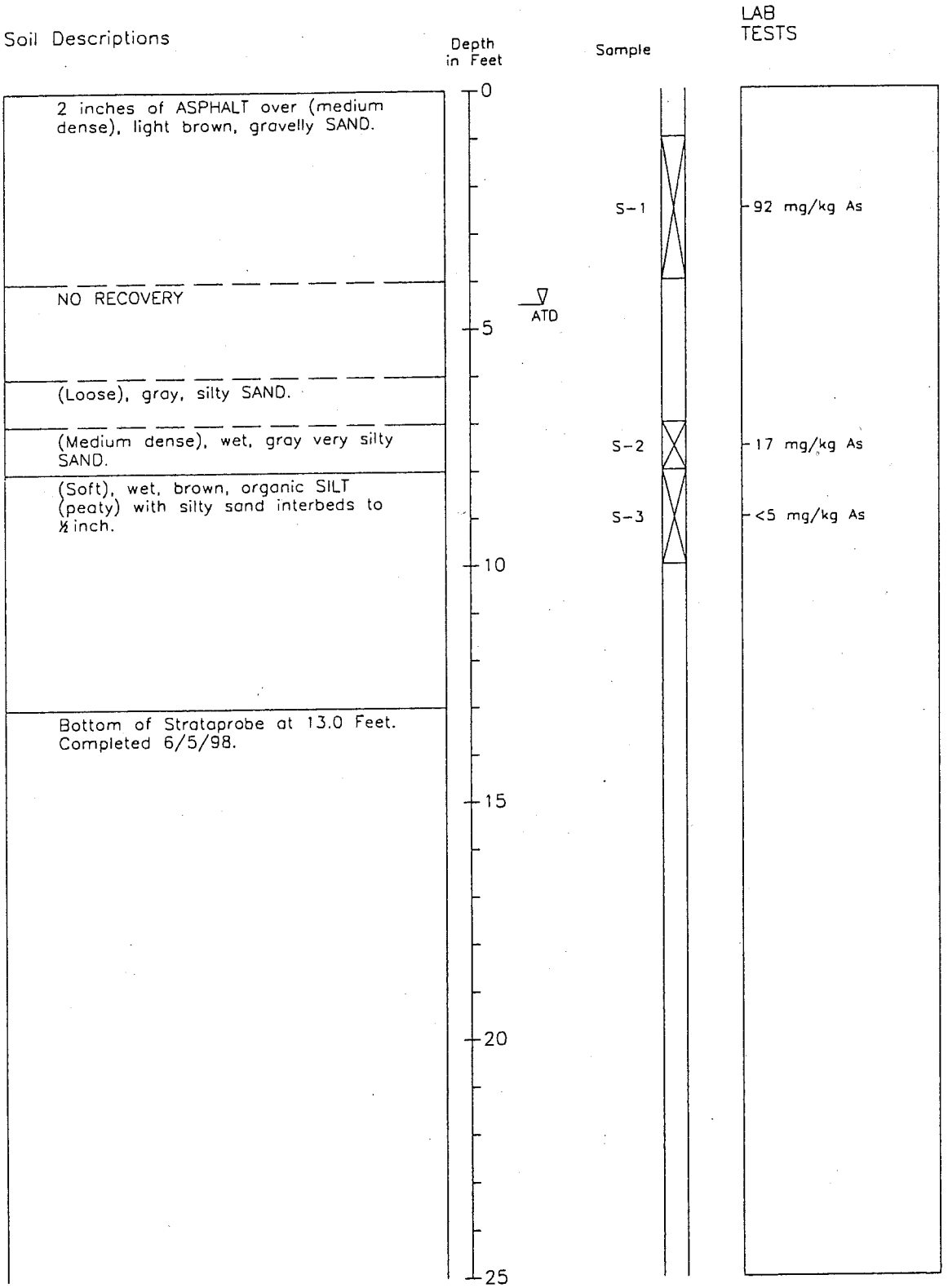
Figure A-14

1=1 ACAD LOG

Strataprobe Log HC-14



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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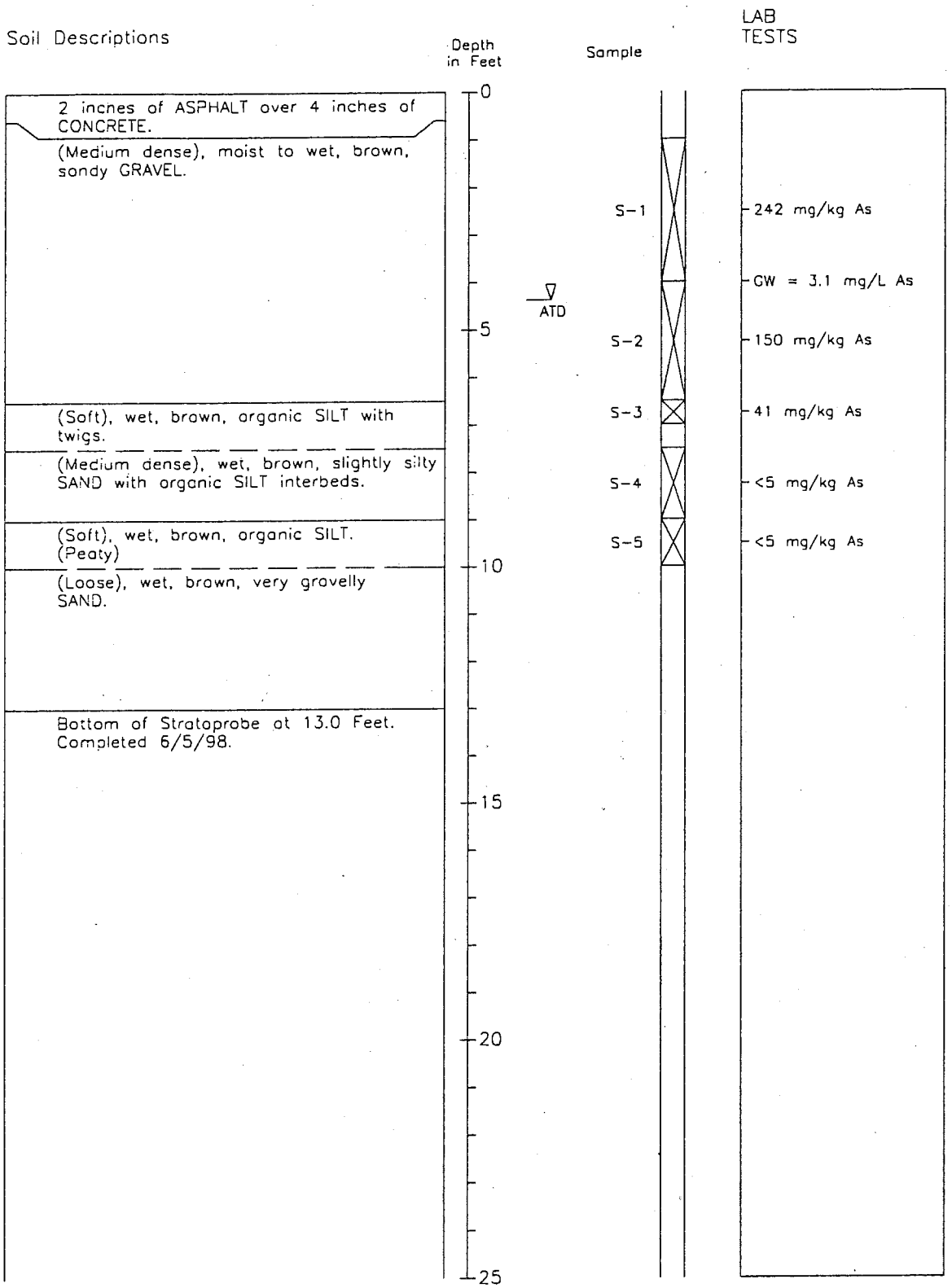
Figure A-15

I=1 ACAD LOG

Strataprobe Log HC-15



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified.. Level may vary with time.

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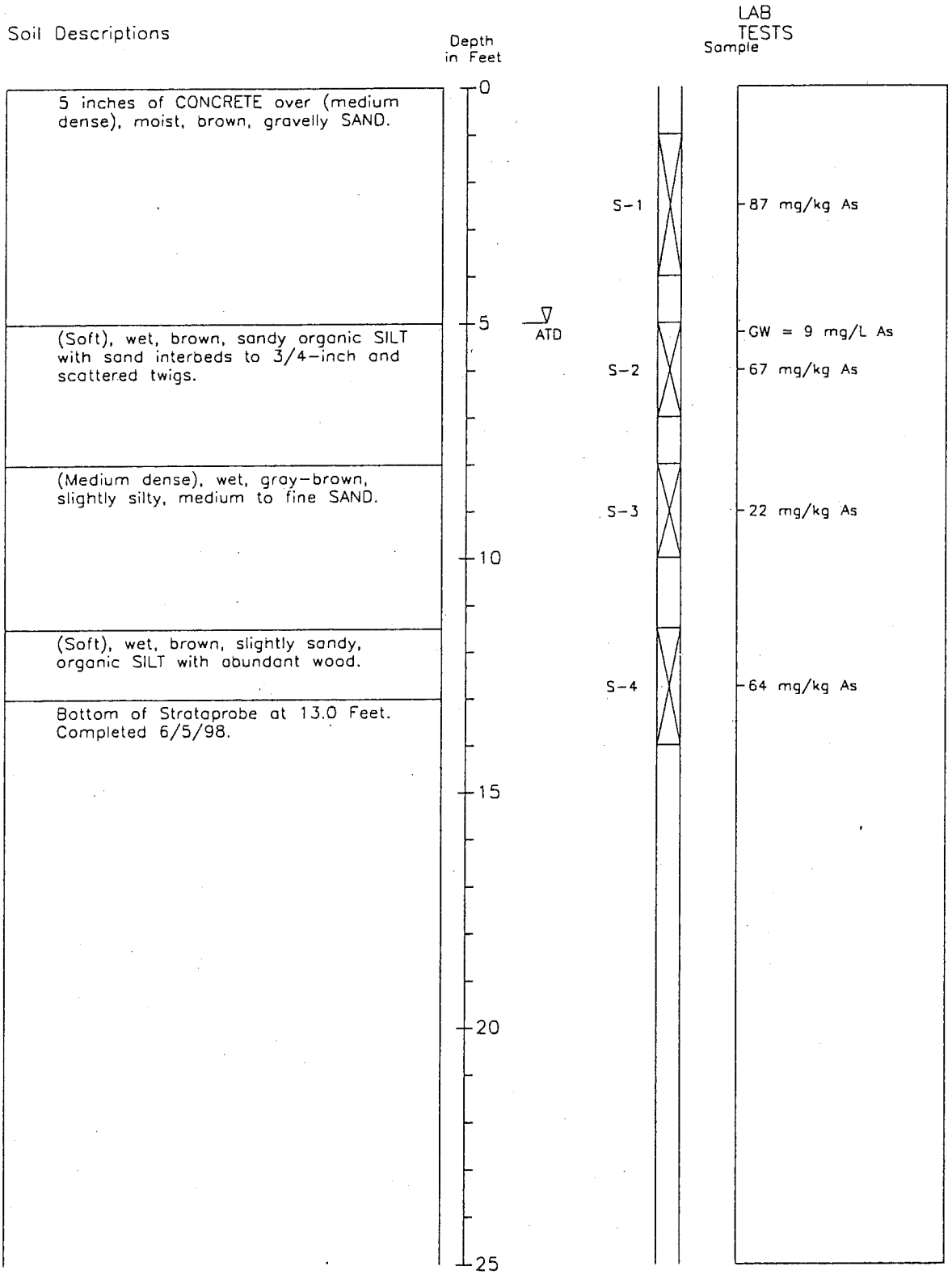
Figure A-16

=1 ACAD LOG

Strataprobe Log HC-16



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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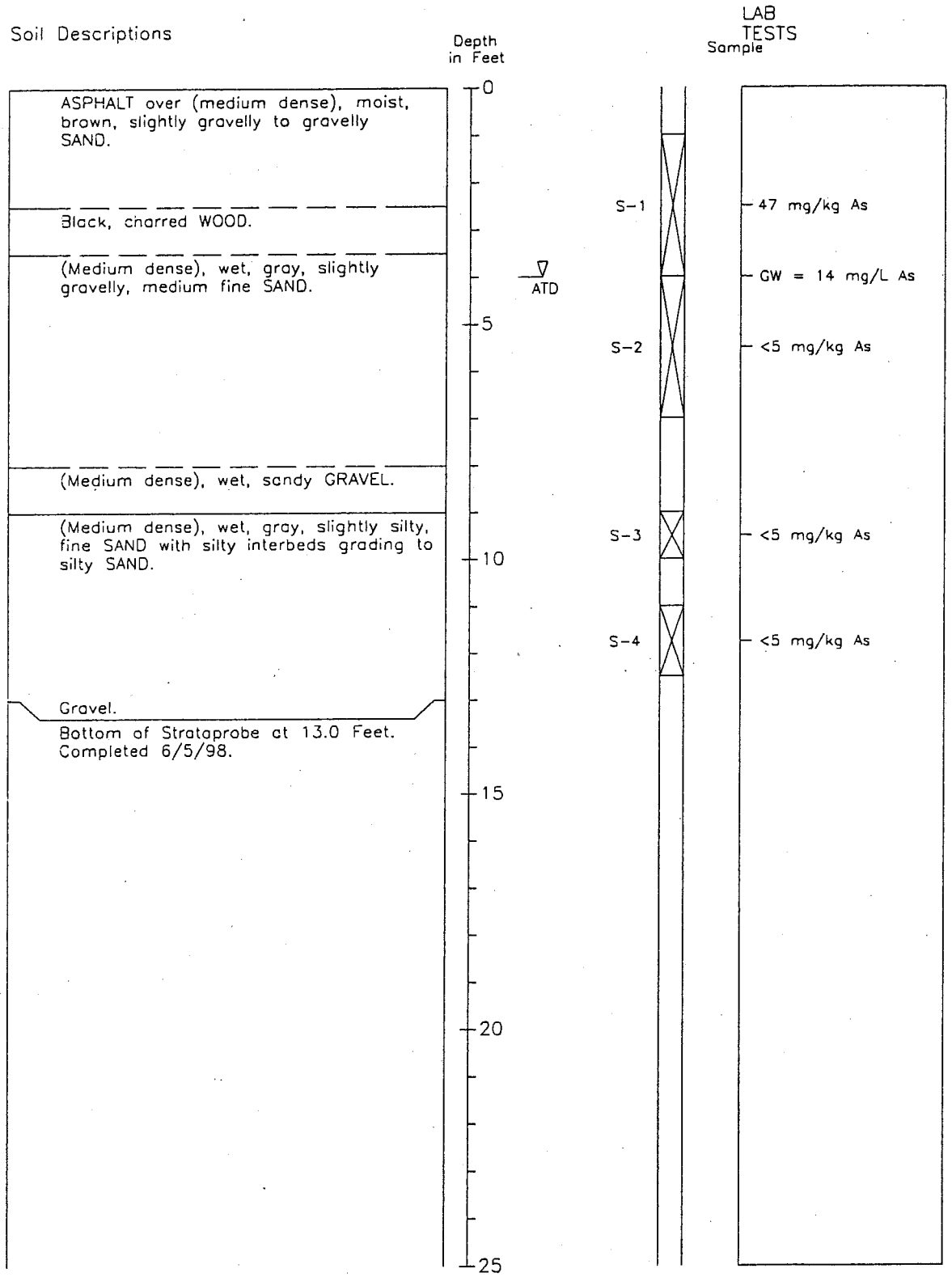
Figure A-17

I=1 ACAD LOG

Strataprobe Log HC-17



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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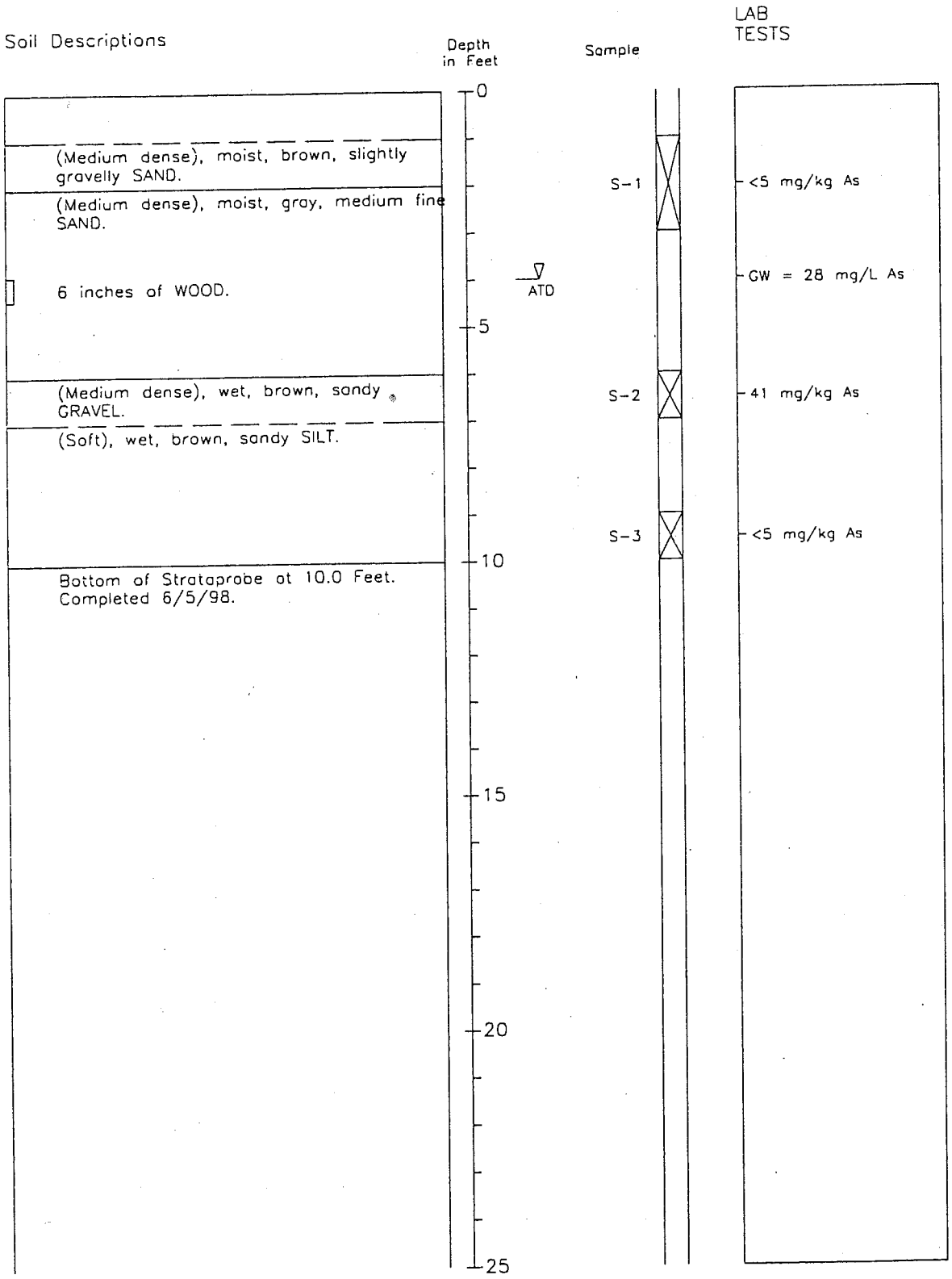
Figure A-18

=1 ACAD LOG

Strataprobe Log HC-18



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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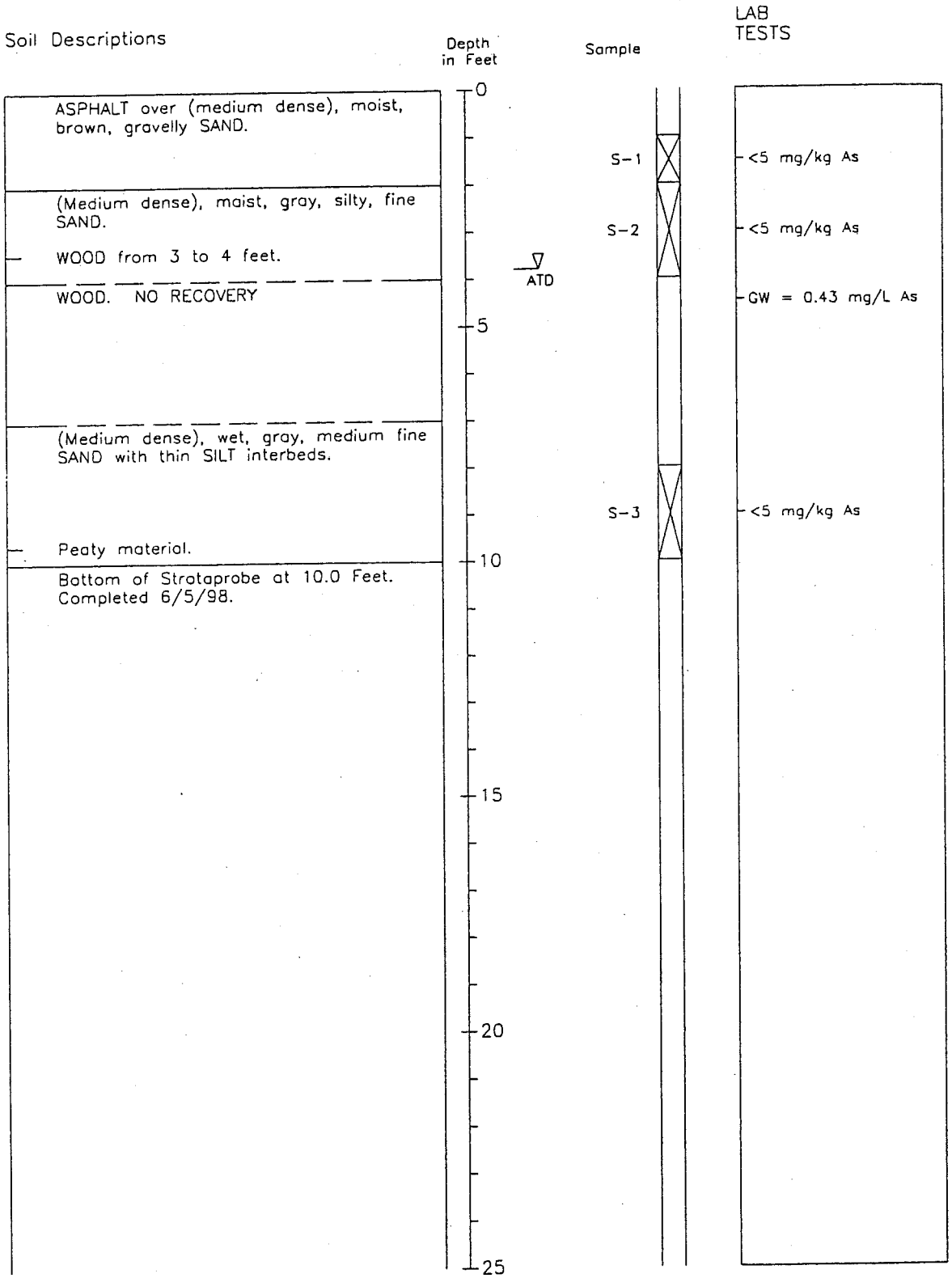
Figure A-19

=1 ACAD LOG

Strataprobe Log HC-19



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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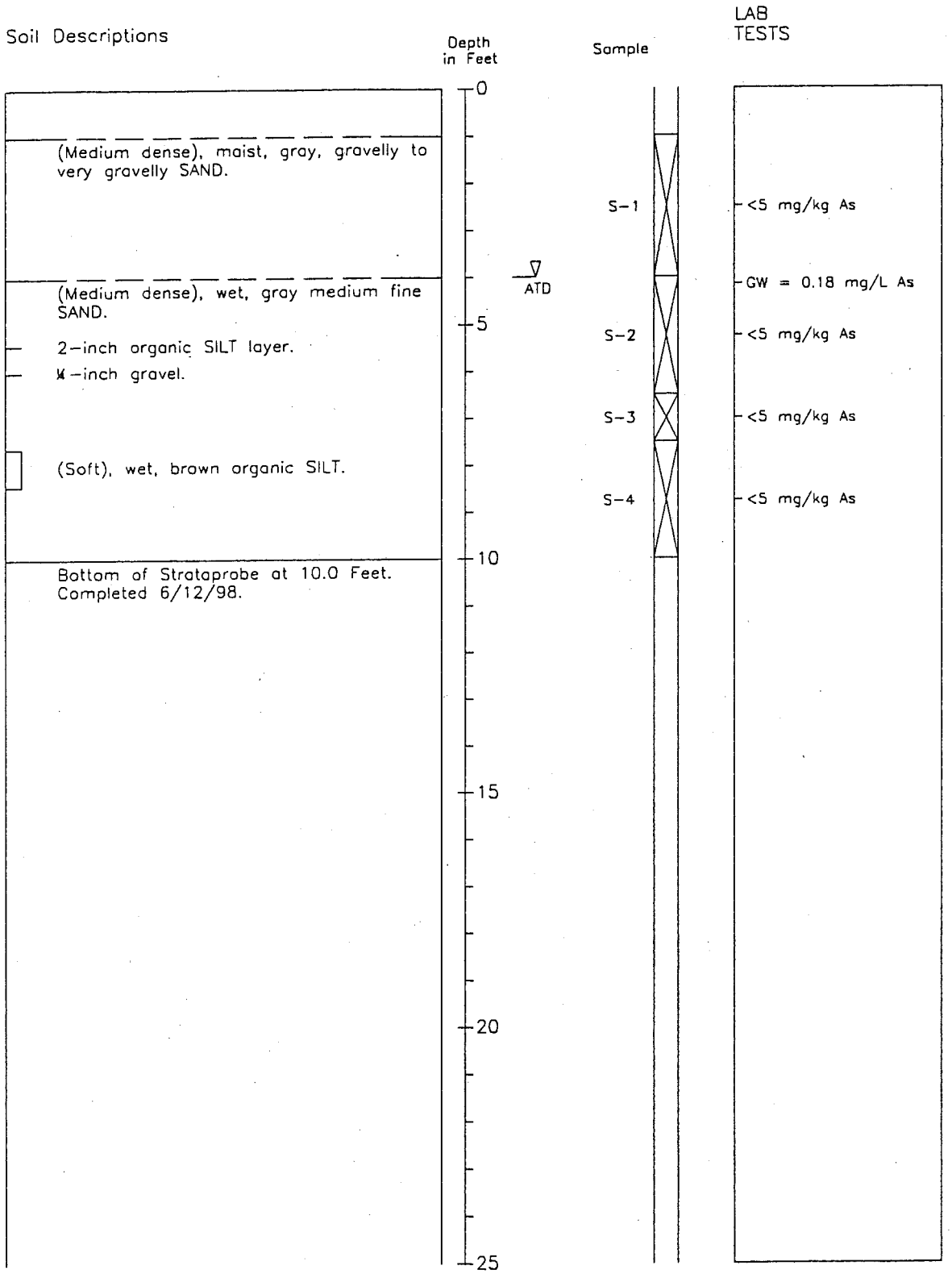
Figure A-20

=1 ACAD LOG

Strataprobe Log HC-20



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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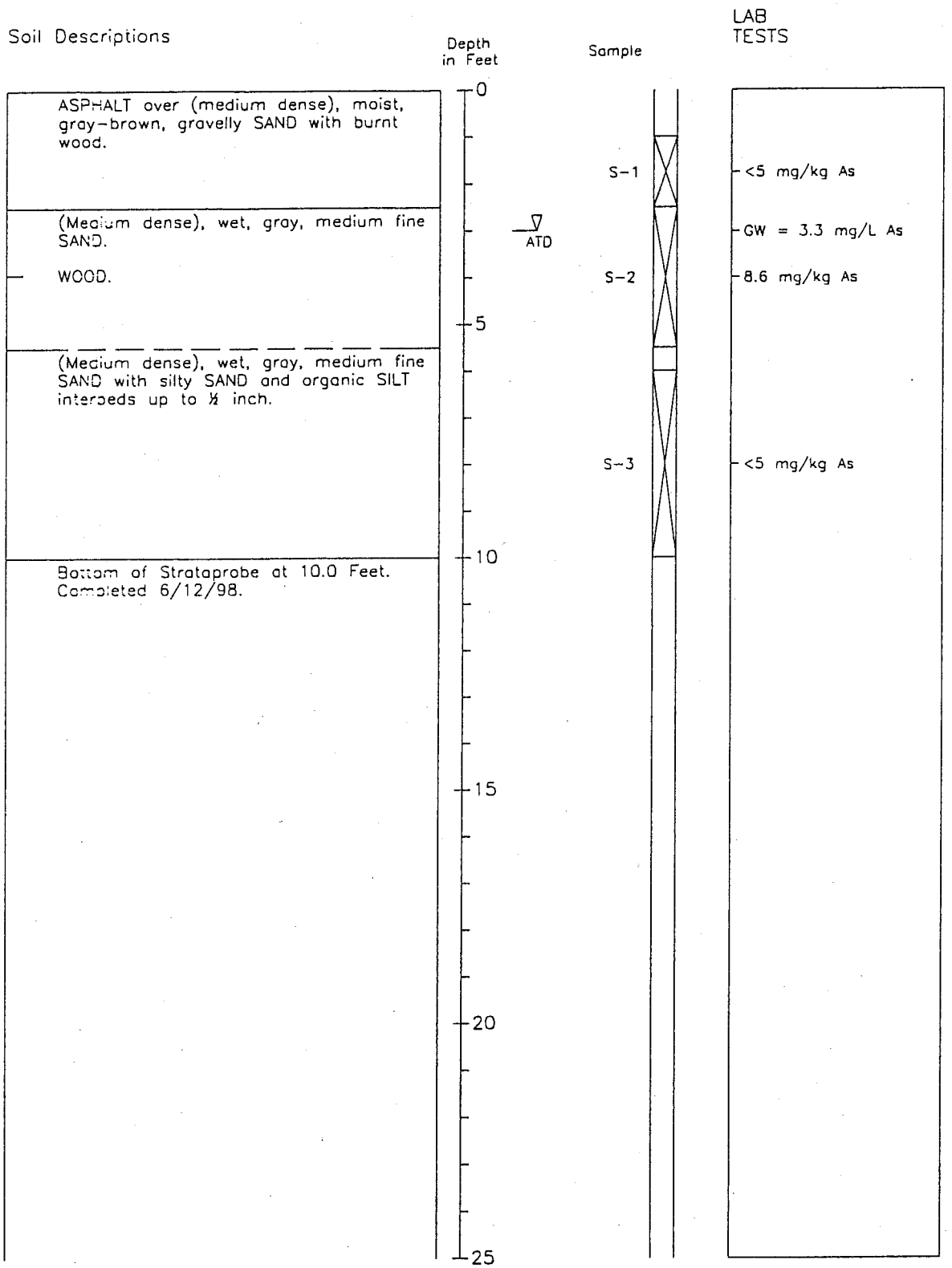
Figure A-21

=1 ACAD LOG

Strataprobe Log HC-22



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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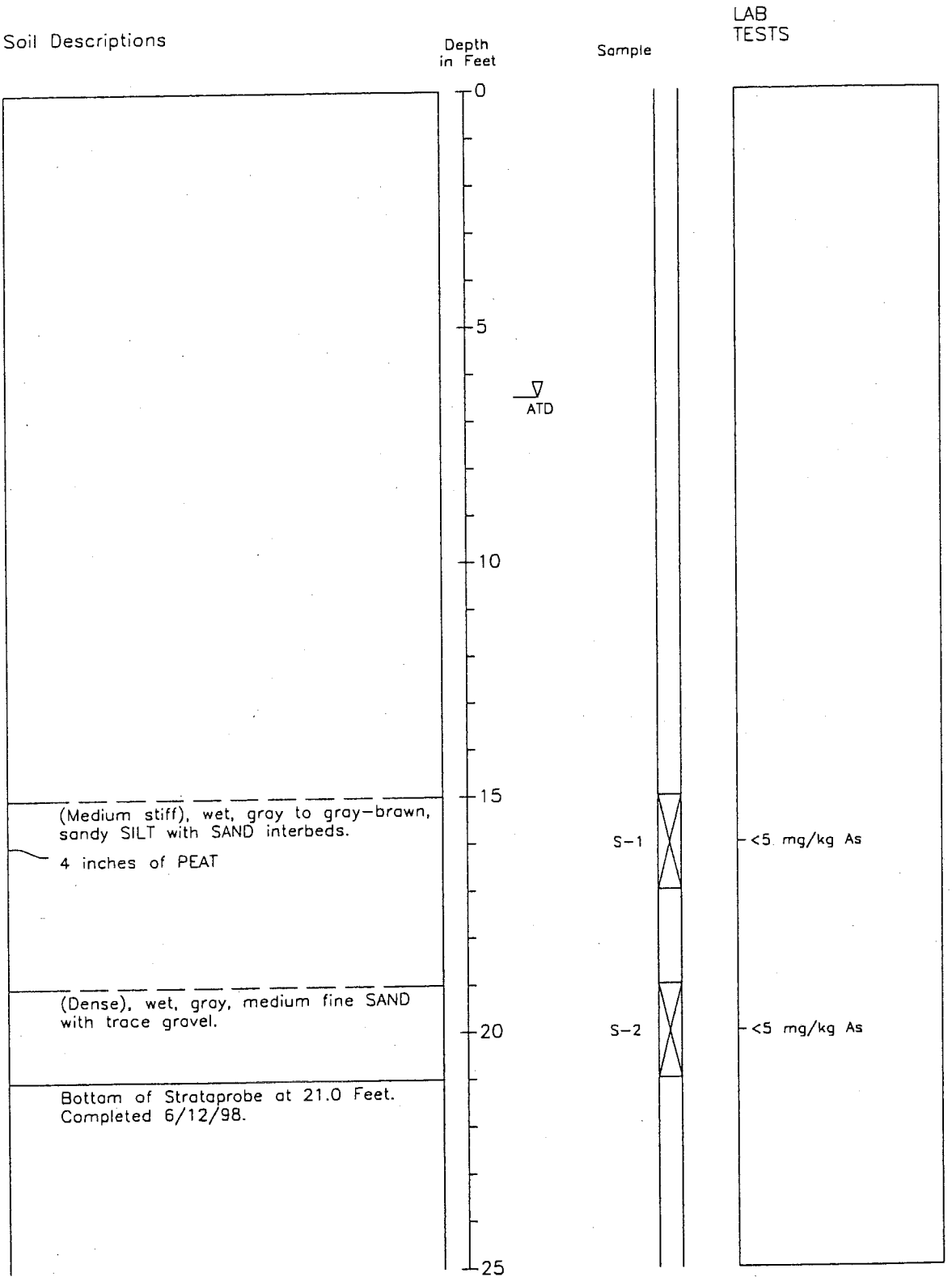
Figure A-23

1=1 ACAD LOG

Strataprobe Log HC-23



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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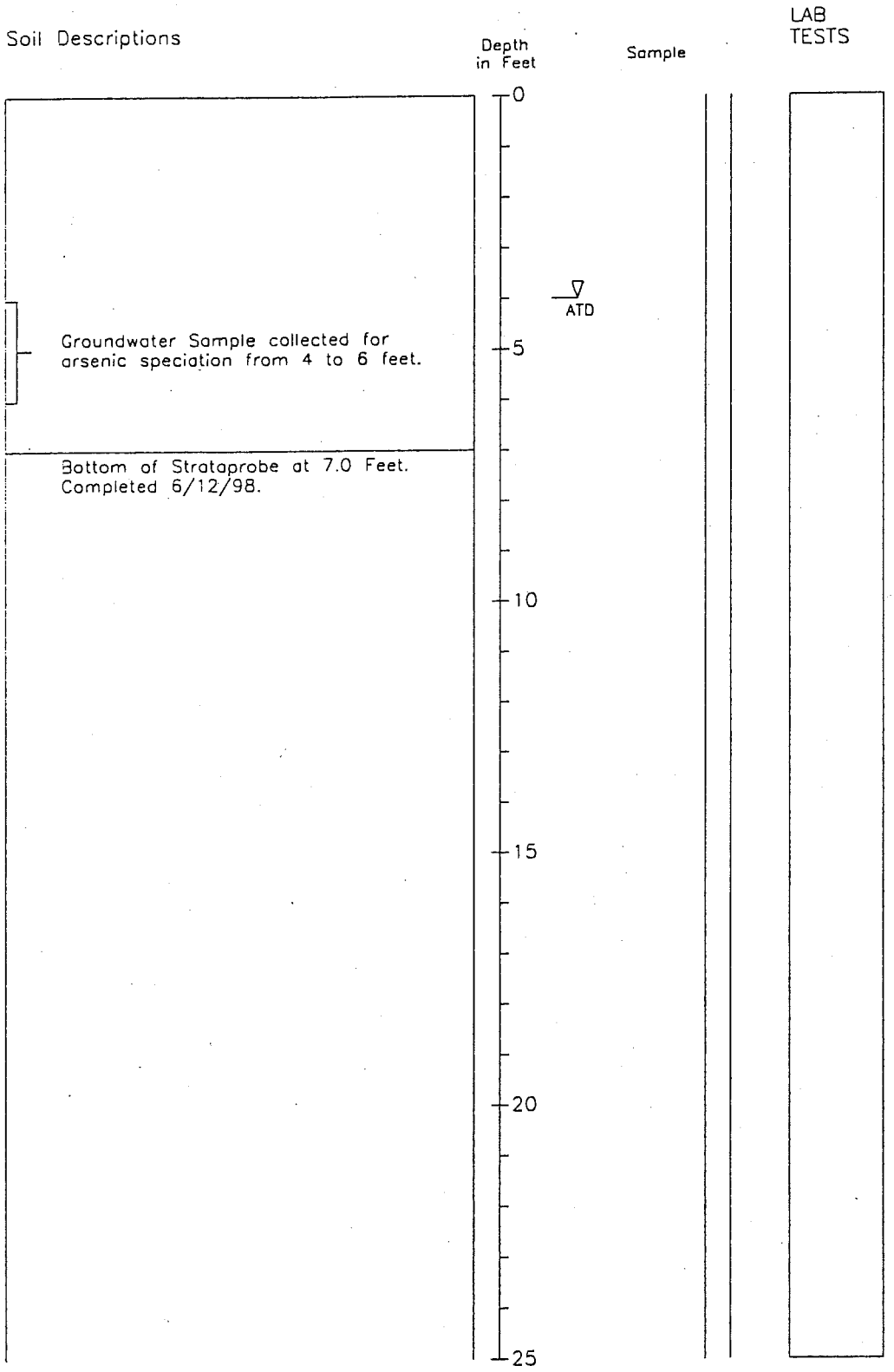
Figure A-24

=1 ACAD LOG

Strataprobe Log HC-24



1. Refer to Figure A–1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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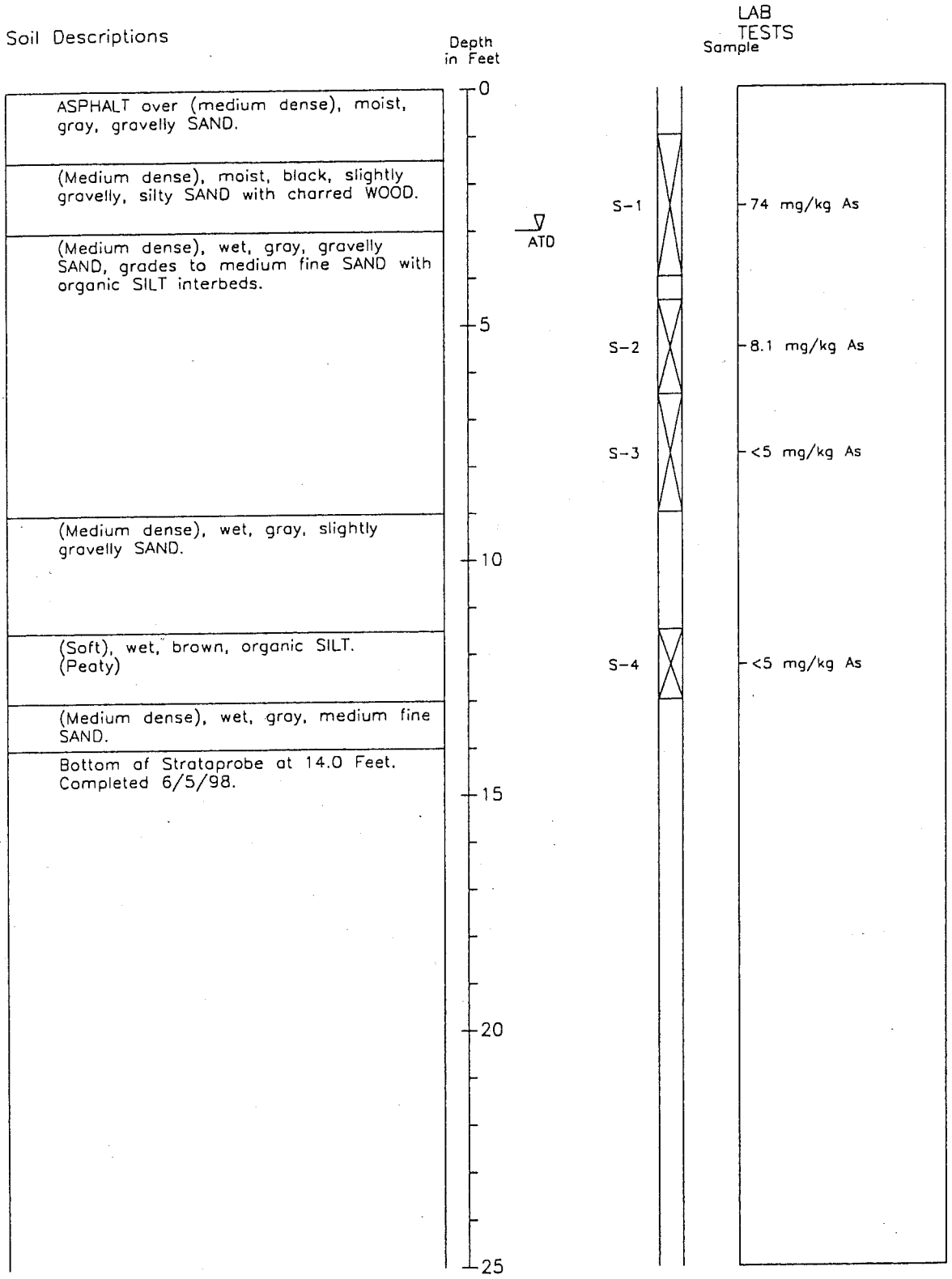
Figure A-25

=1 ACAD LOG

Strataprobe Log HC-25



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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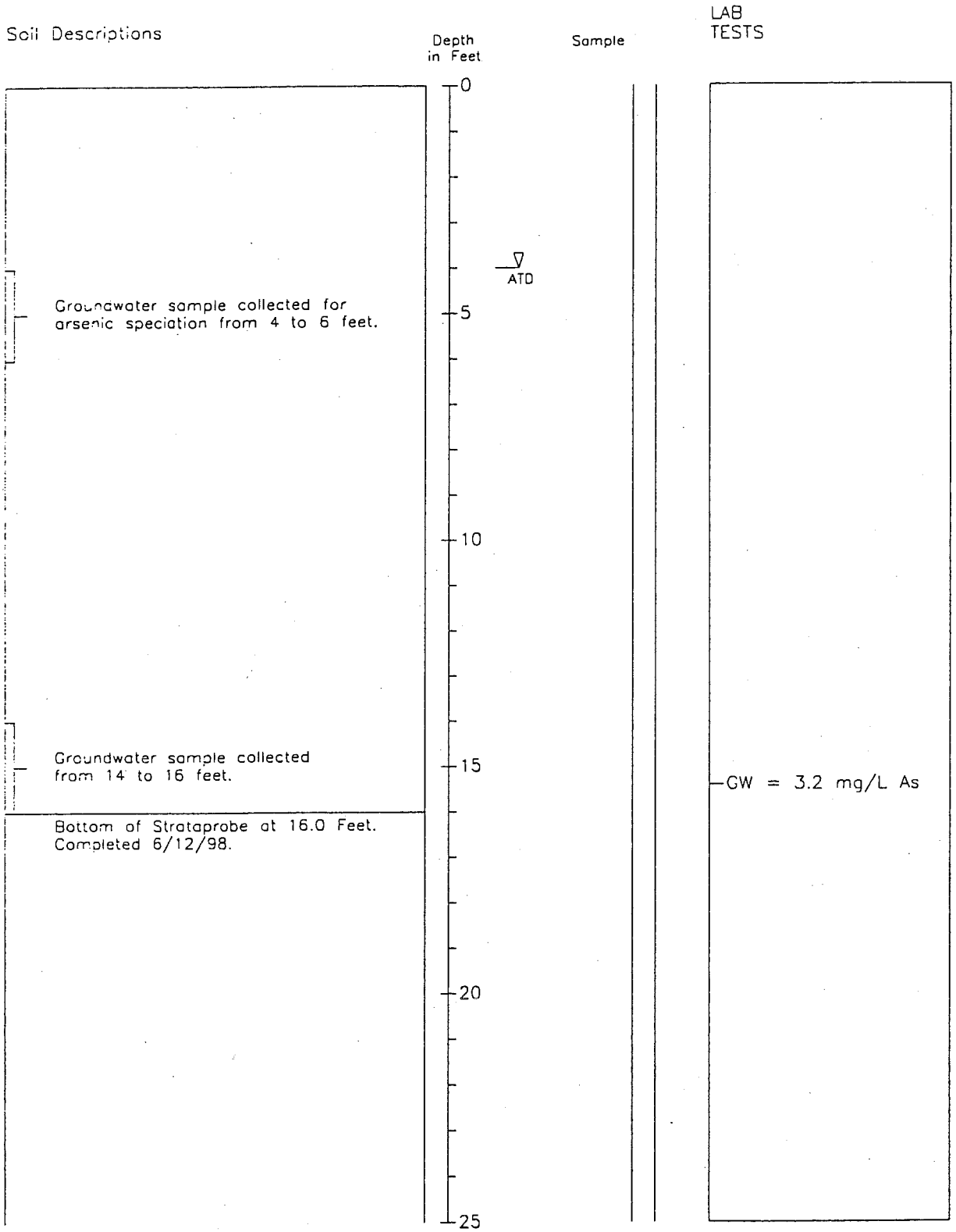
Figure A-26

1=1 ACAD LOG

Strataprobe Log HC-26



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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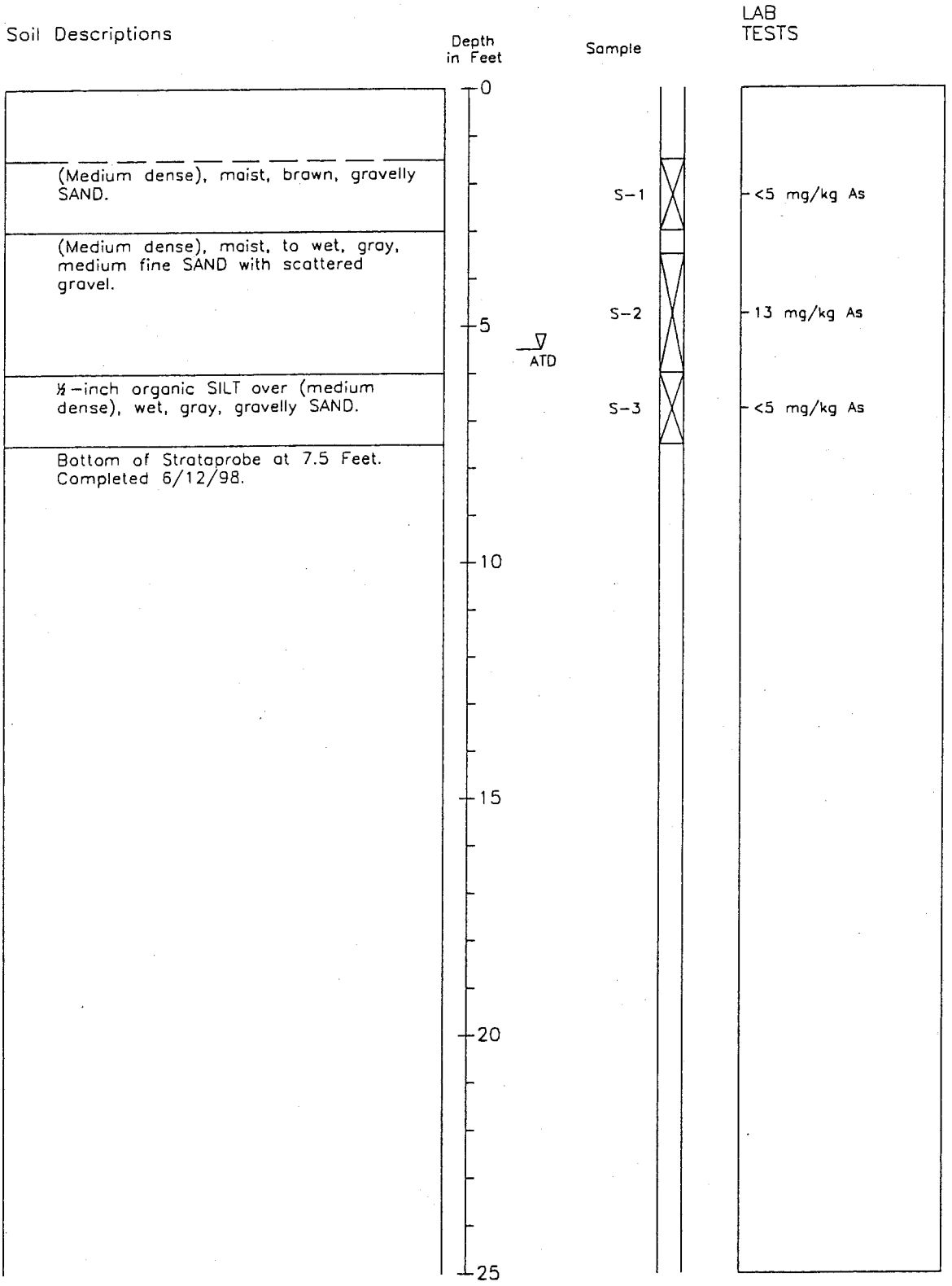
Figure A-27

1=1 ACAD LOG

Strataprobe Log HC-27



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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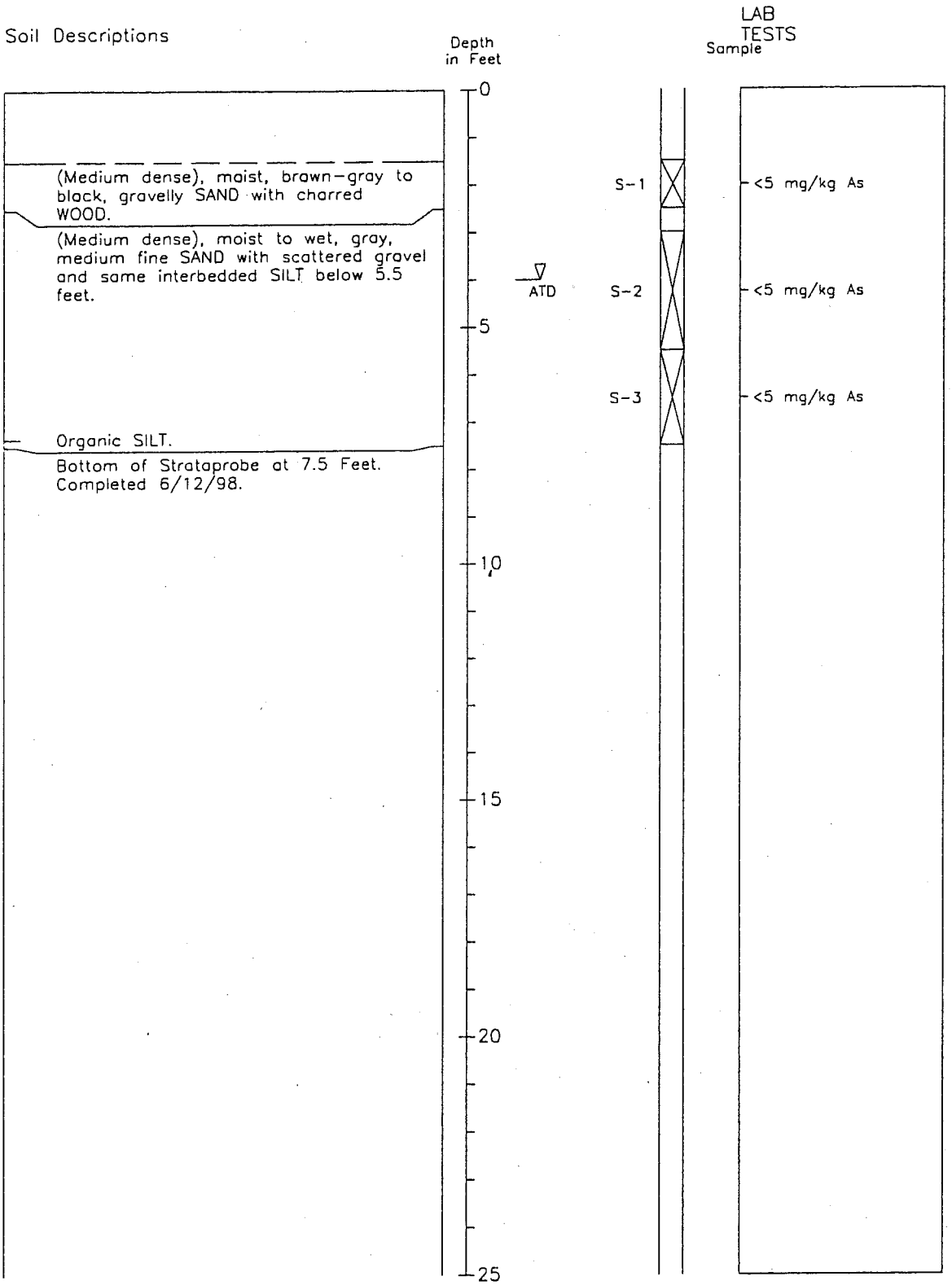
Figure A-28

1=1 ACAD LOG

Strataprobe Log HC-28



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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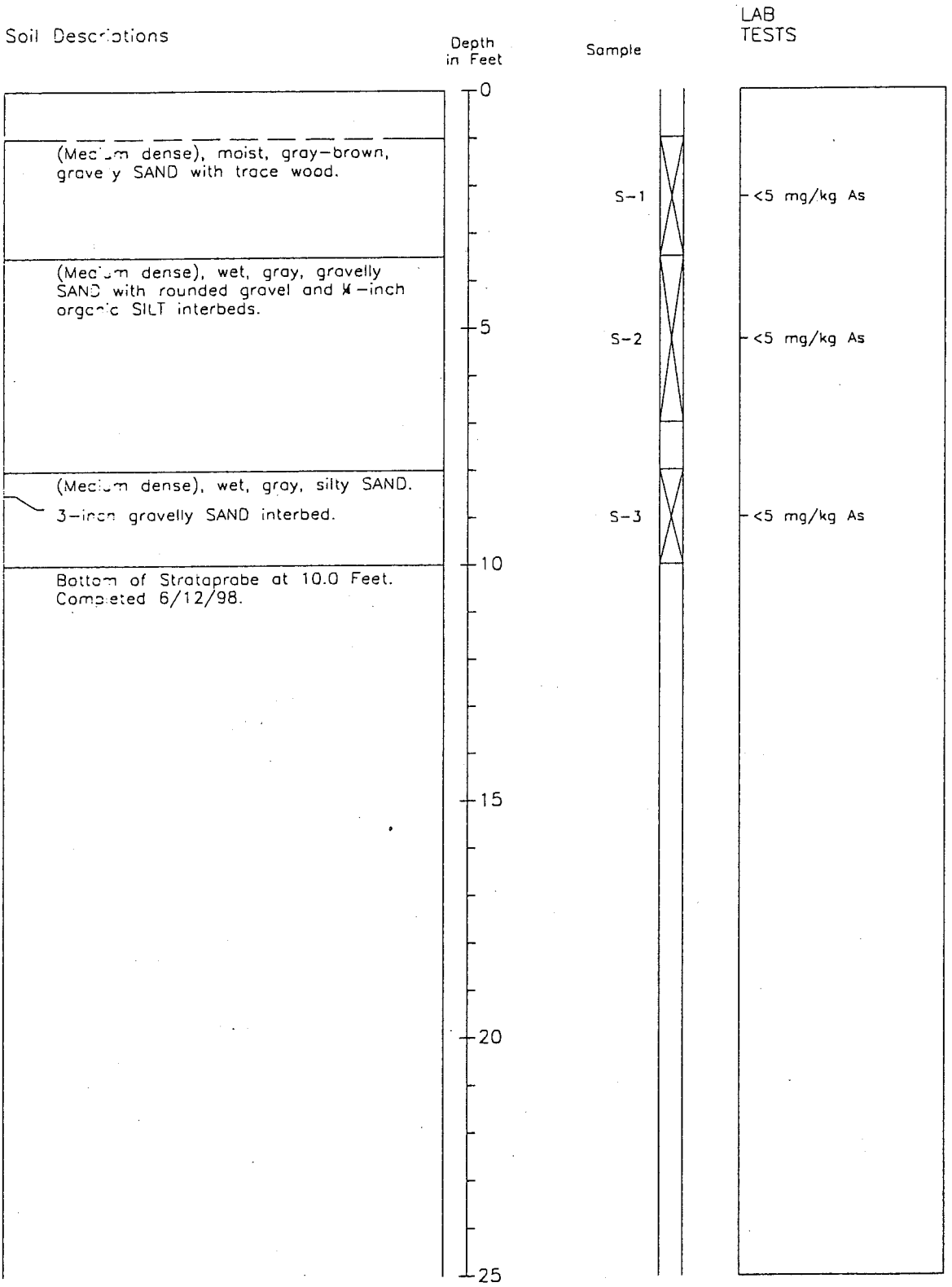
Figure A-29

=1 ACAD LOG

Strataprobe Log HC-29



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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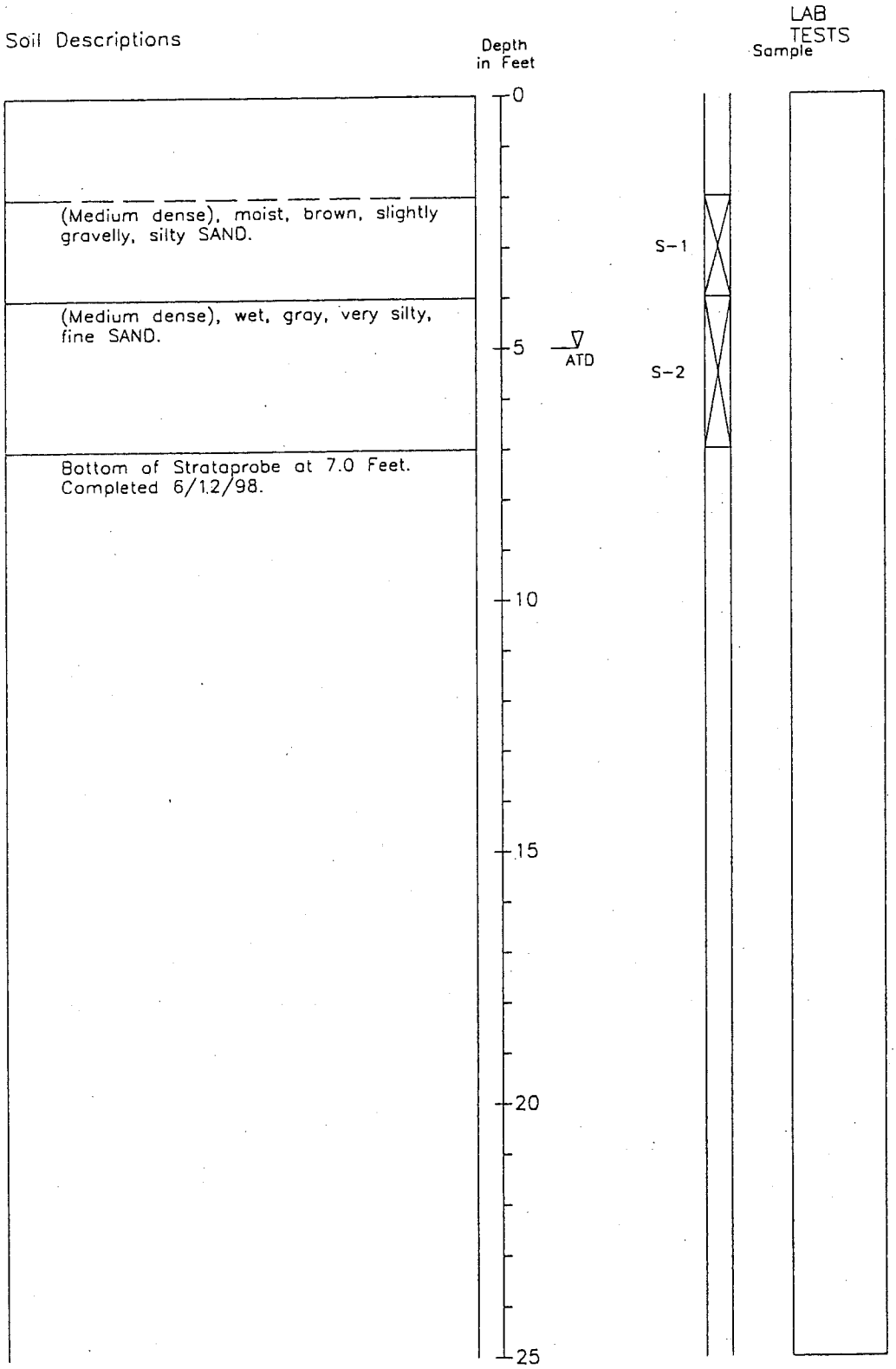
Figure A-30

1=1 ACAD LOG

Strataprobe Log HC-30



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Graund water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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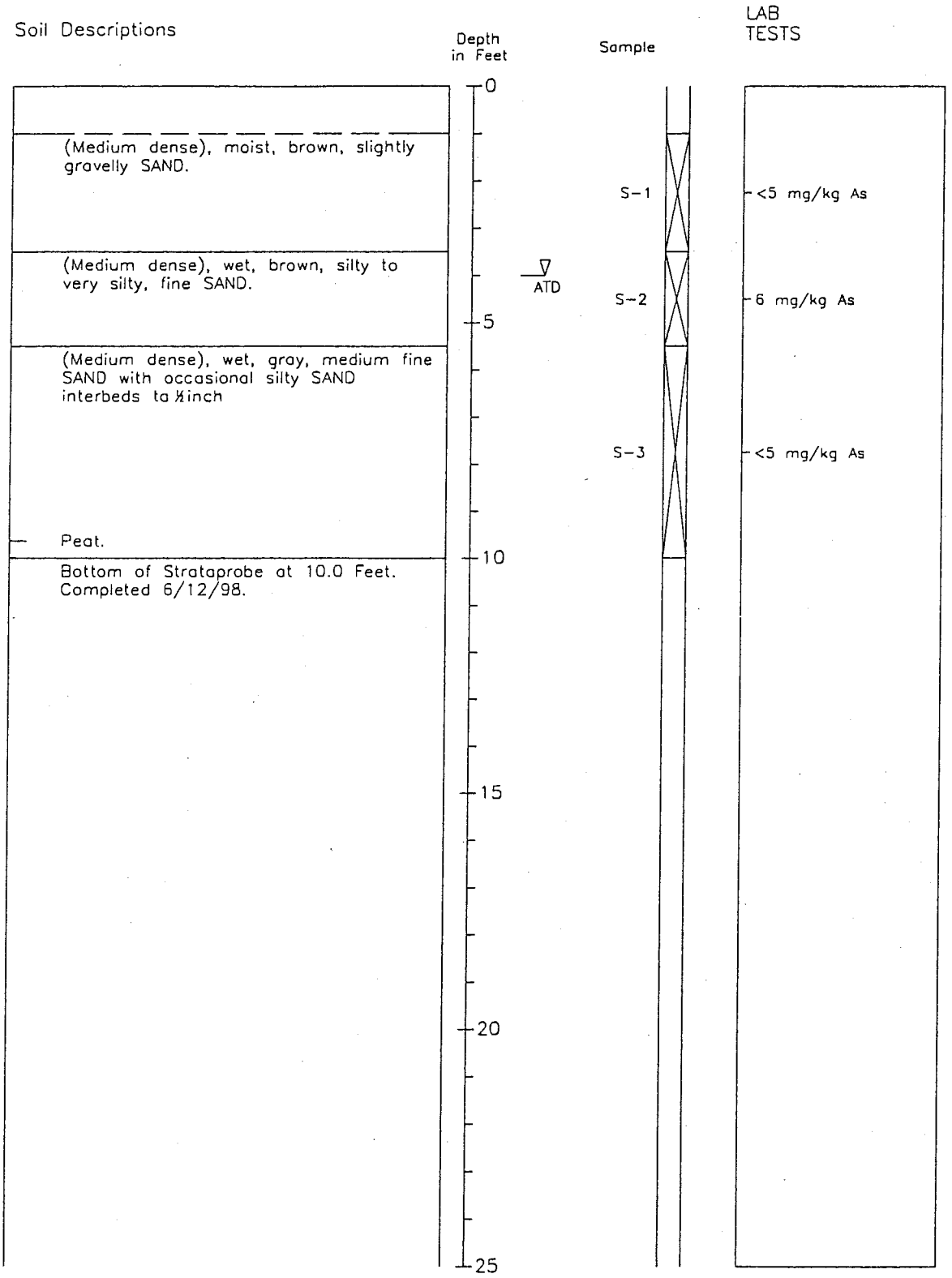
Figure A-31

=1 ACAD LOG

Strataprobe Log HC-31



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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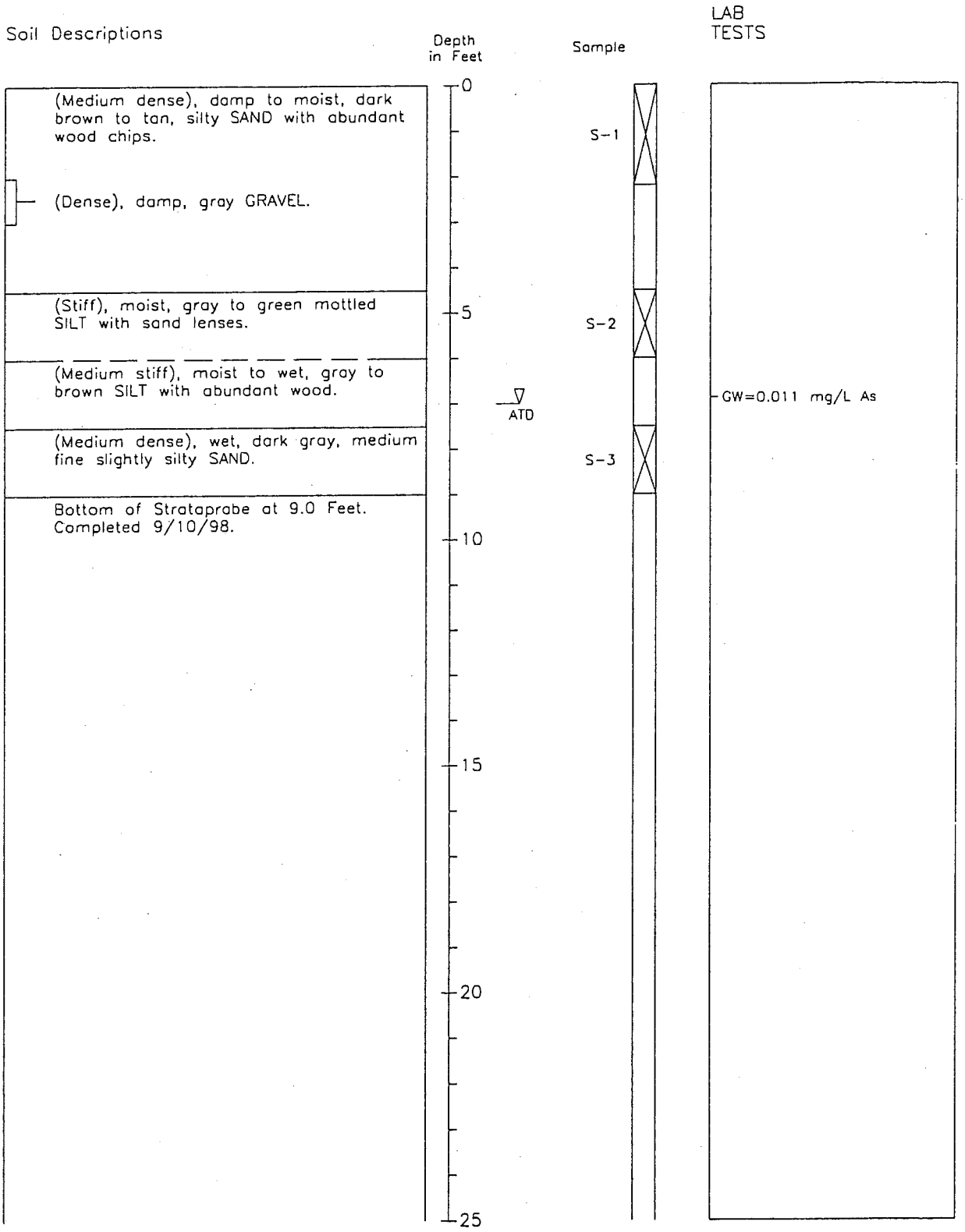
Figure A-32

1=1 ACAD LOG

Strataprobe Log HC-32



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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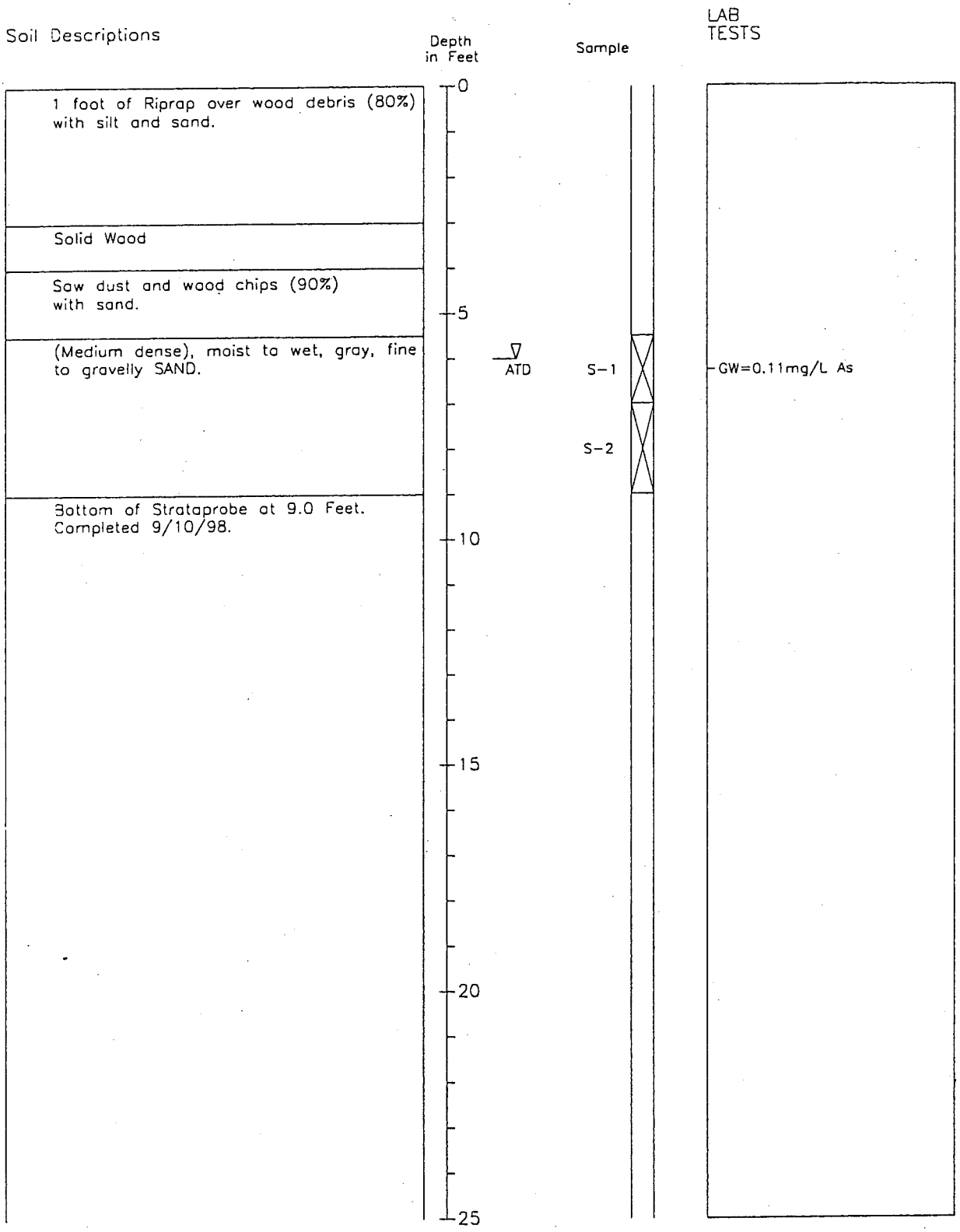
Figure A-33

=1 ACAD LOG

Strataprobe Log HC-33



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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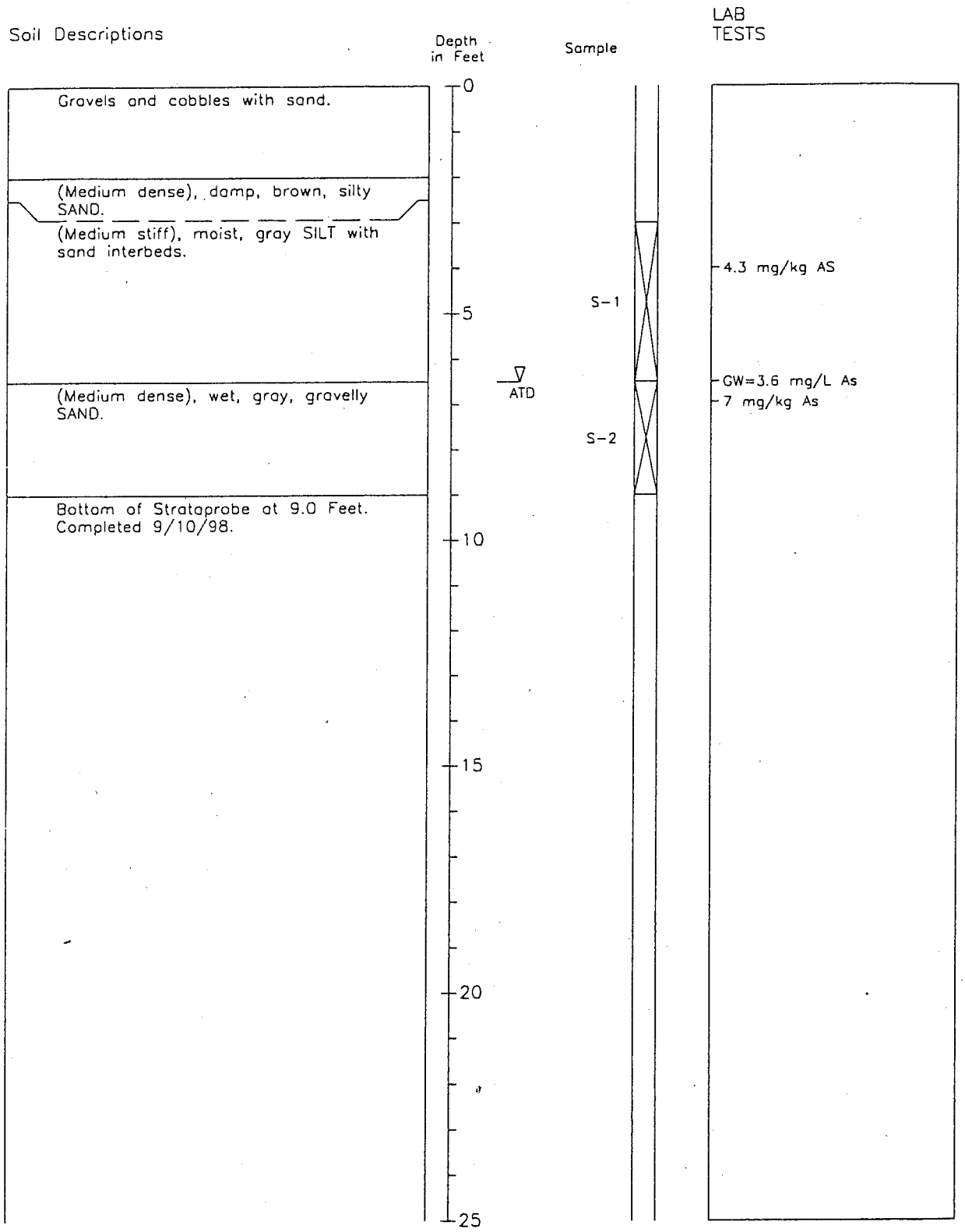
Figure A-34

1=1 ACAD LOG

Strataprobe Log HC-34



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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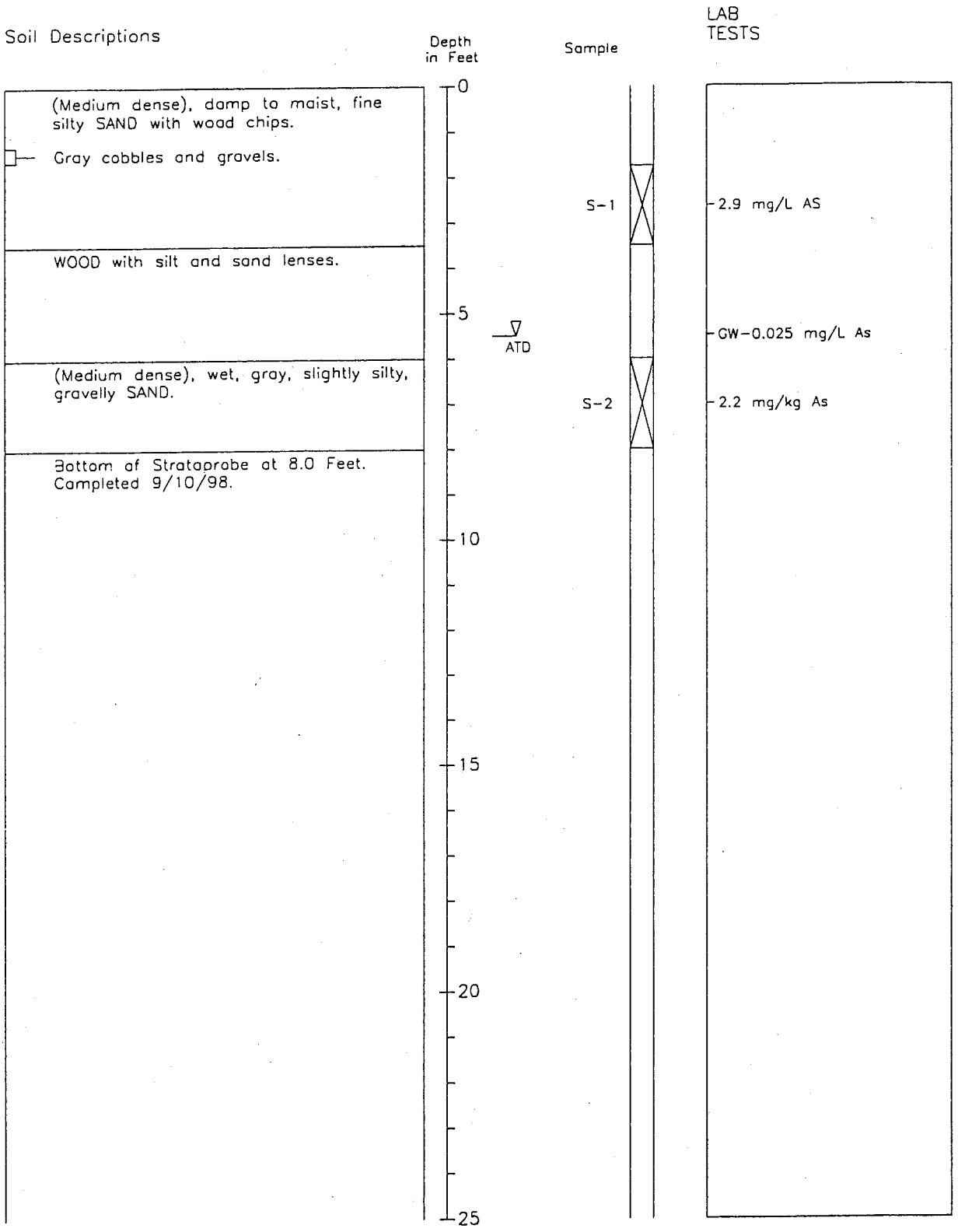
Figure A-35

1=1 ACAD LOG

Strataprobe Log HC-35



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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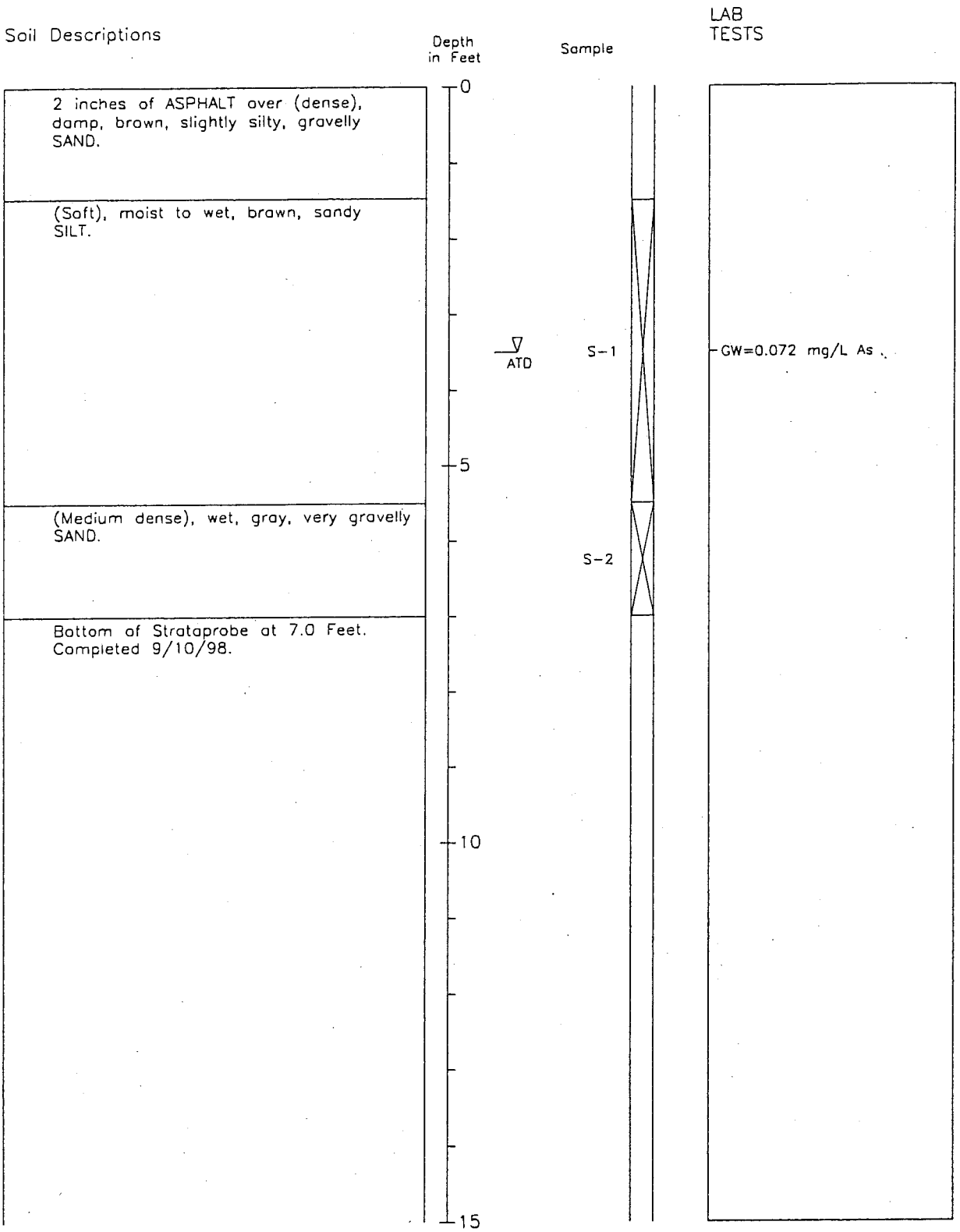
Figure A-36

=1 ACAD LOG

Strataprobe Log HC-36



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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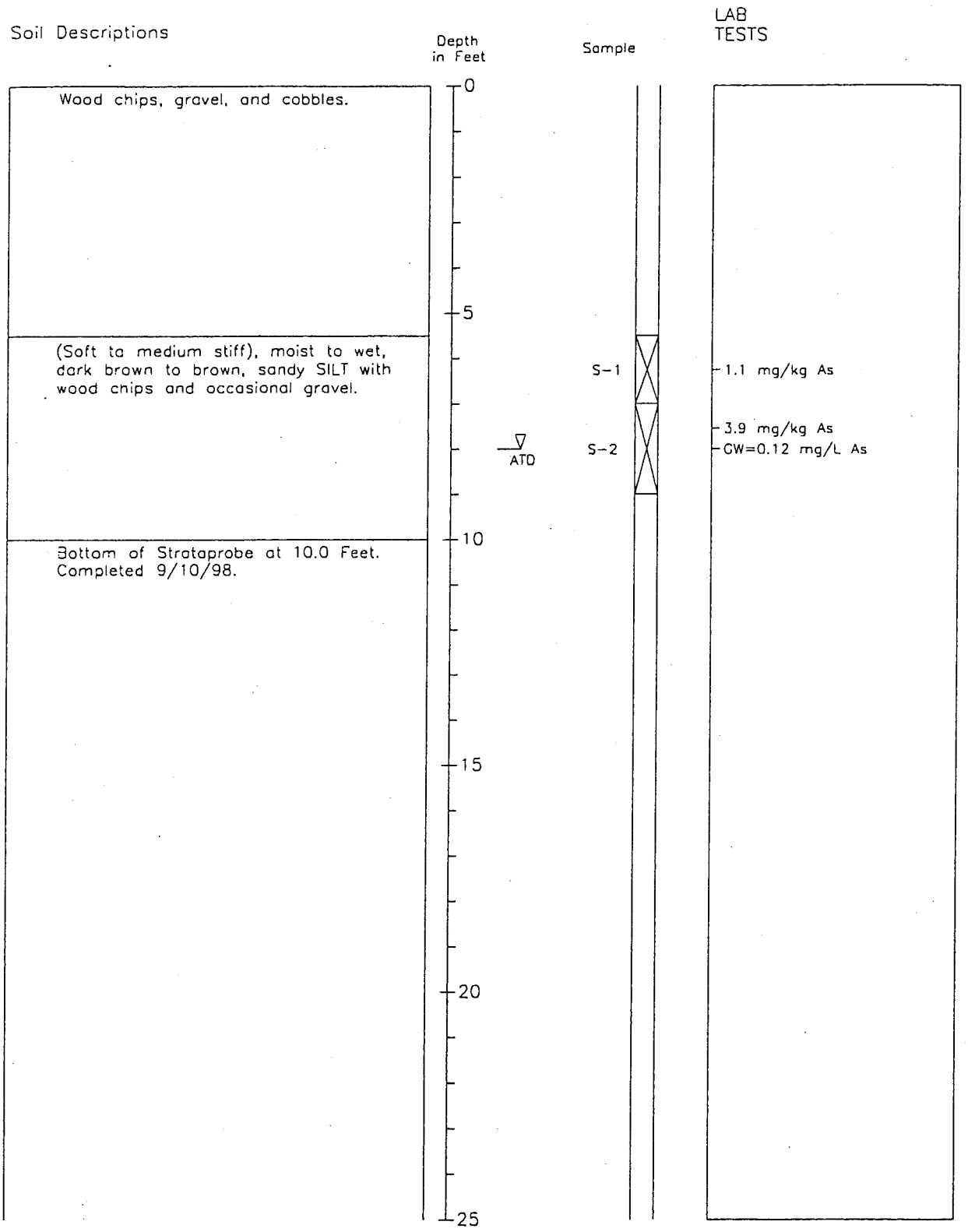
Figure A-37

I=1 ACAD LOG

Strataprobe Log HC-37



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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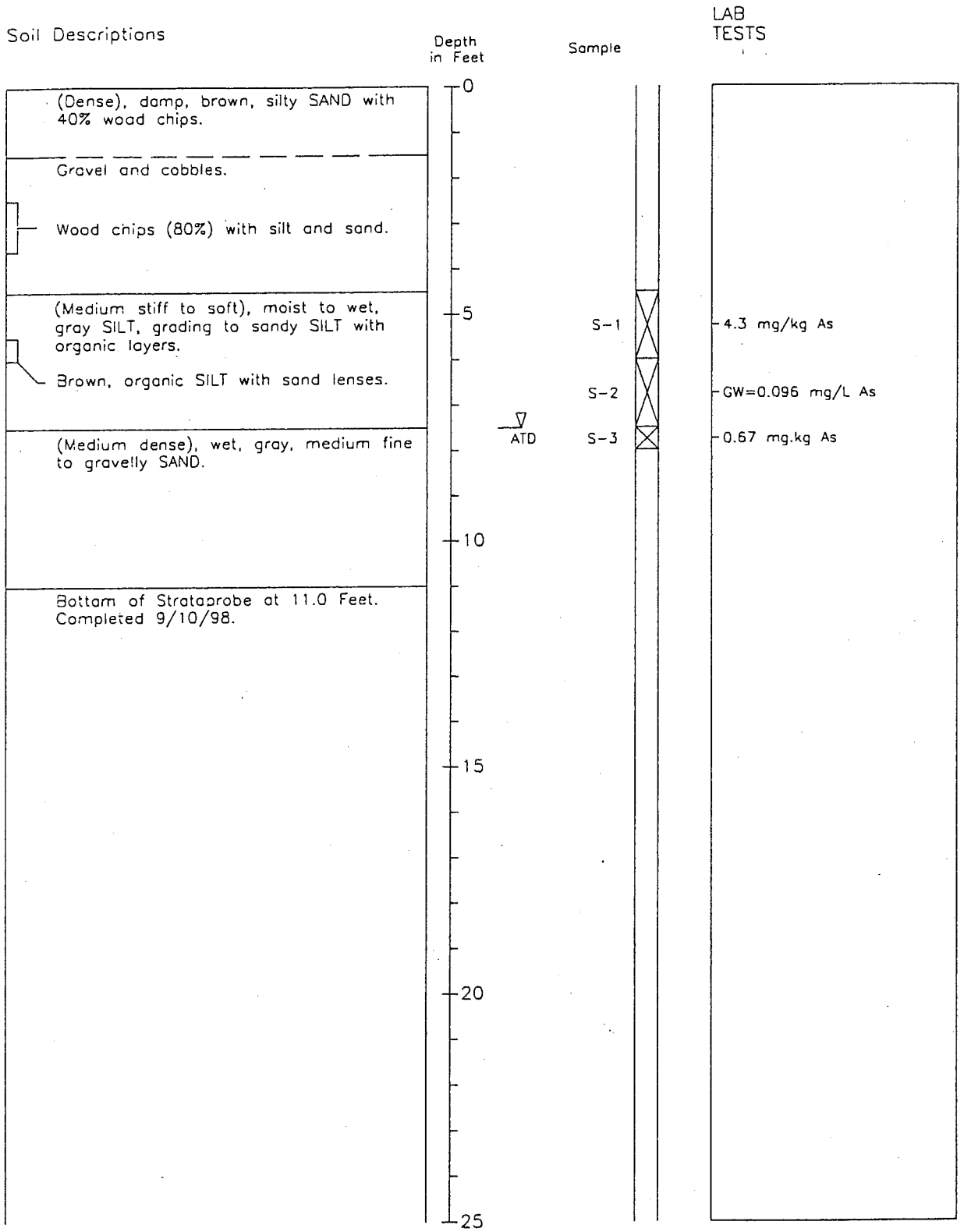
Figure A-38

1=1 ACAD LOG

Strataprobe Log HC-38



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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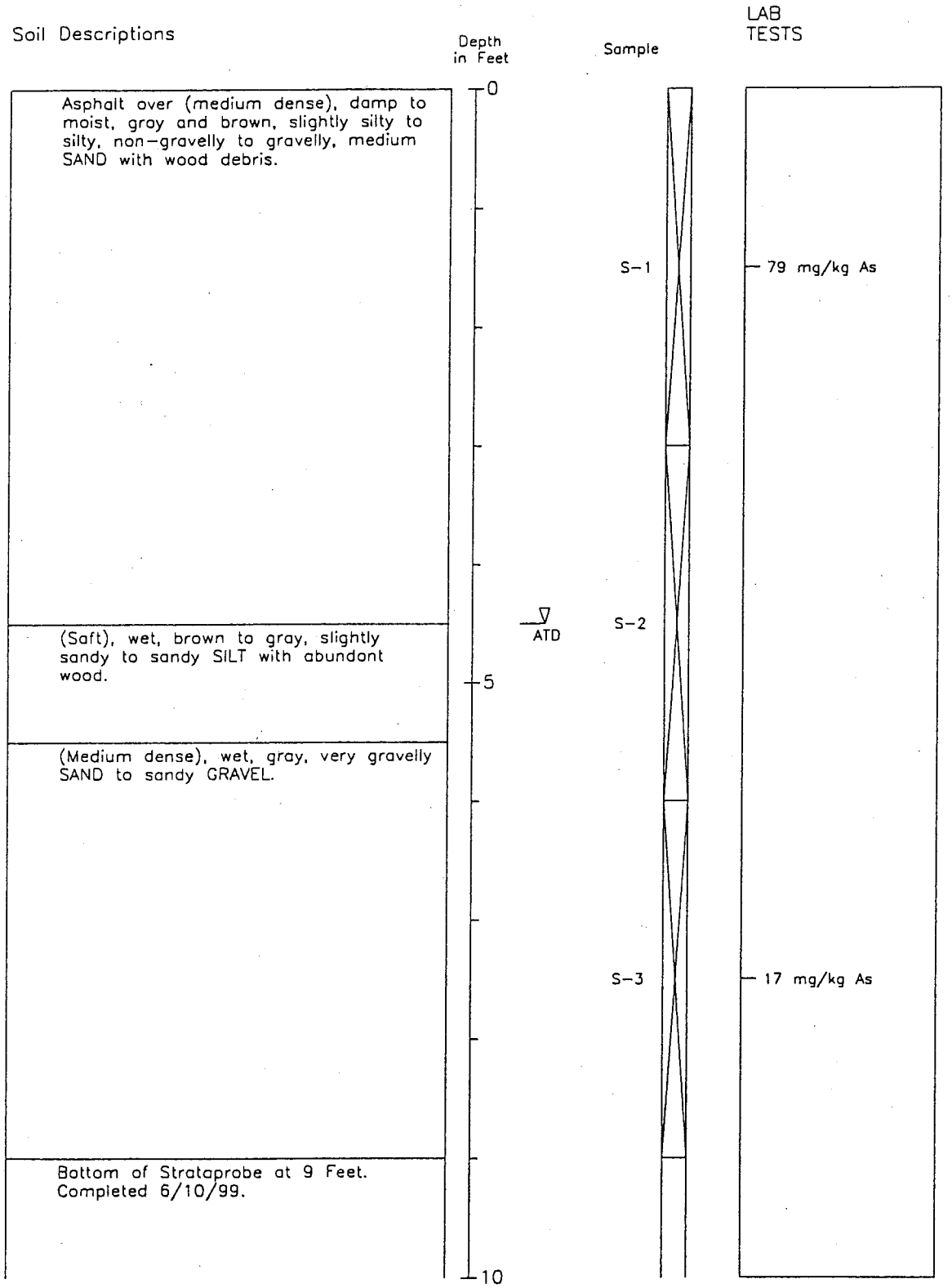
Figure A-39

1=1 ACAD LOG

Strataprobe Log HC-39



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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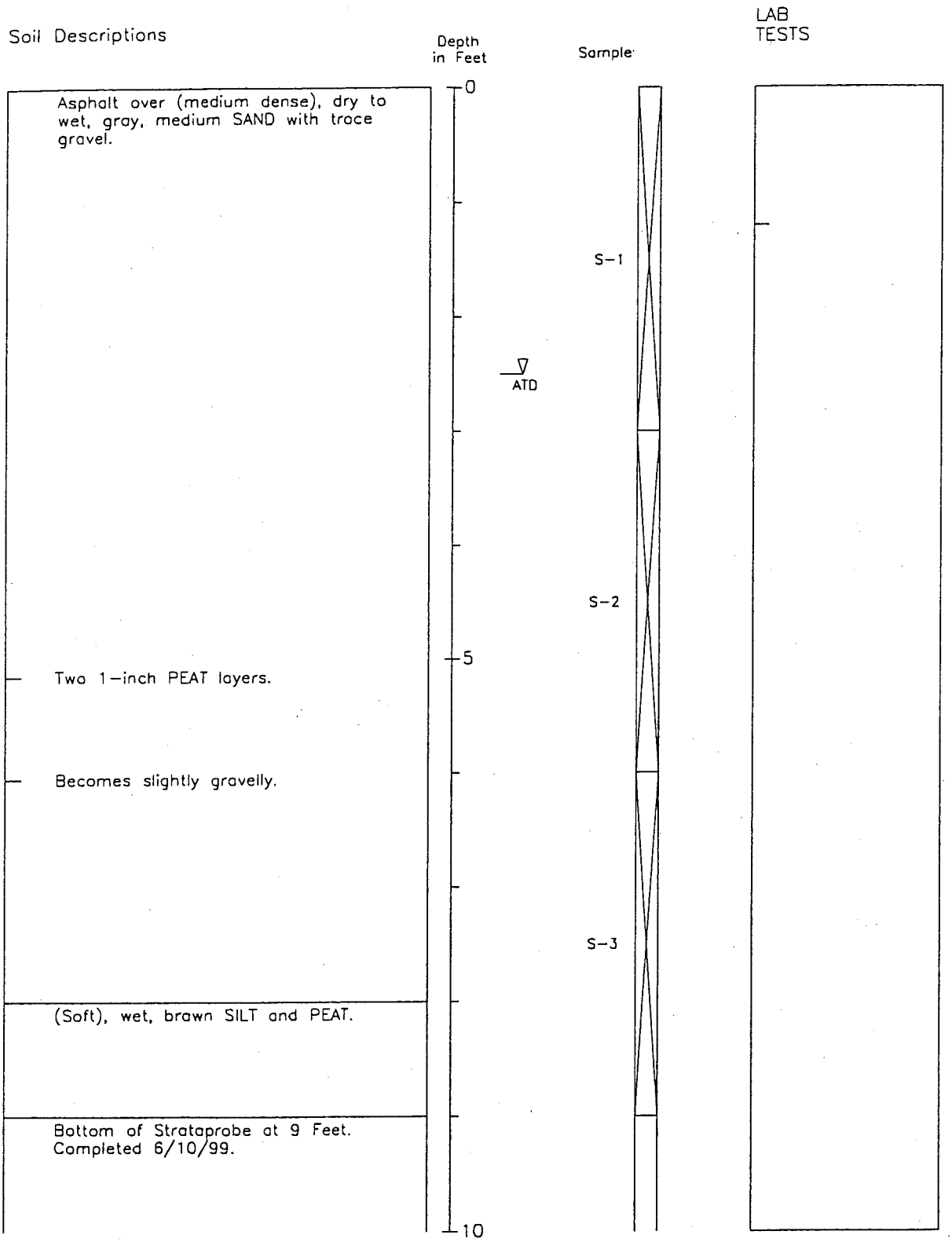
Figure A-40

1=1 ACAD LOG

Strataprobe Log HC-40



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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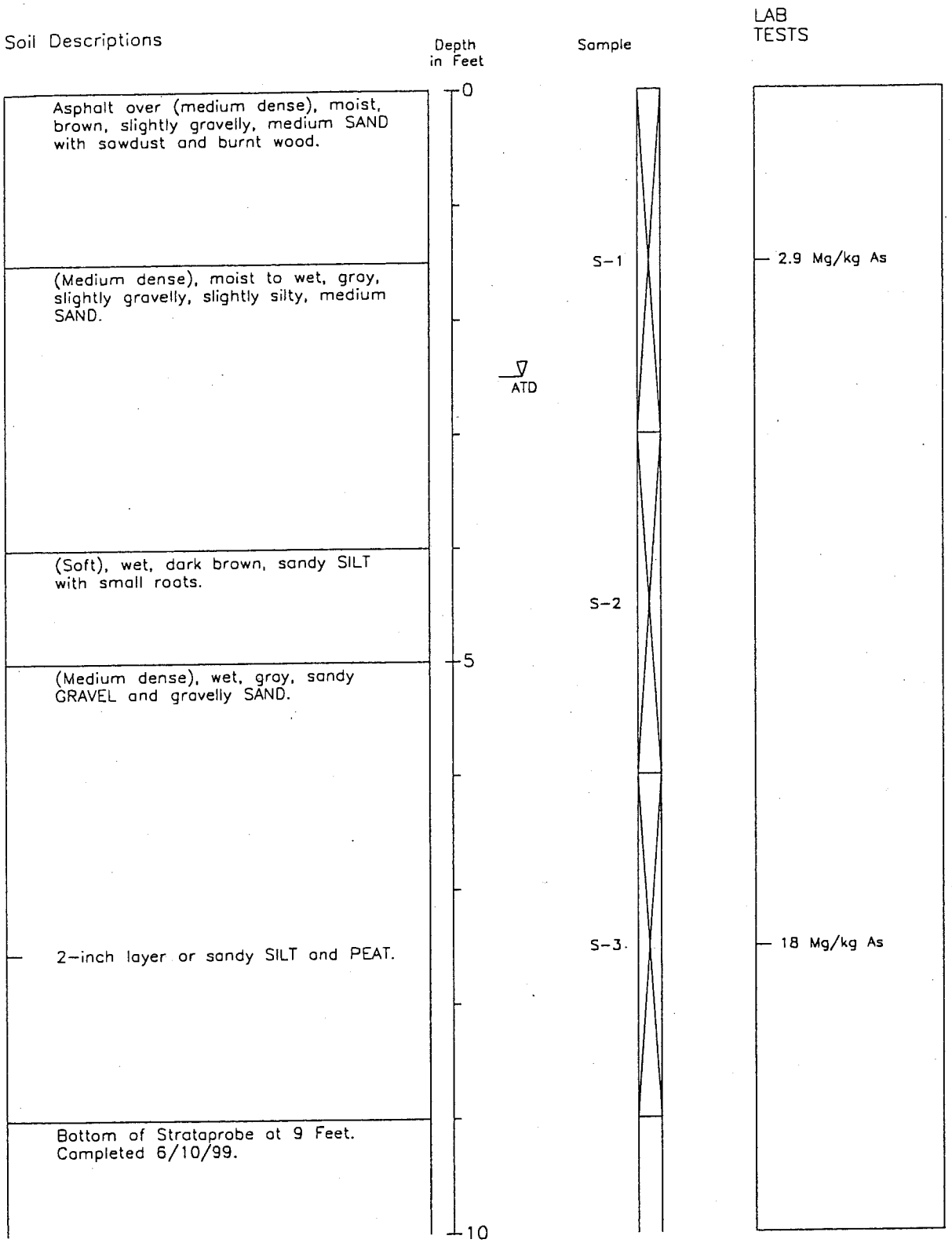
Figure A-41

1=1 ACAD LOG

Strataprobe Log HC-41



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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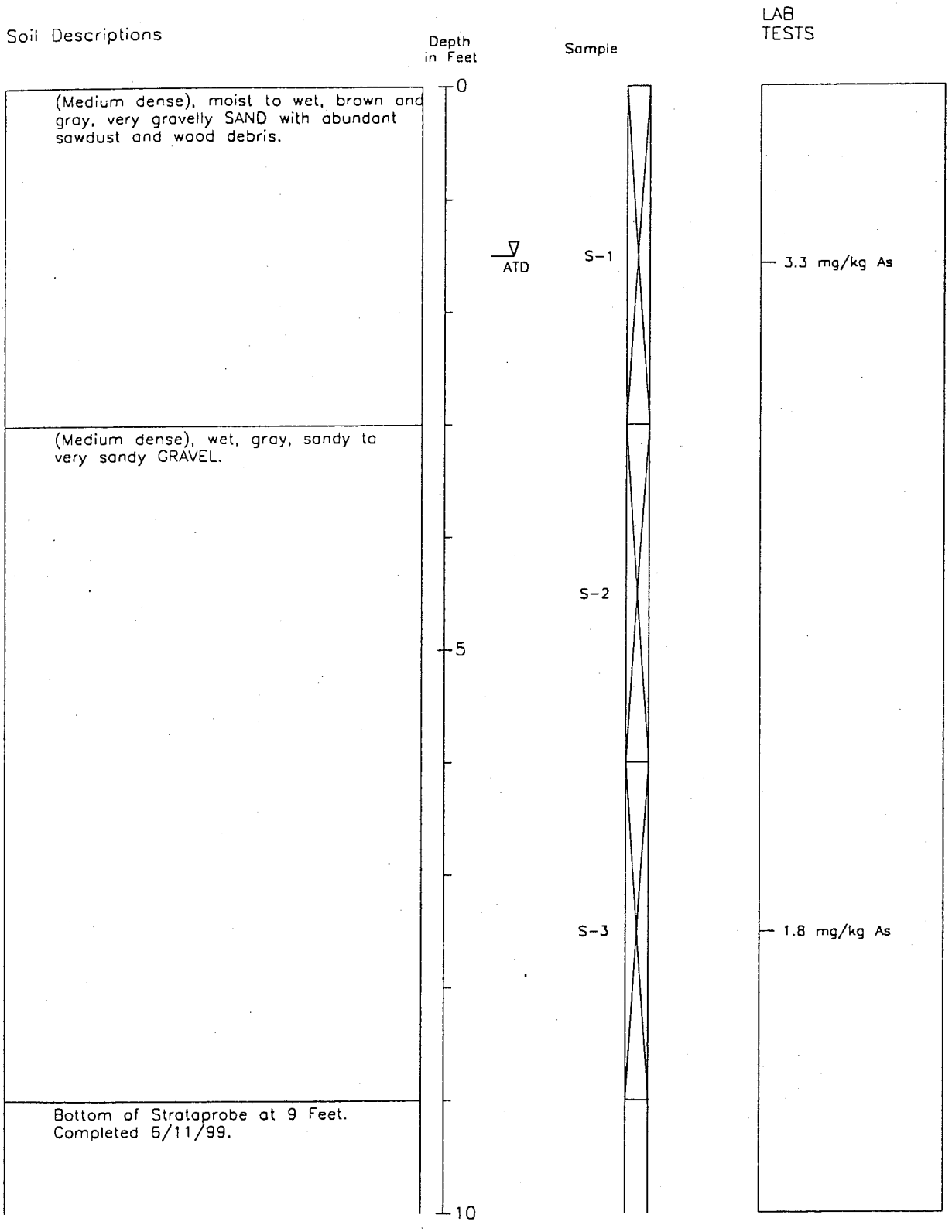
Figure A-42

1=1 ACAD LOG

Strataprobe Log HC-42



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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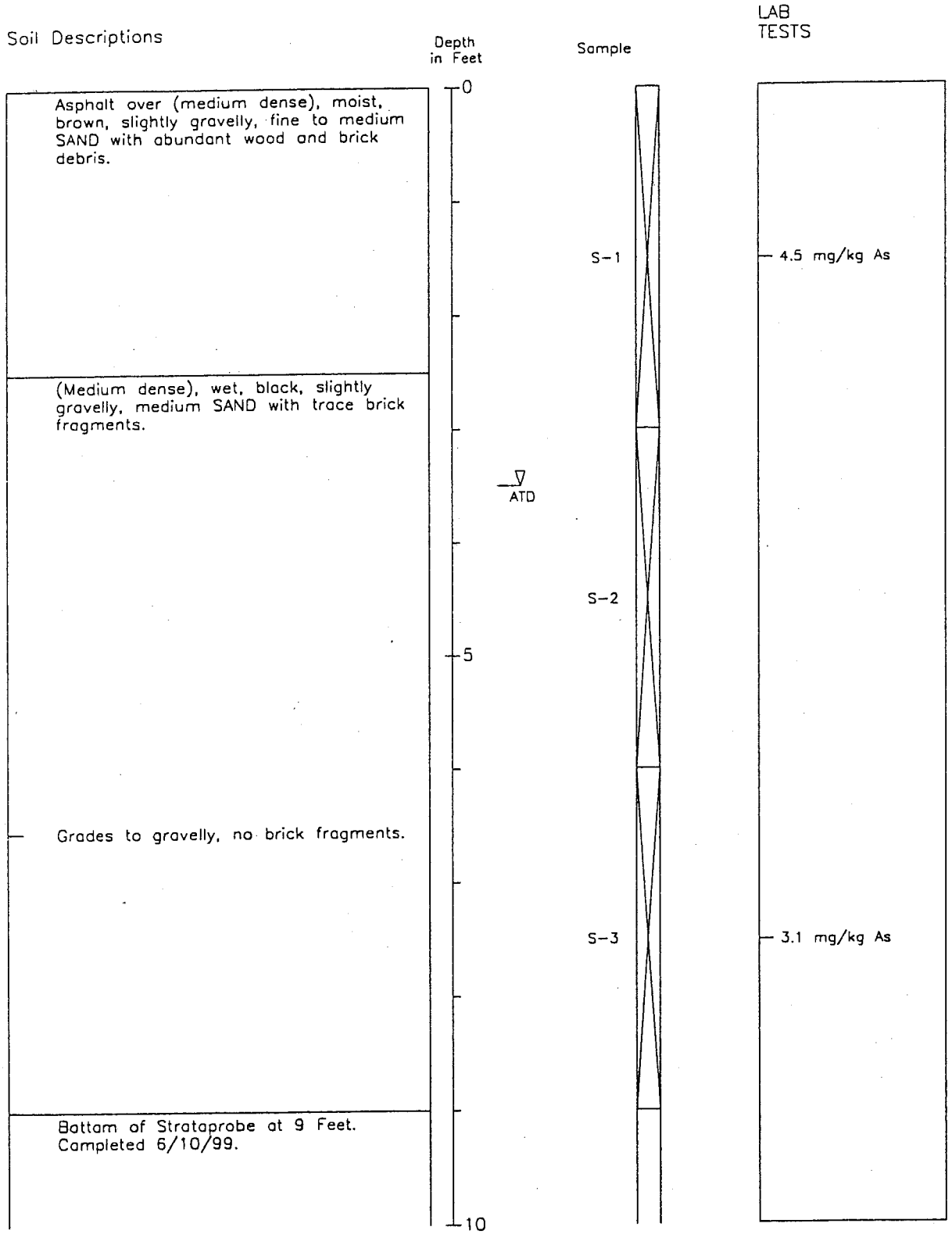
Figure A-43

1 ACAD LOG

Strataprobe Log HC-43



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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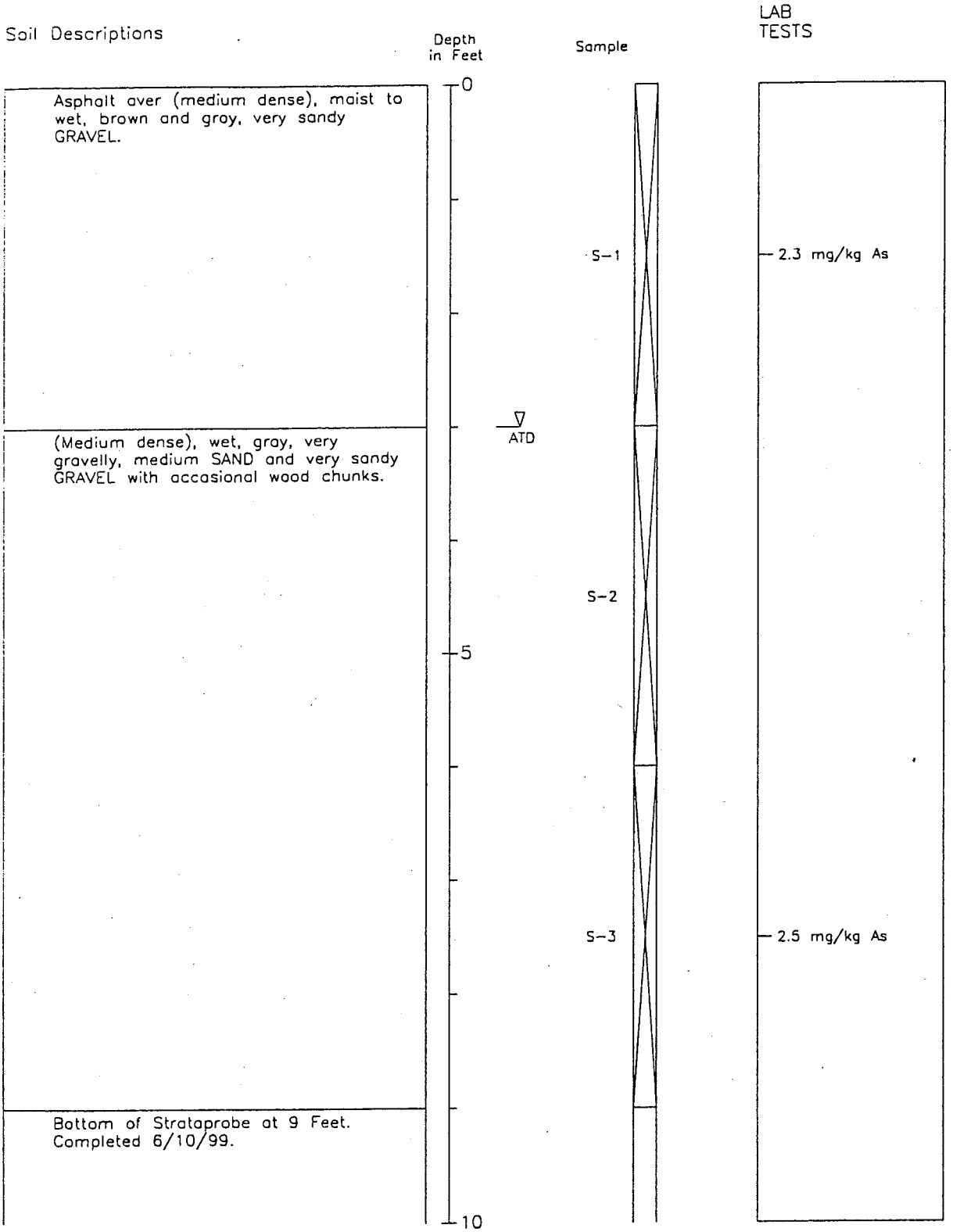
Figure A-44

1=1 ACAD LOG

Strataprobe Log HC-44



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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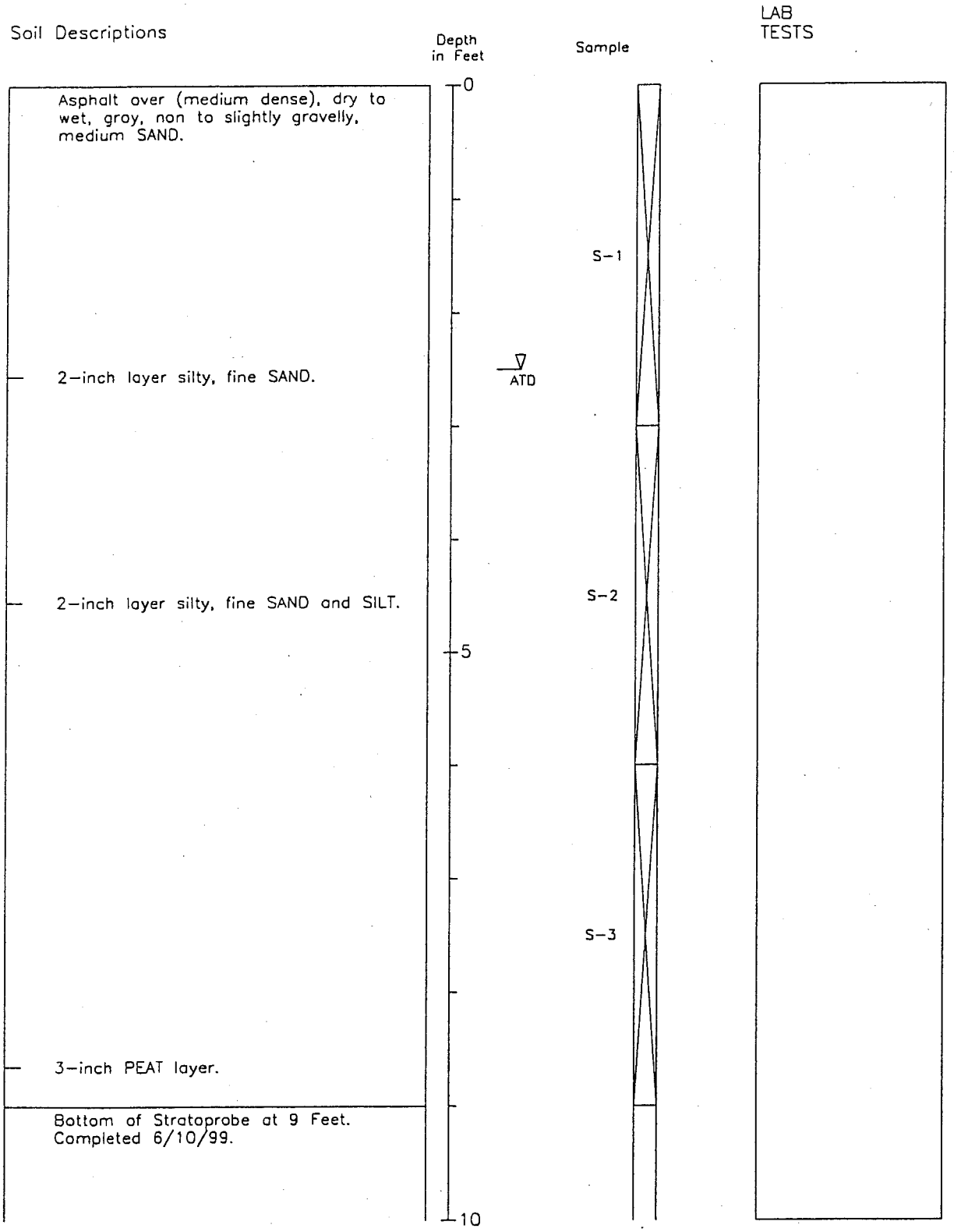
Figure A-45

1=1 ACAD LOG

Strataprobe Log HC-45



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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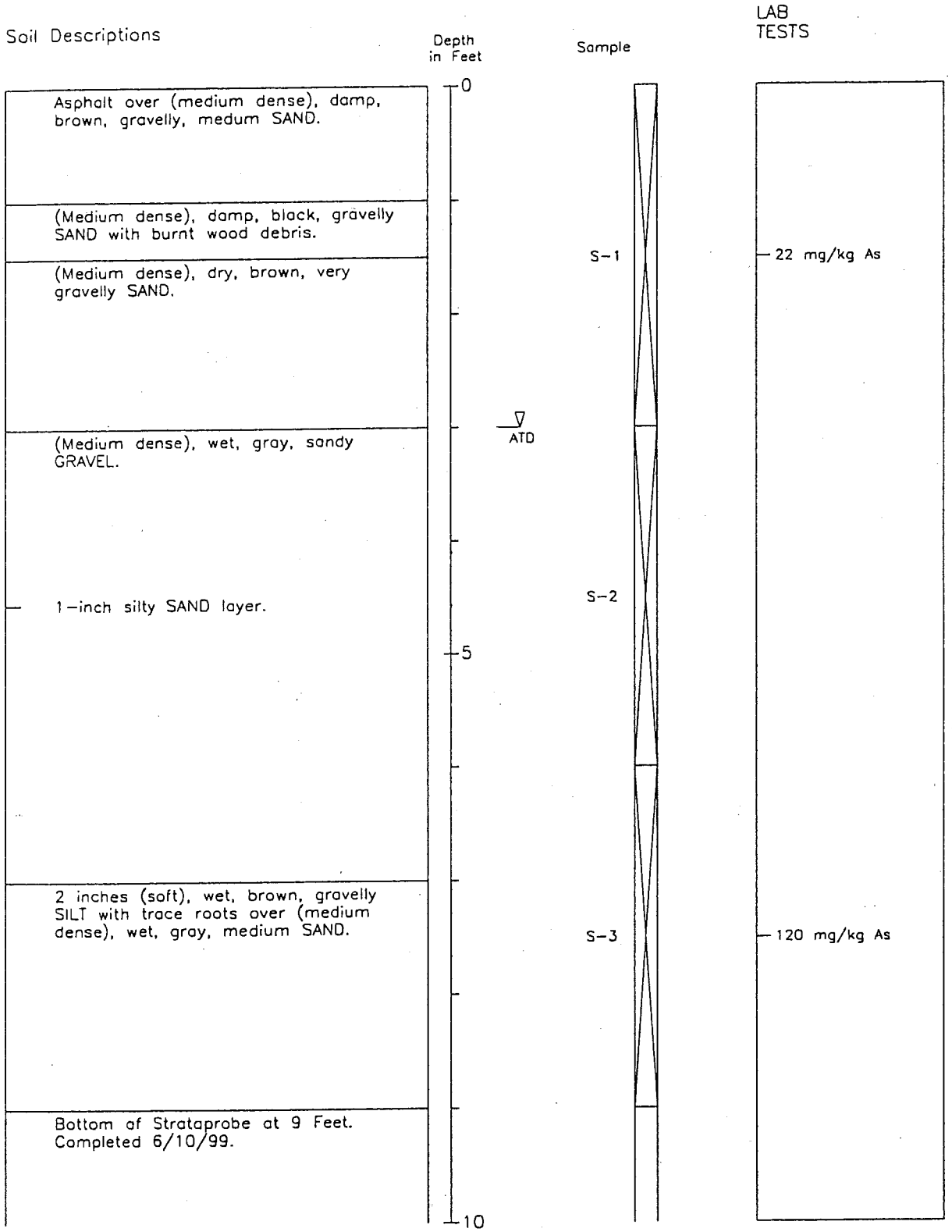
Figure A-46

=1 ACAD LOG

Strataprobe Log HC-46



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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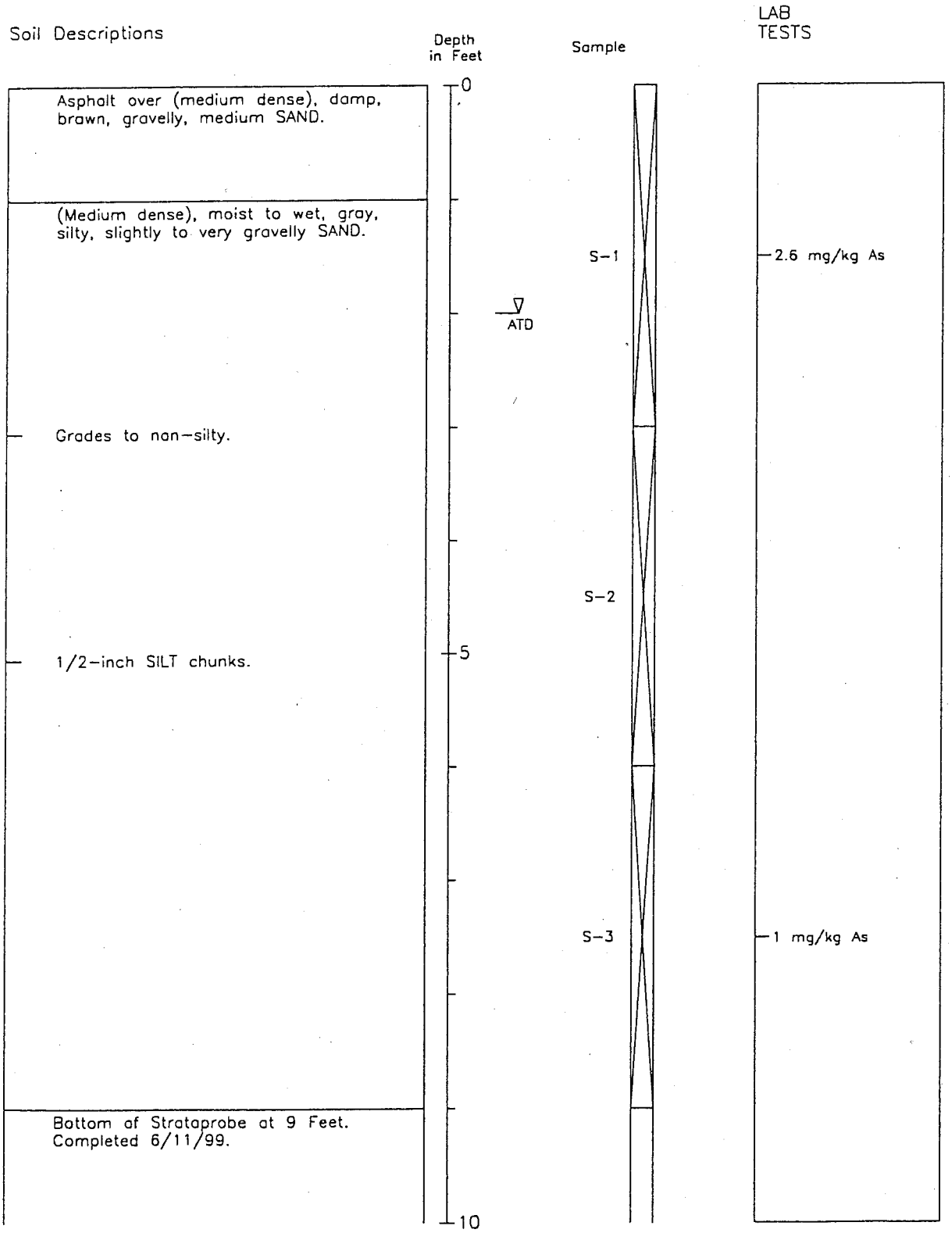
Figure A-47

=1 ACAD LOG

Strataprobe Log HC-47



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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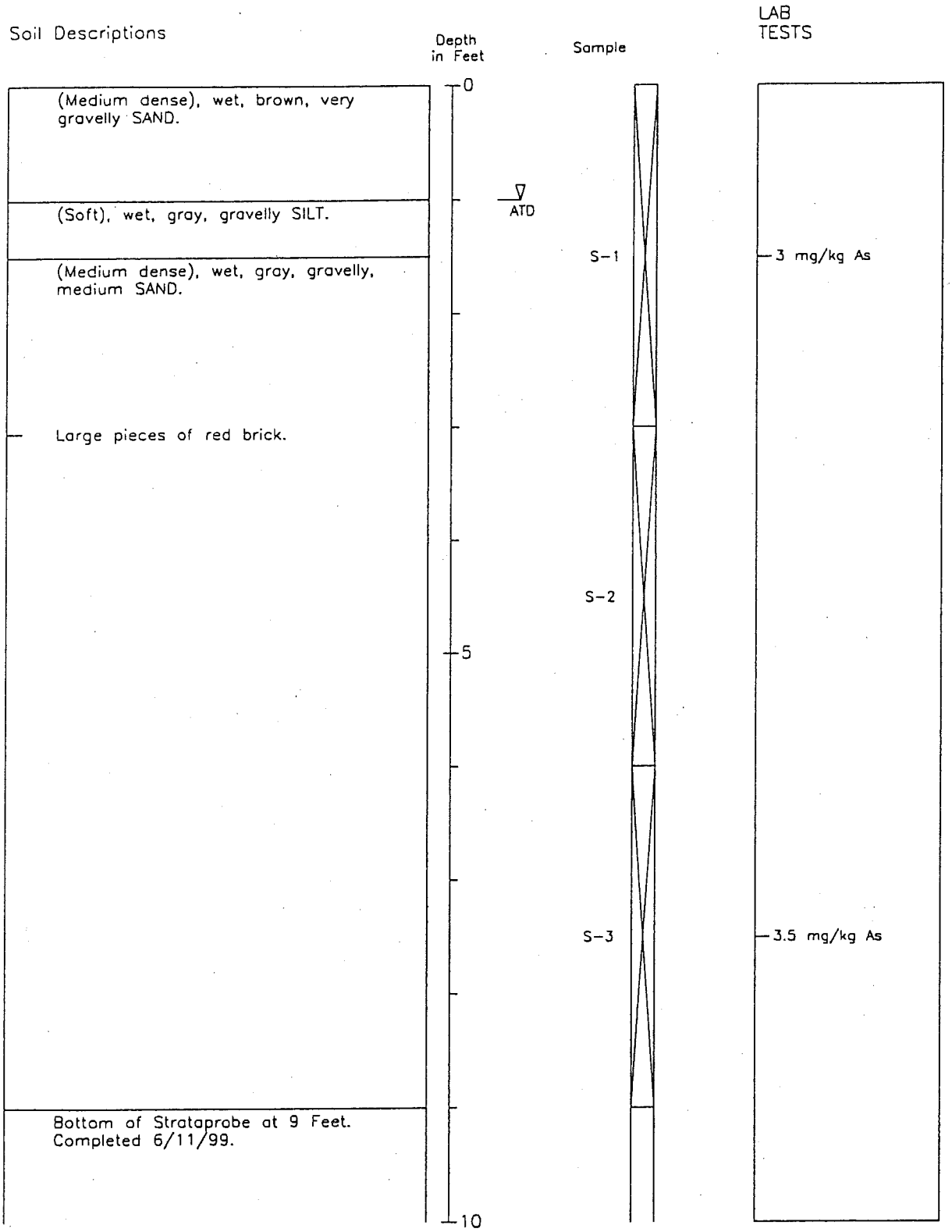
Figure A-48

1=1 ACAD LOG

Strataprobe Log HC-48



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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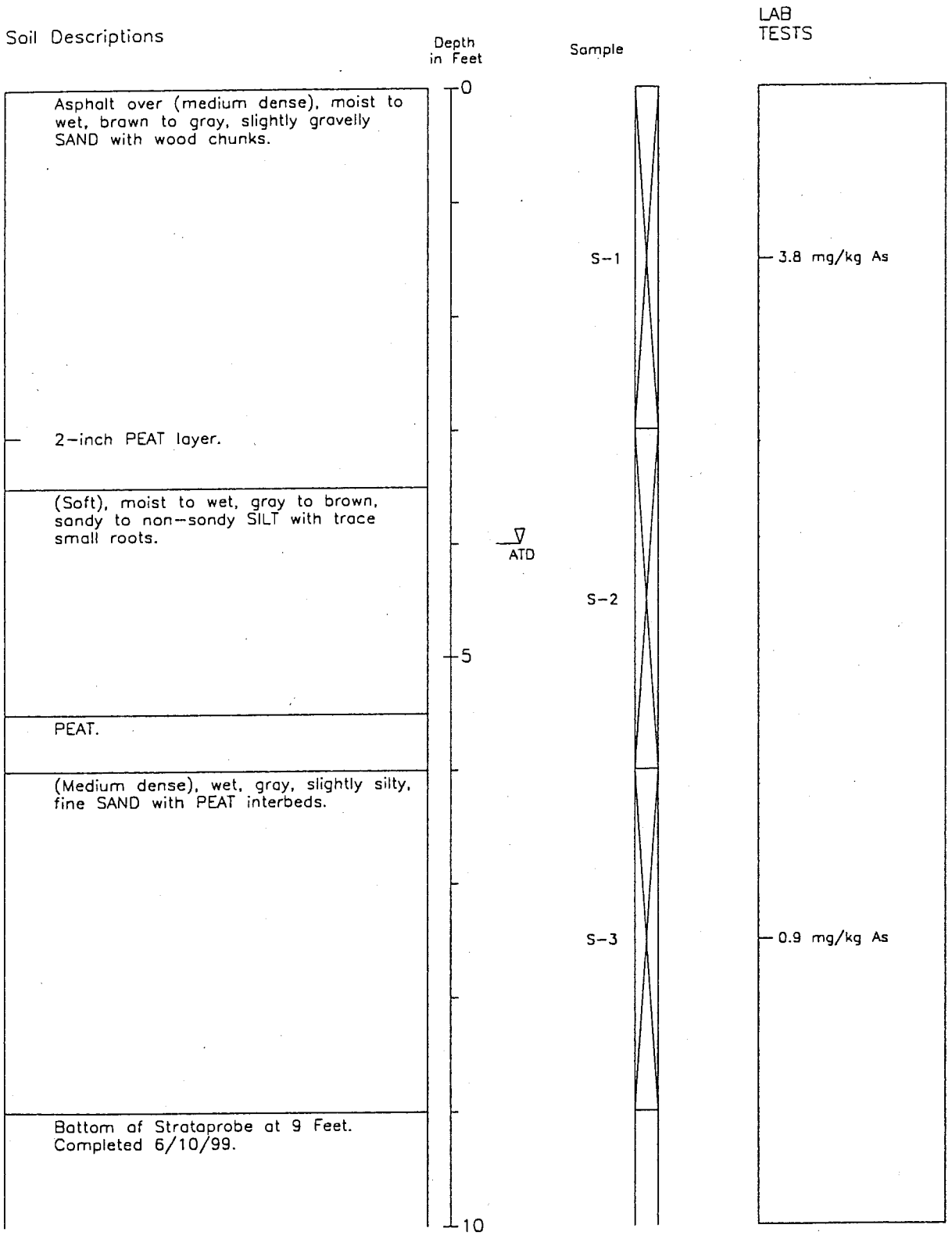
Figure A-49

=1 ACAD LOG

Strataprobe Log HC-49



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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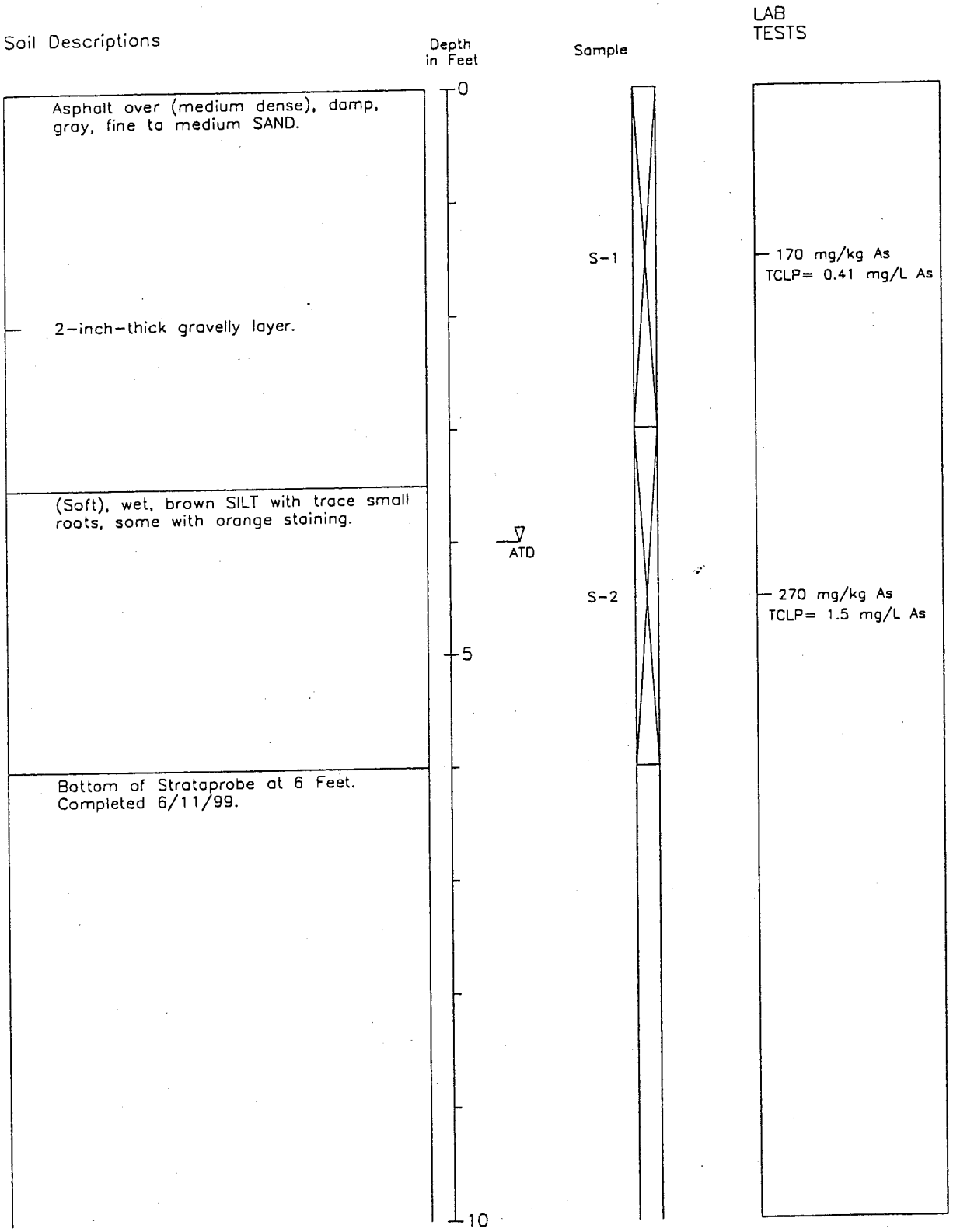
Figure A-50

1=1 ACAD LOG

Strataprobe Log HC-50



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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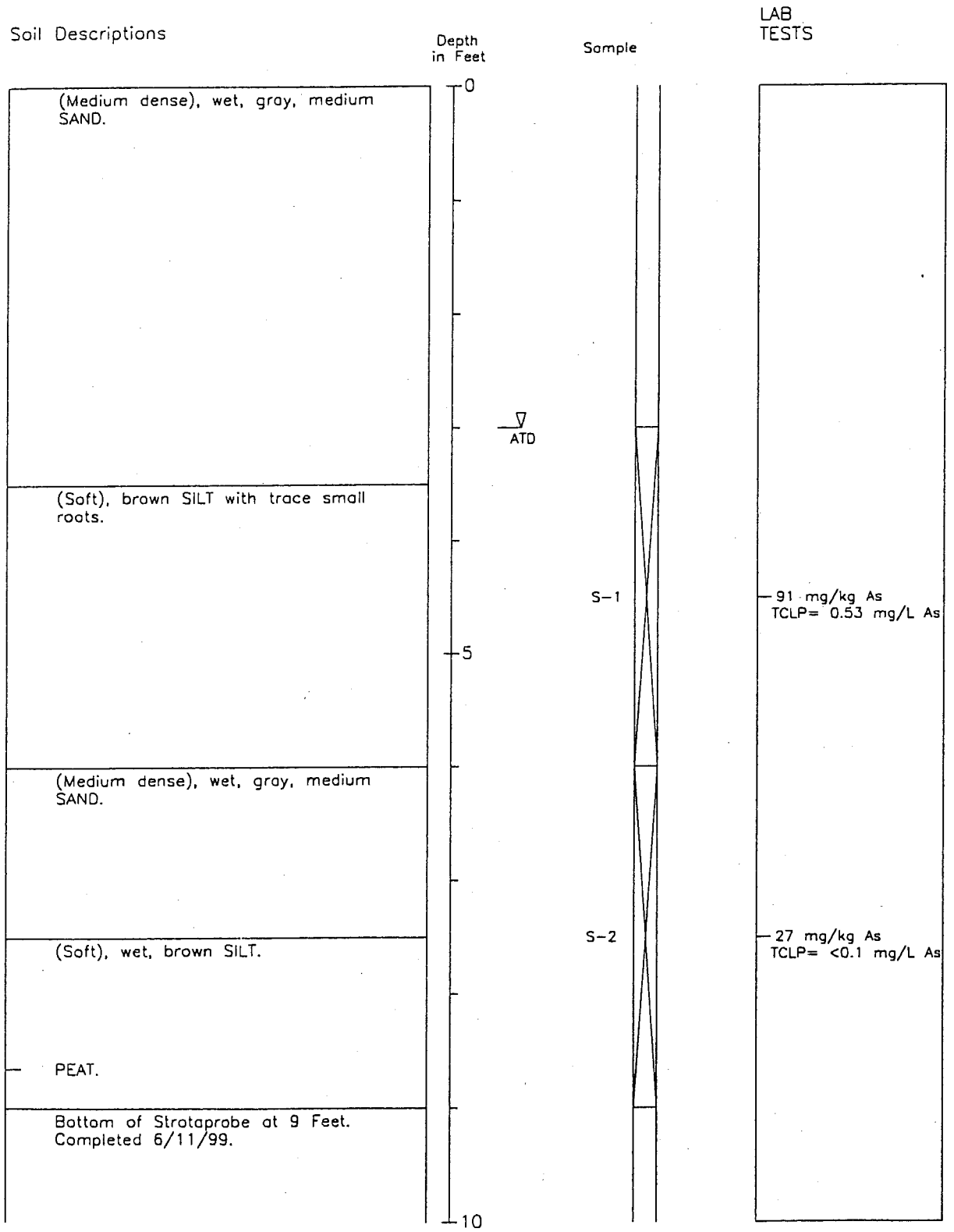
Figure A-51

=1 ACAD LOG

Strataprobe Log HC-51



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

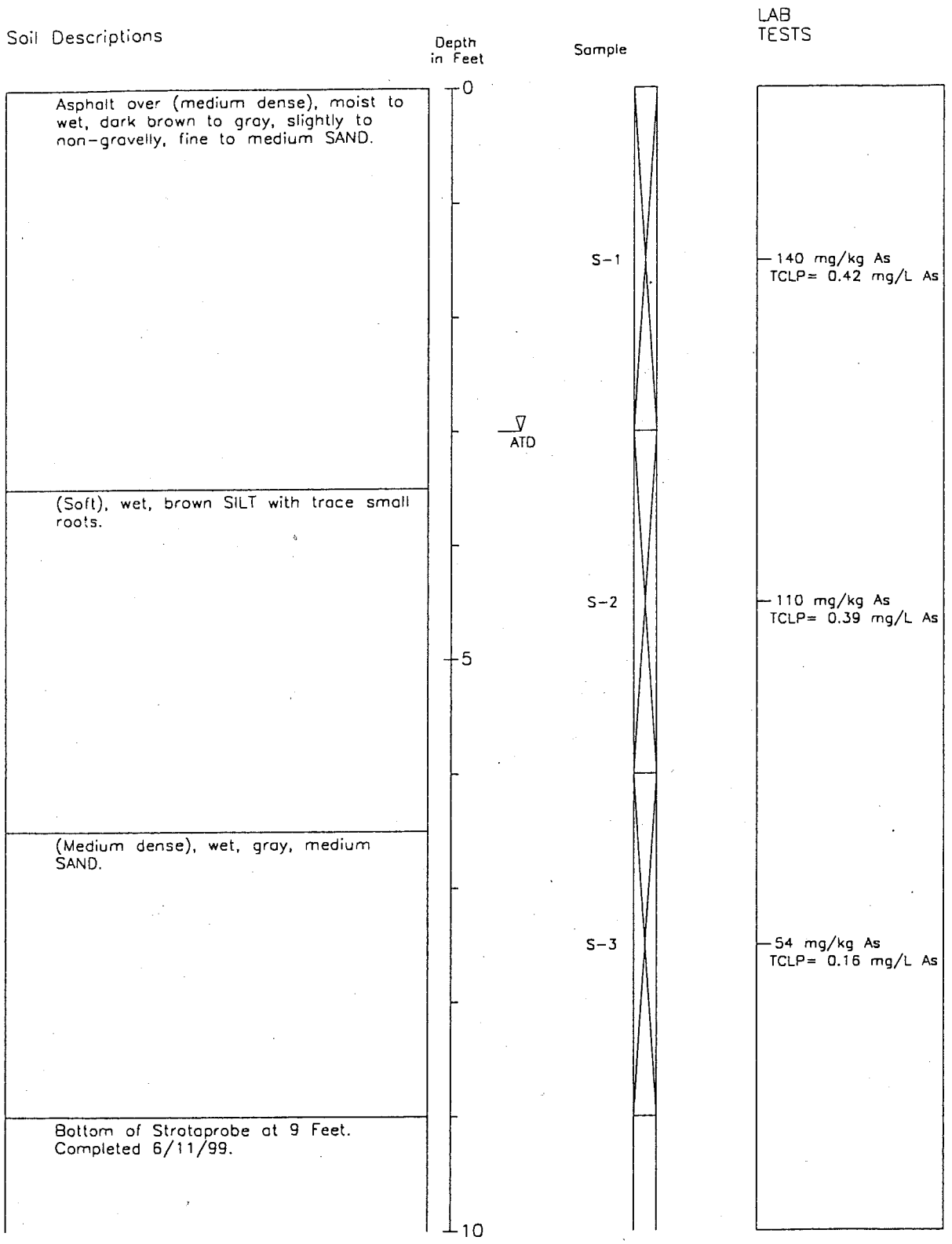
HARTCROWSER

J-4946-10 6/99

Figure A-52

i=1 ACAD LOG

Strataprobe Log HC-52



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

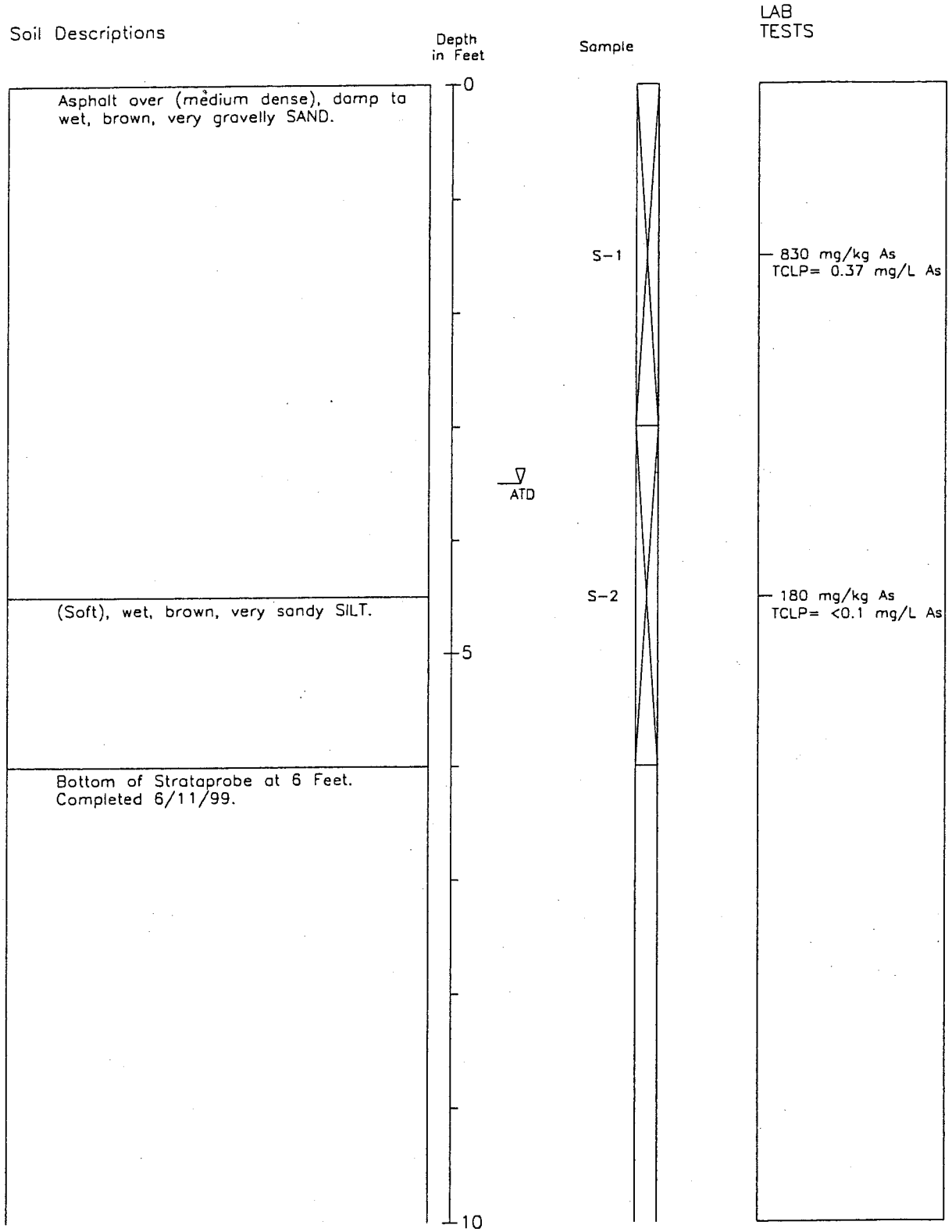
HARTCROWSER

J-4946-10 6/99

Figure A-53

:1 ACAD LOG

Strataprobe Log HC-53



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

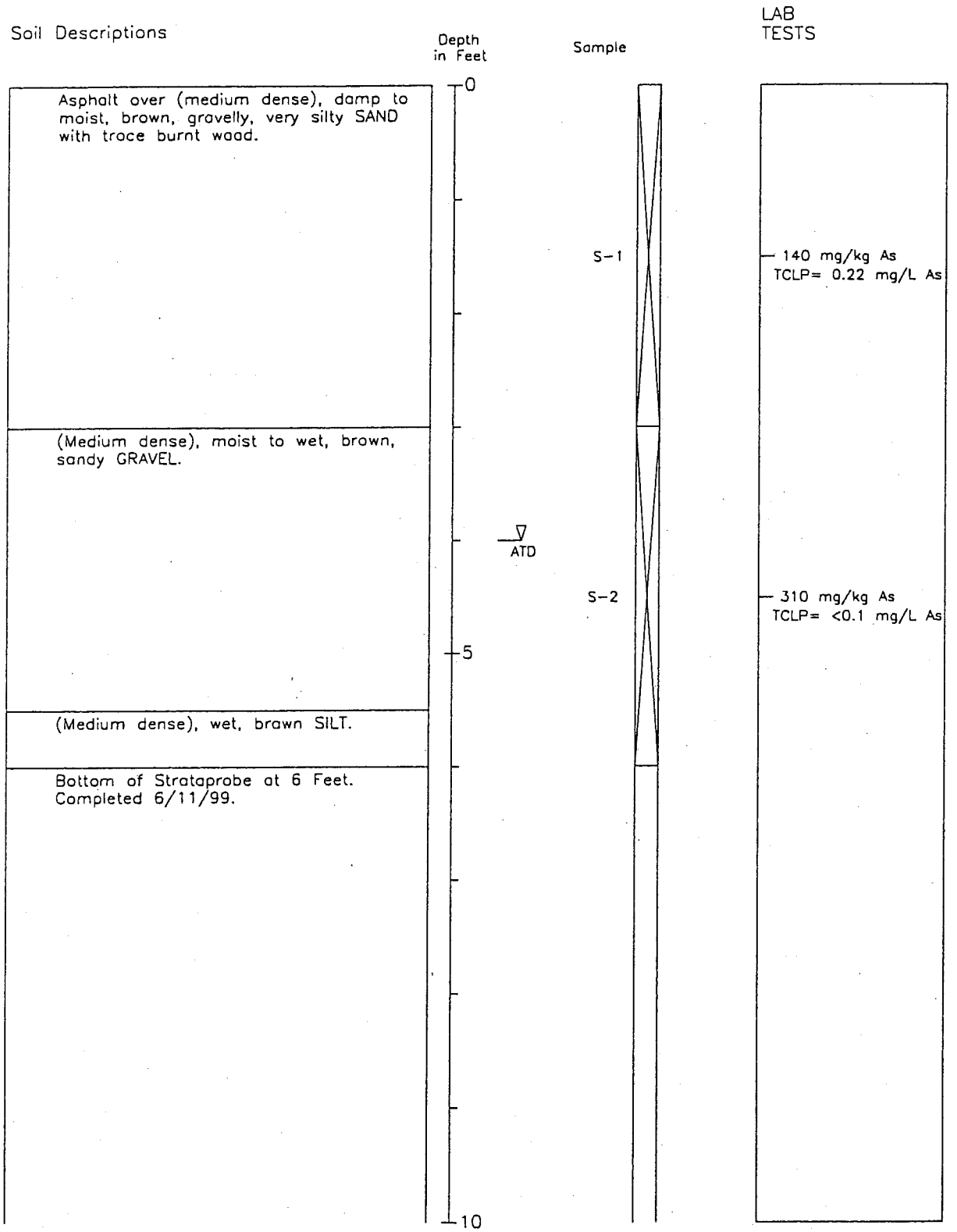
HARTCROWSER

J-4946-10 6/99

Figure A-54

=1 ACAD LOG

Strataprobe Log HC-54



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

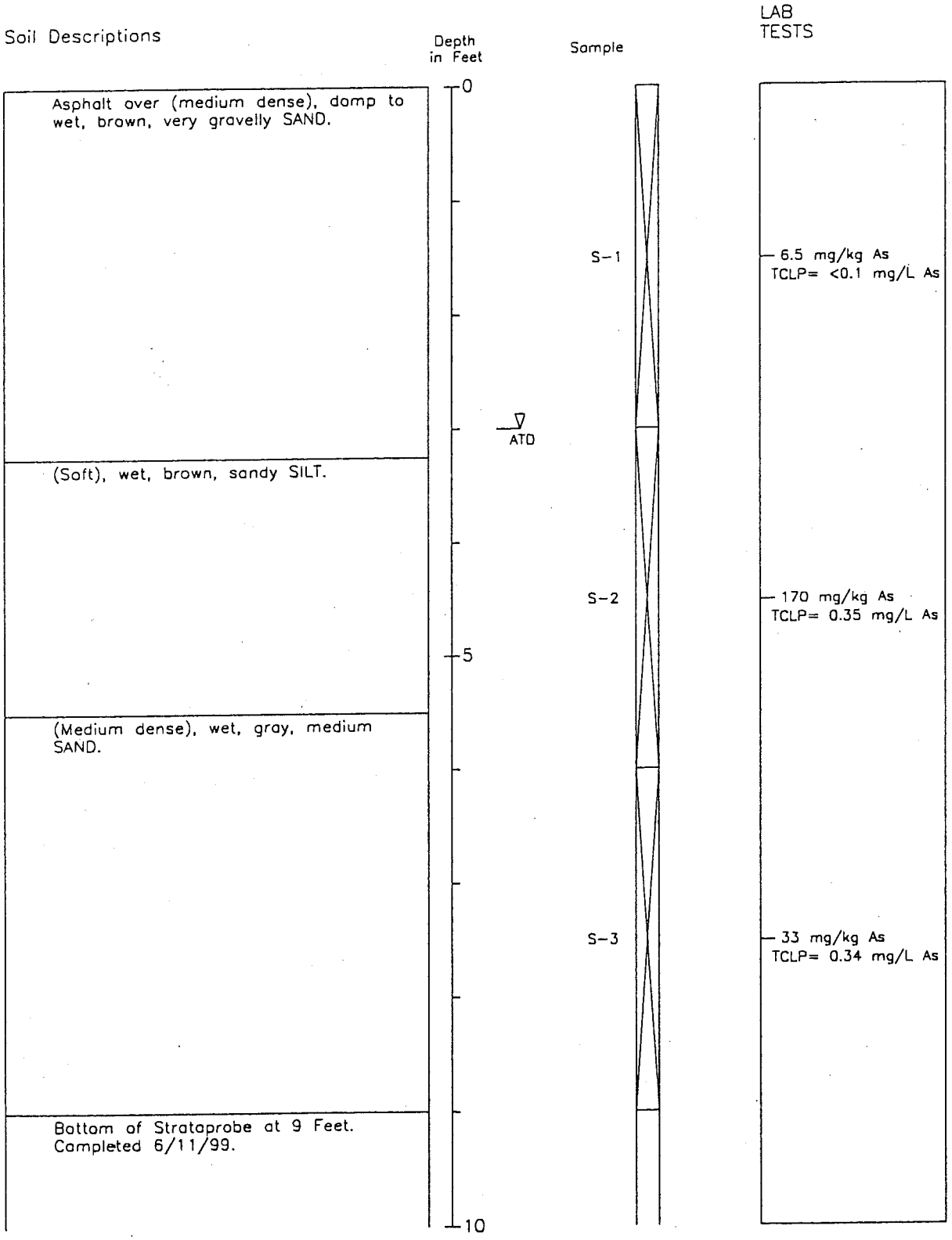
HARTCROWSER

J-4946-10 6/99

Figure A-55

I=1 ACAD LOG

Strataprobe Log HC-55



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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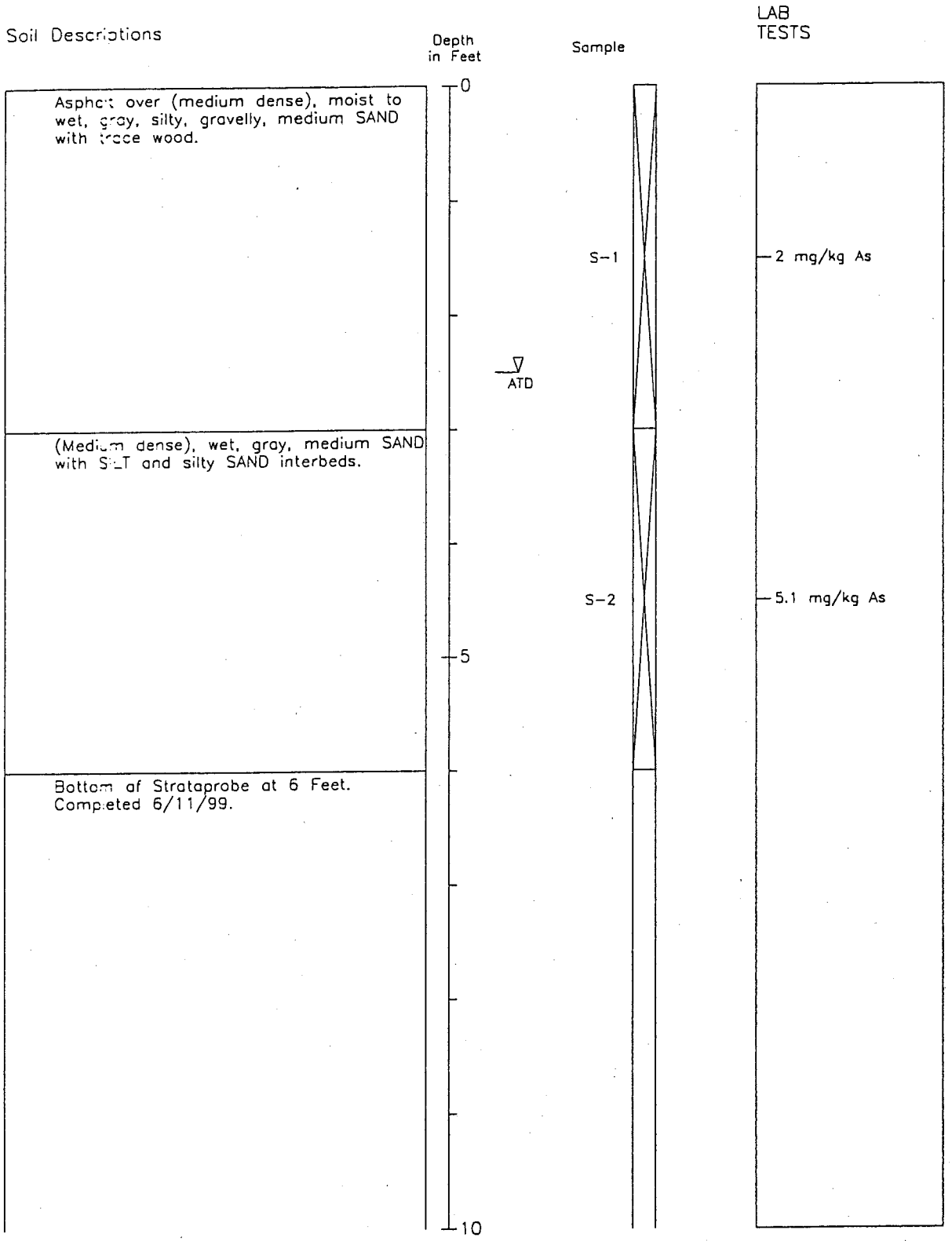
J-4946-10 6/99

Figure A-56

I=1 ACAD LOG

Strataprobe Log HC-56



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

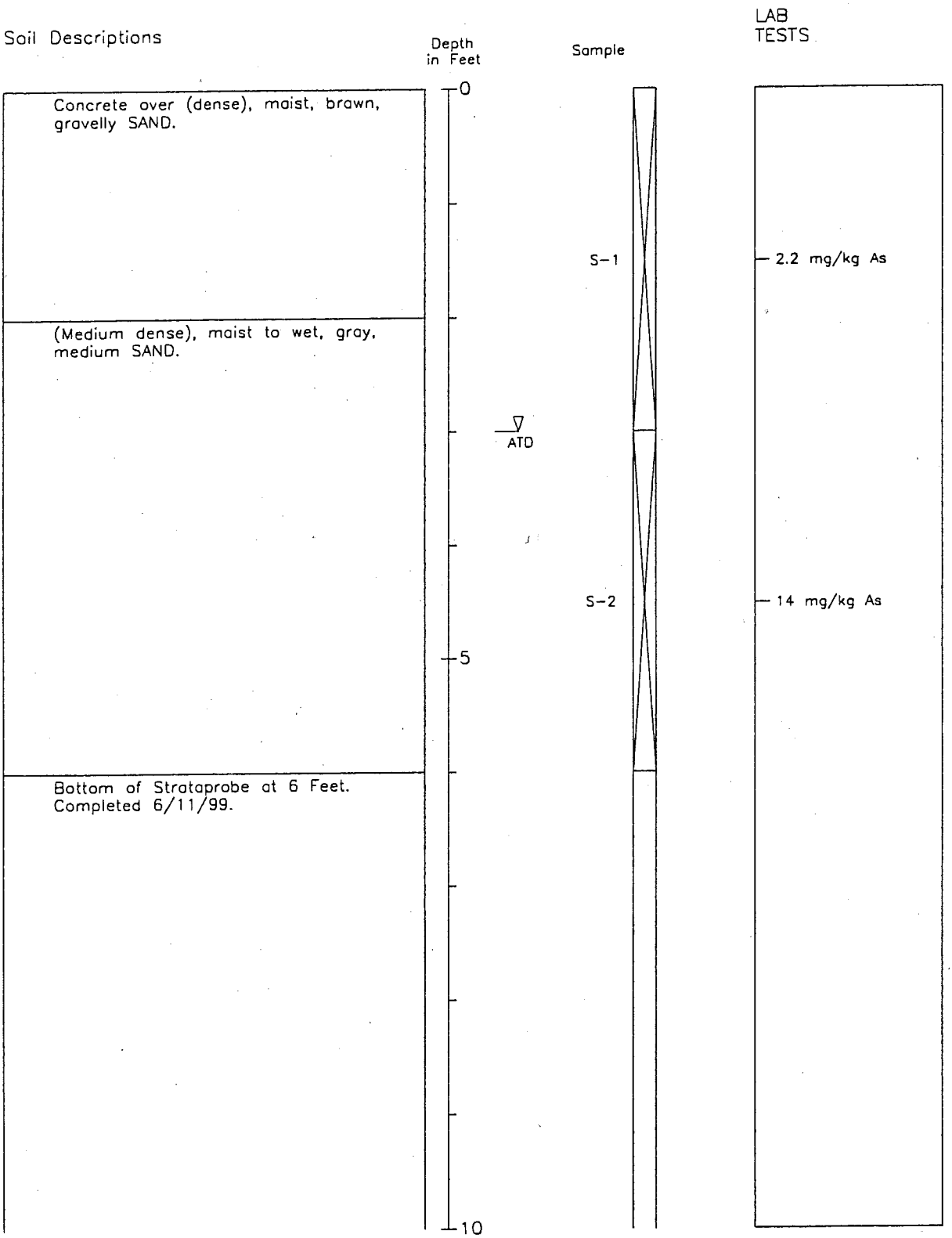
HARTCROWSER

J-4946-10 6/99

Figure A-57

1=1 ACAD LOG

Strataprobe Log HC-57



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-58

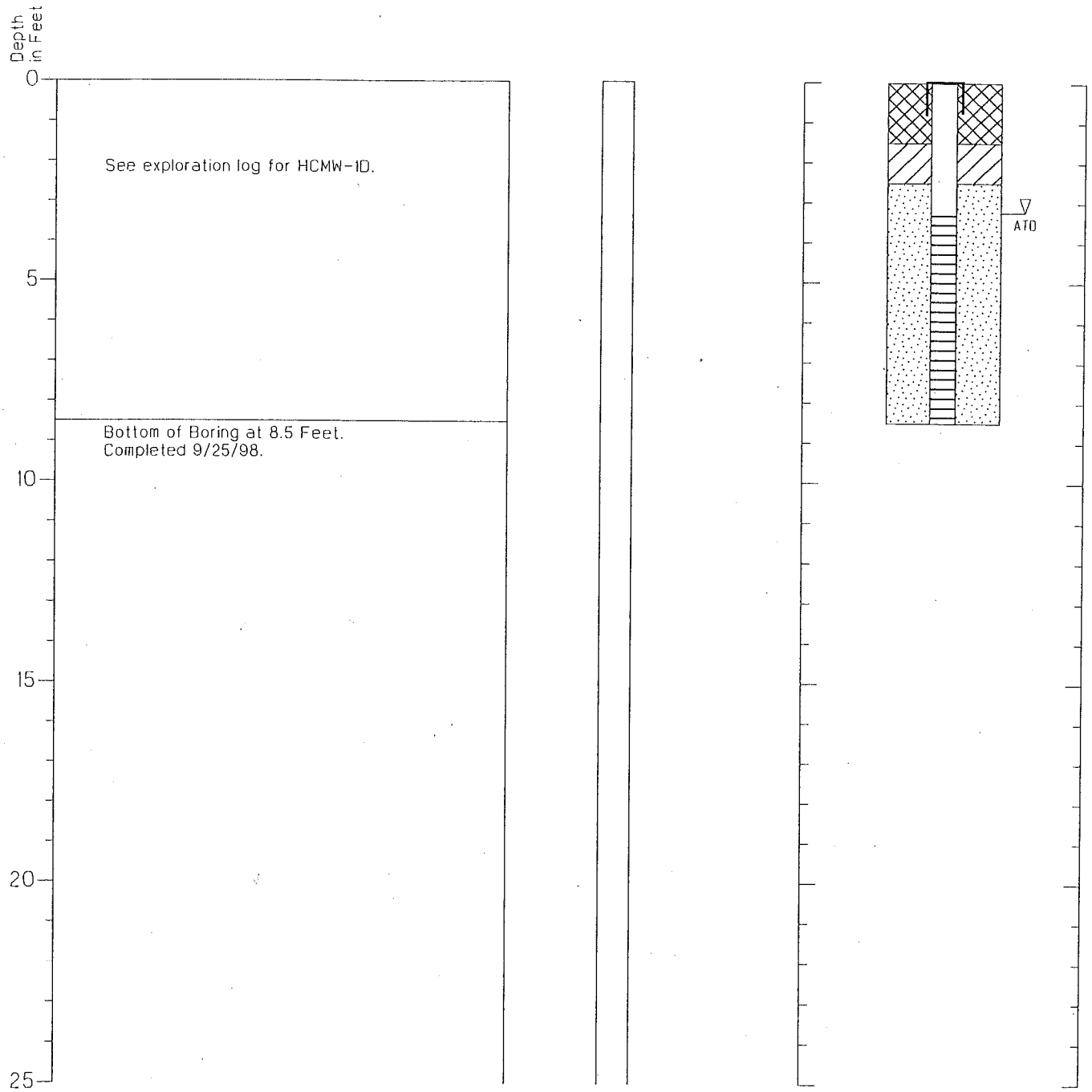
1=1 ACAD LOG

Boring Log and Construction Data for Monitoring Well HCMW-1S

Geologic Log

Monitoring Well Design

Casing Stickup in Feet: -0.2



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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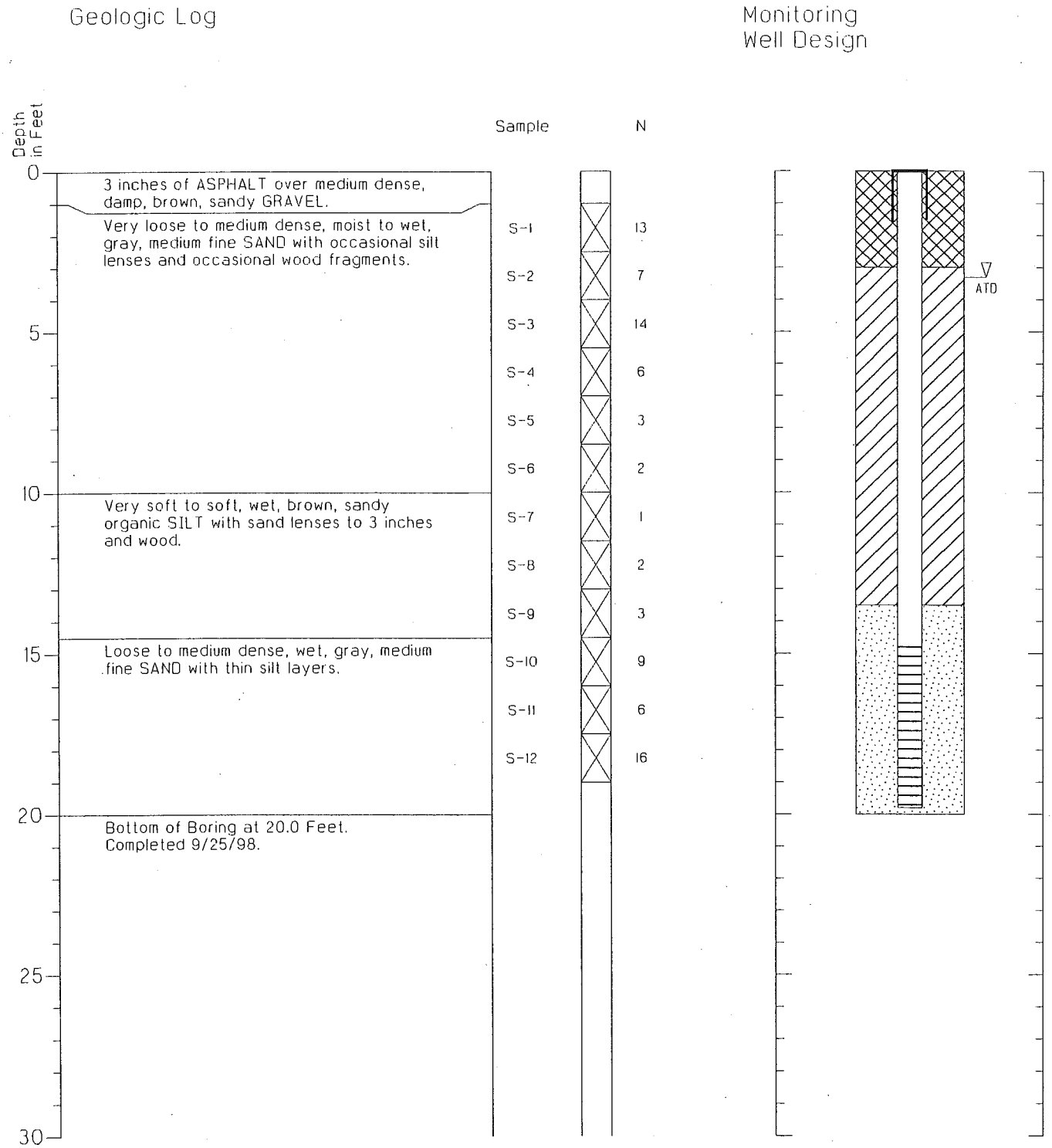
Figure A-59

Boring Log and Construction Data for Monitoring Well HCMW-1D



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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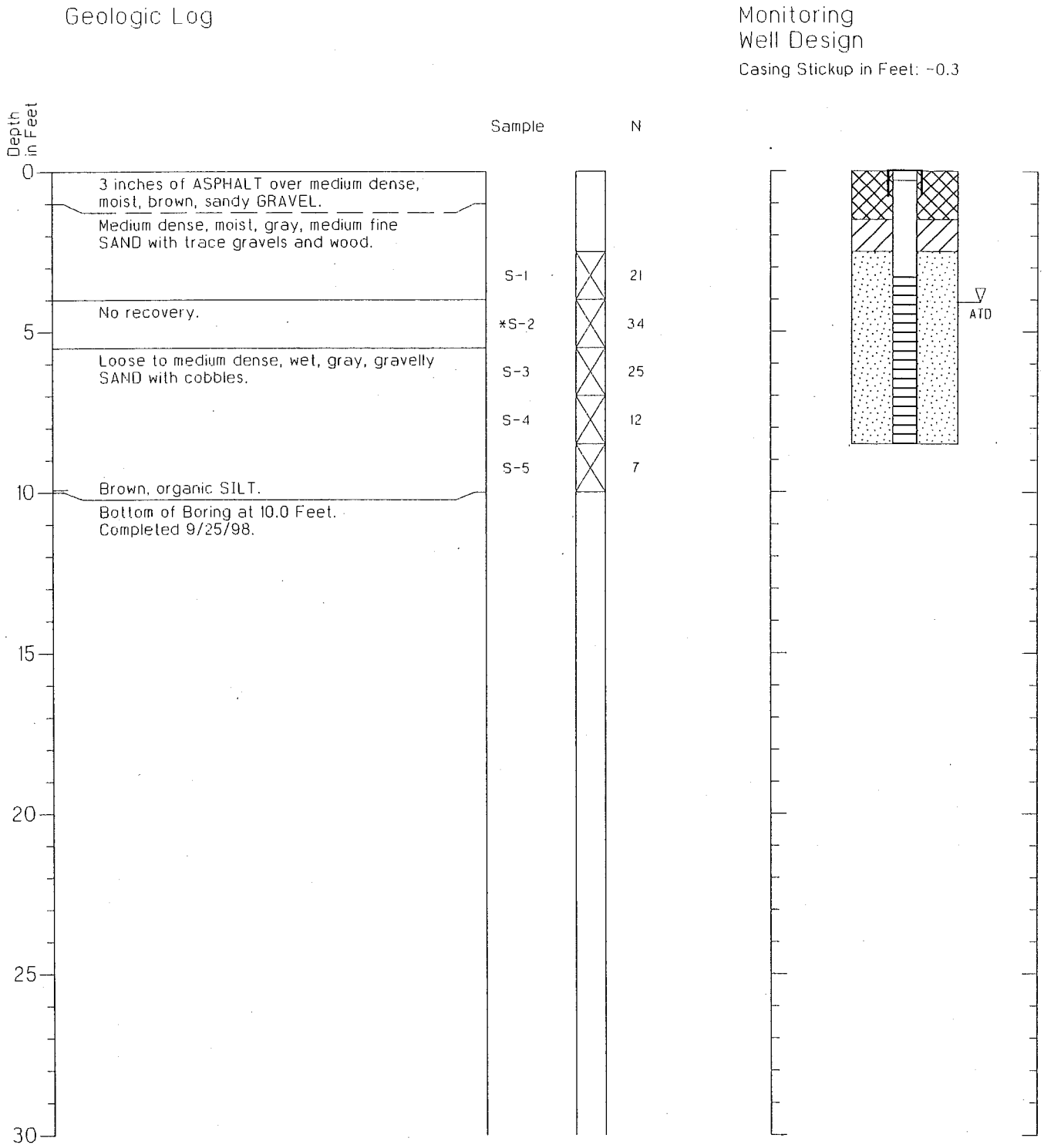
Figure A-60

Boring Log and Construction Data for Monitoring Well HCMW-2



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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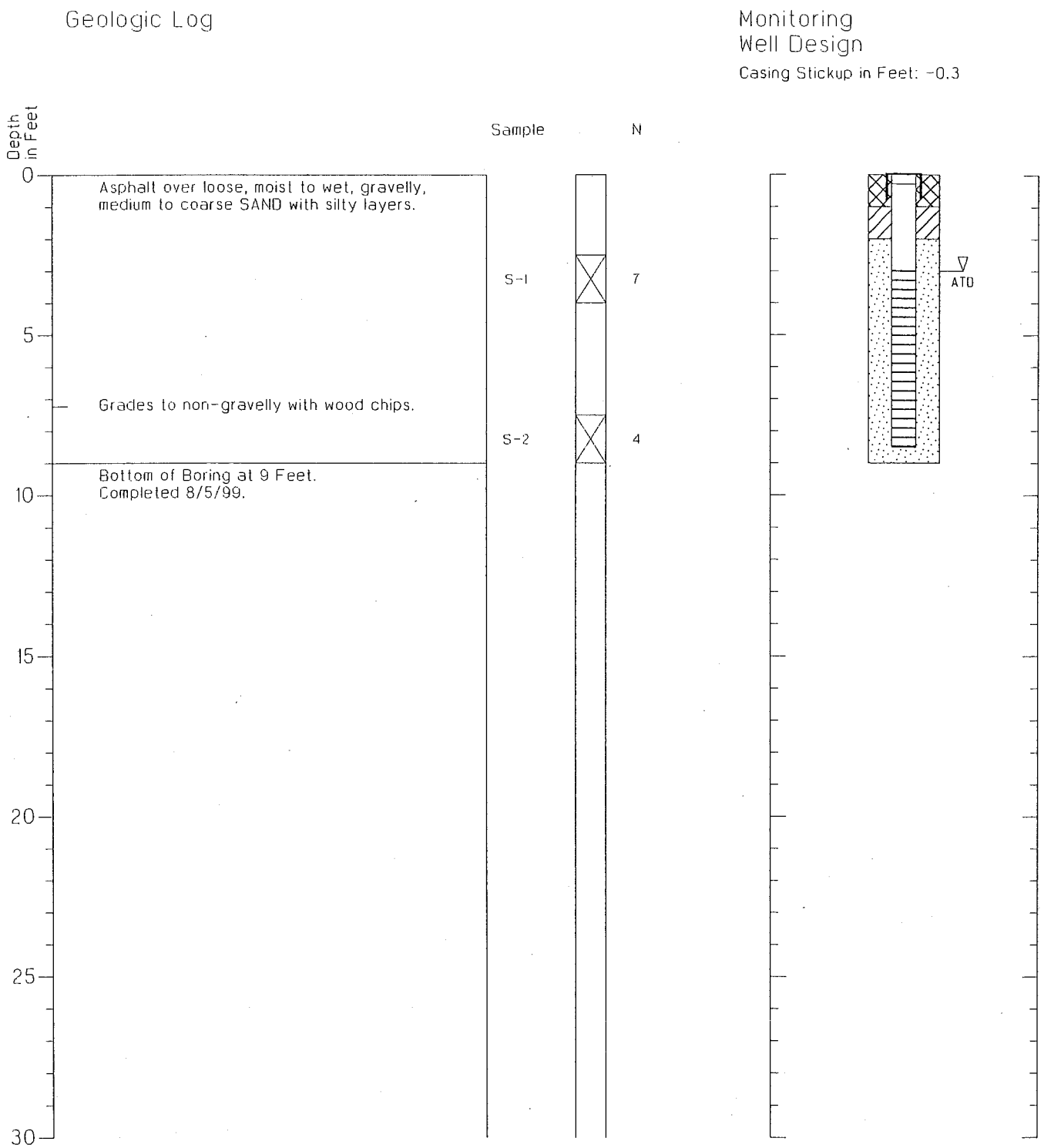
Figure A-61

Boring Log and Construction Data for Monitoring Well HCMW-3



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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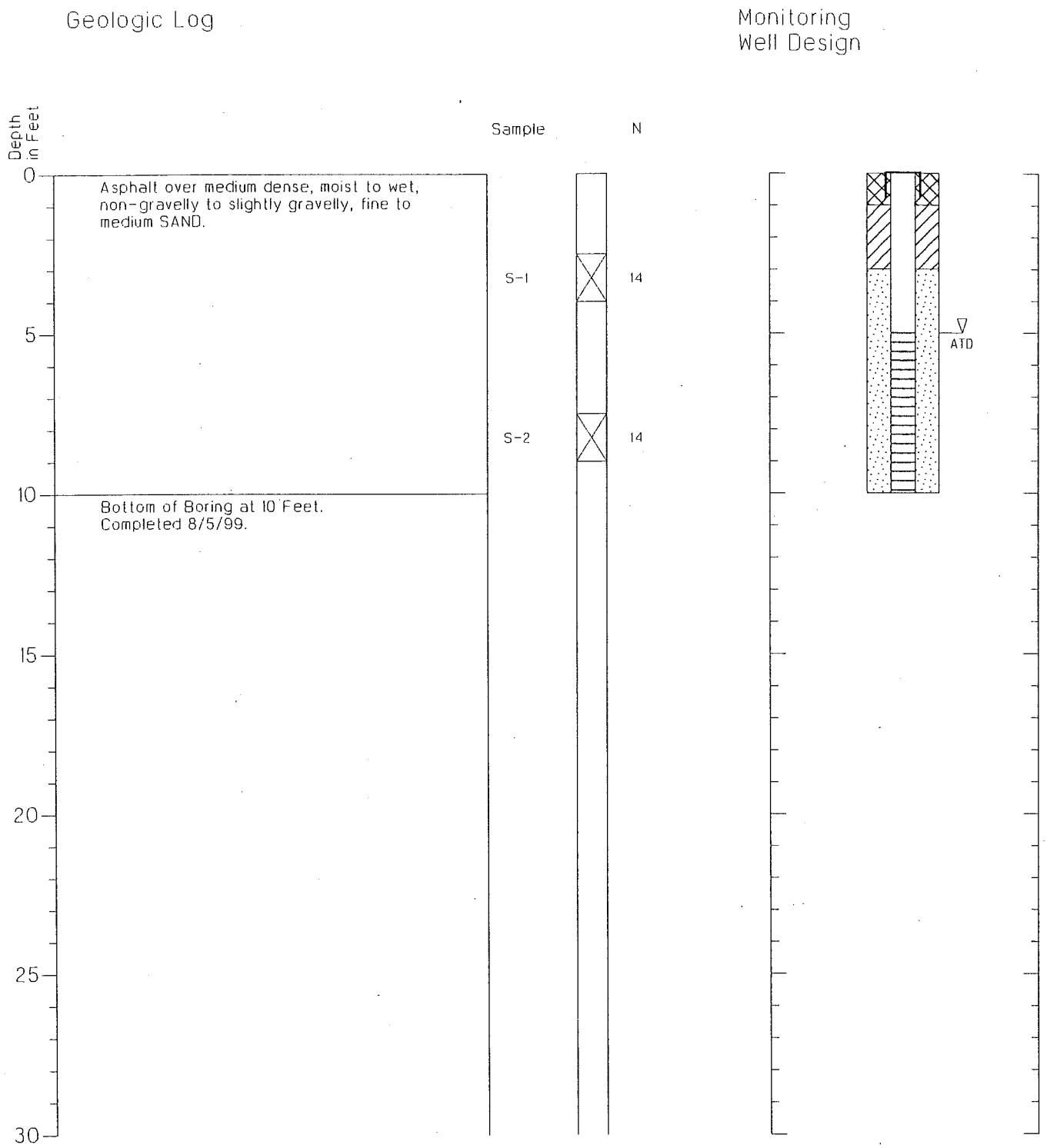
Figure A-62

Boring Log and Construction Data for Monitoring Well HCMW-4



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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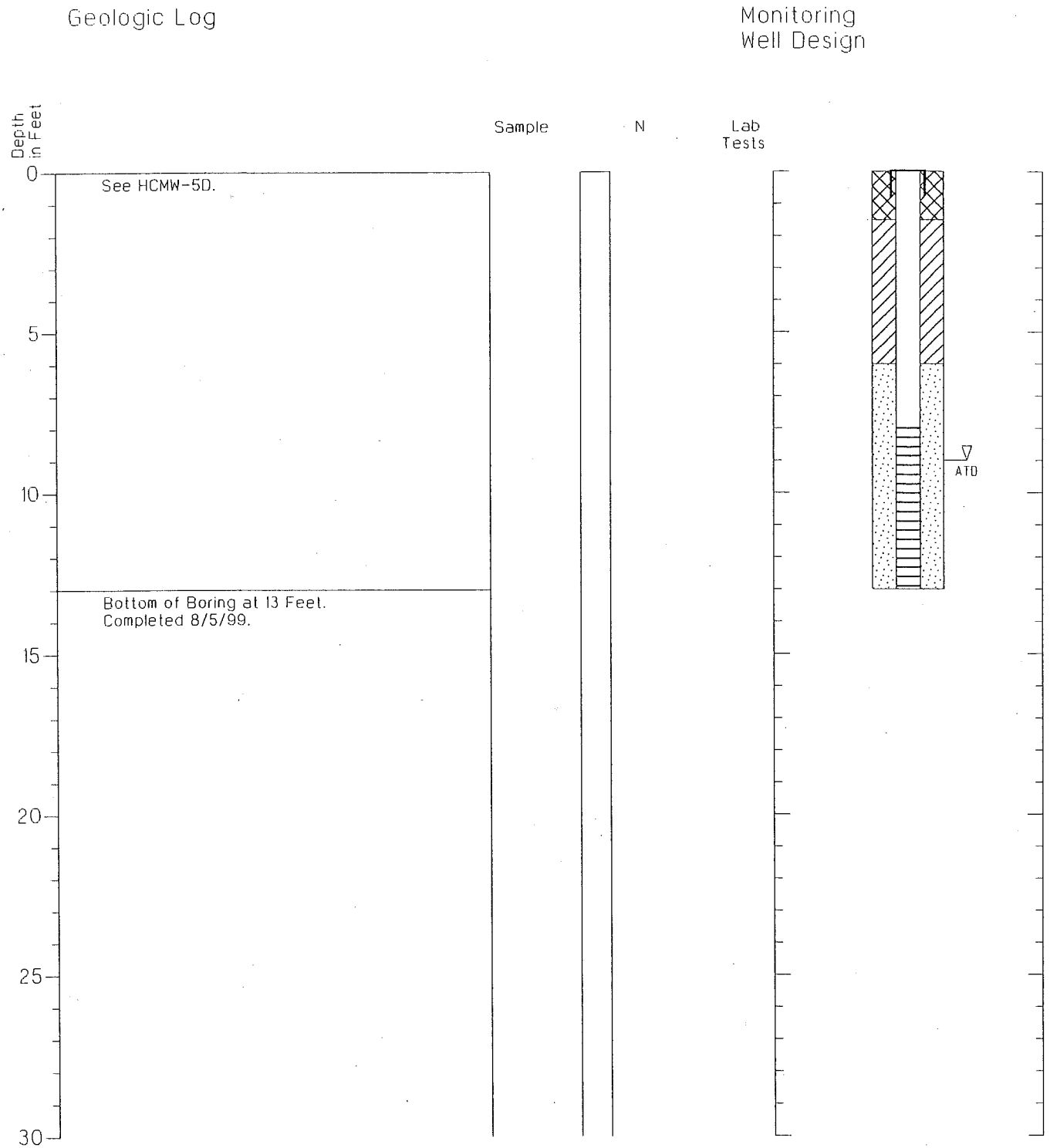
Figure A-63

Boring Log and Construction Data for Monitoring Well HCMW-5S



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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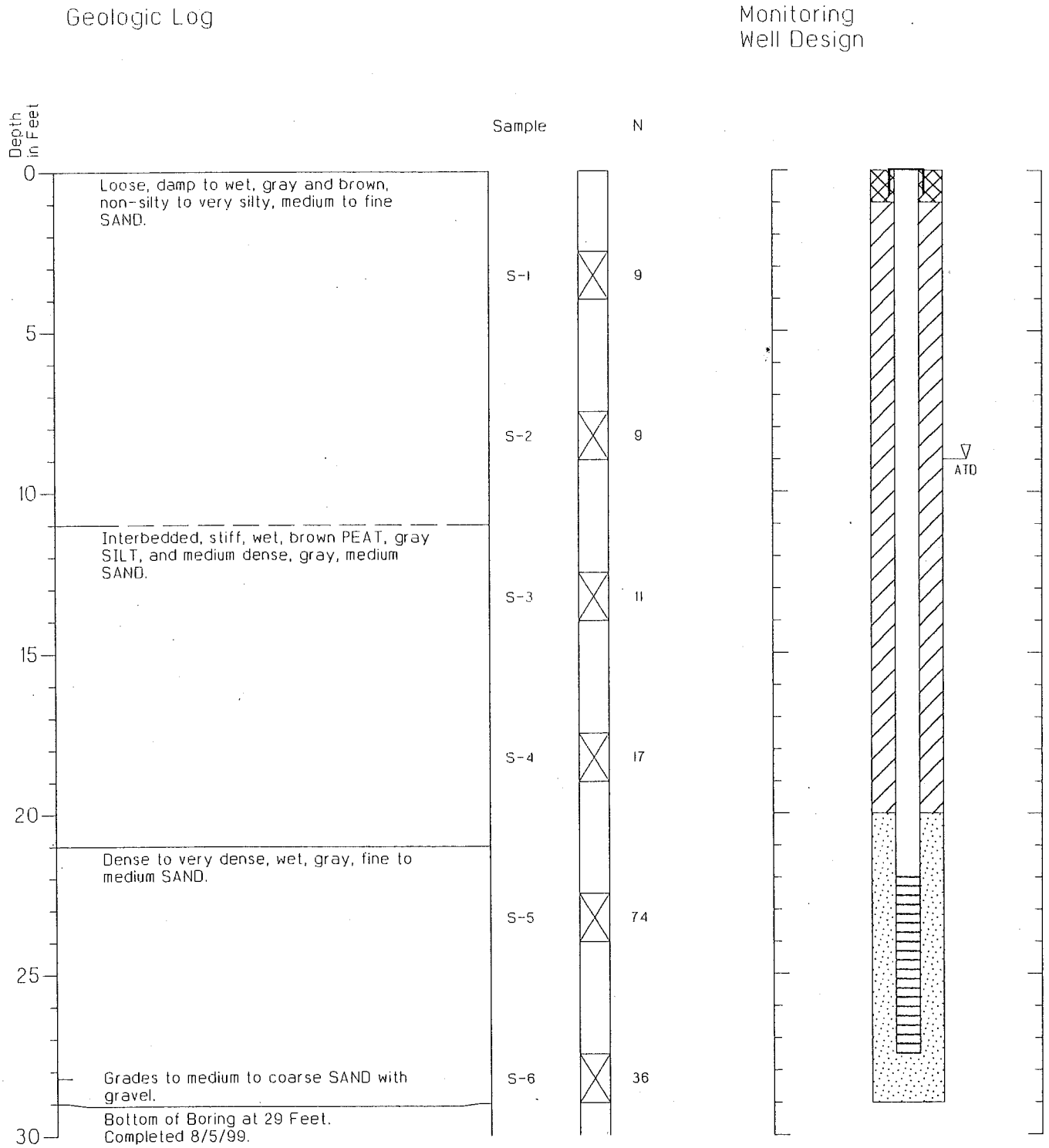
Figure A-64

Boring Log and Construction Data for Monitoring Well HCMW-5D



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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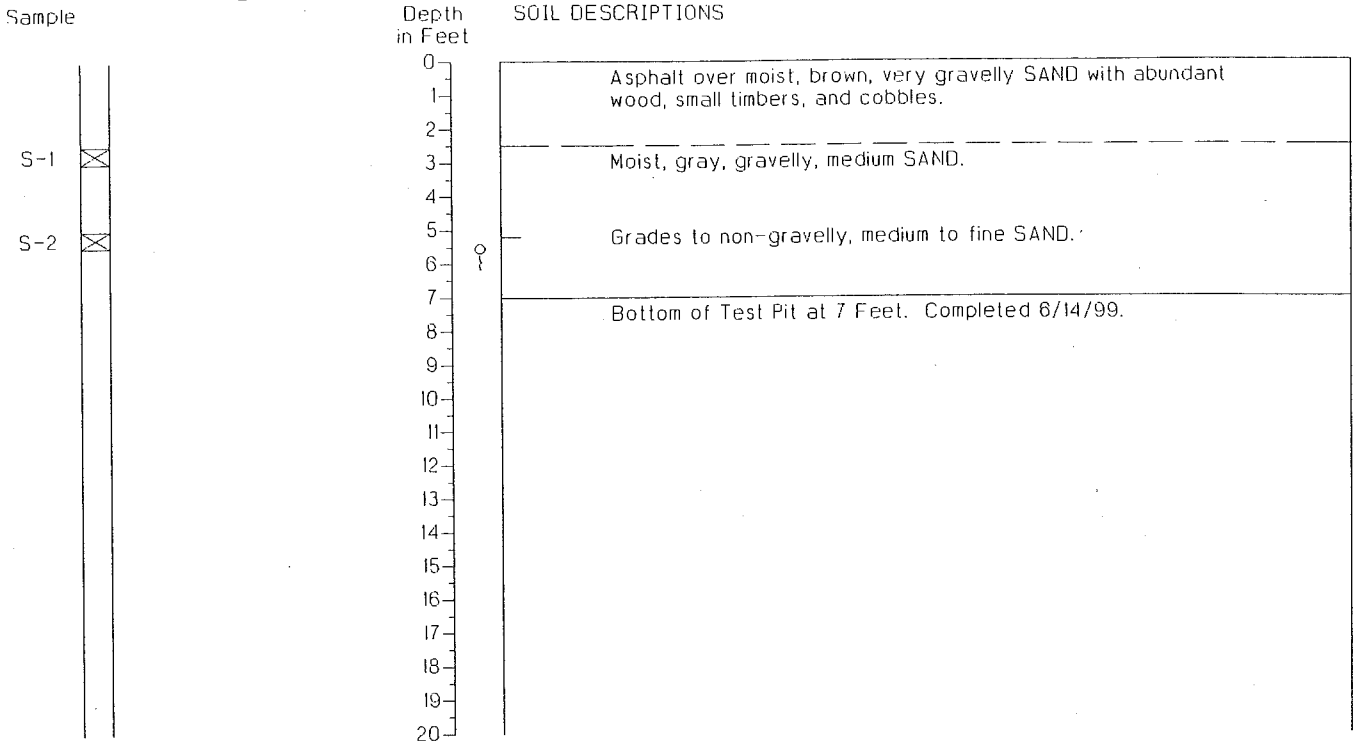
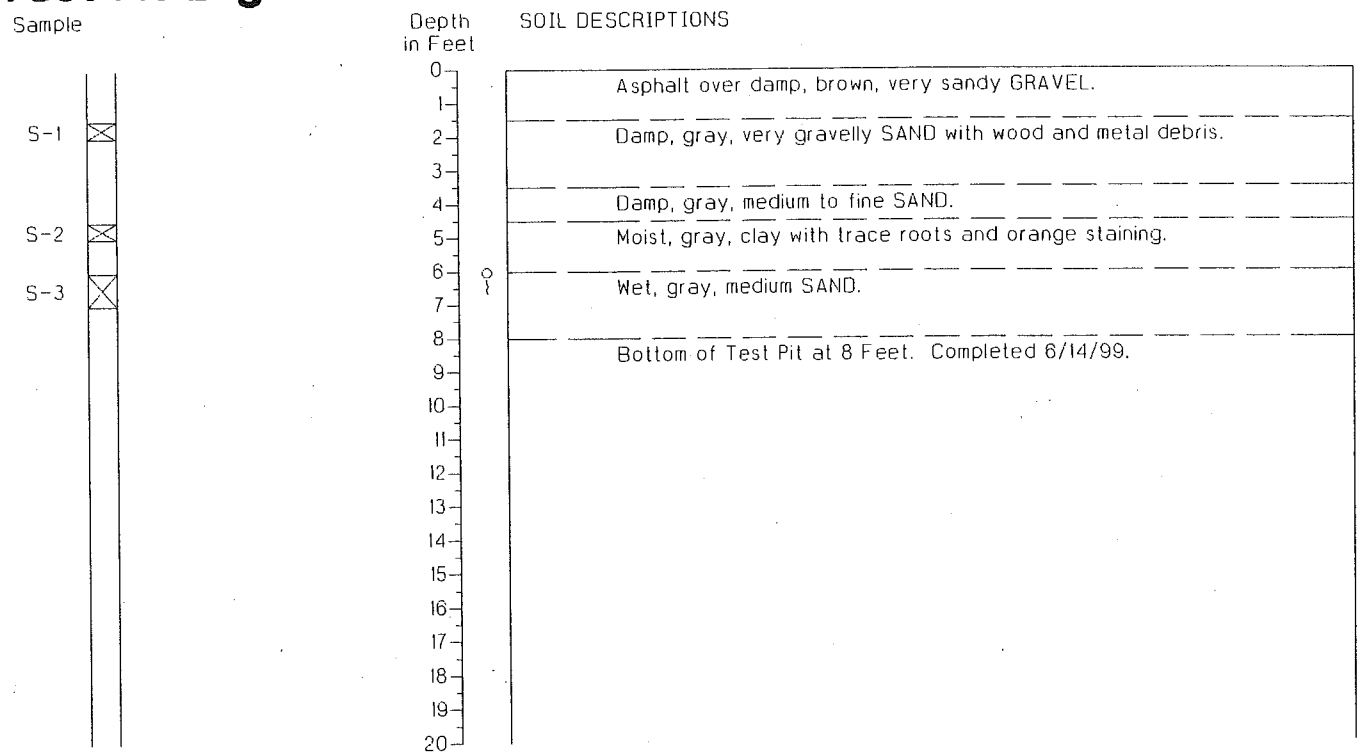
Figure A-65

Test Pit Log TP-1



Test Pit Log TP-2



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

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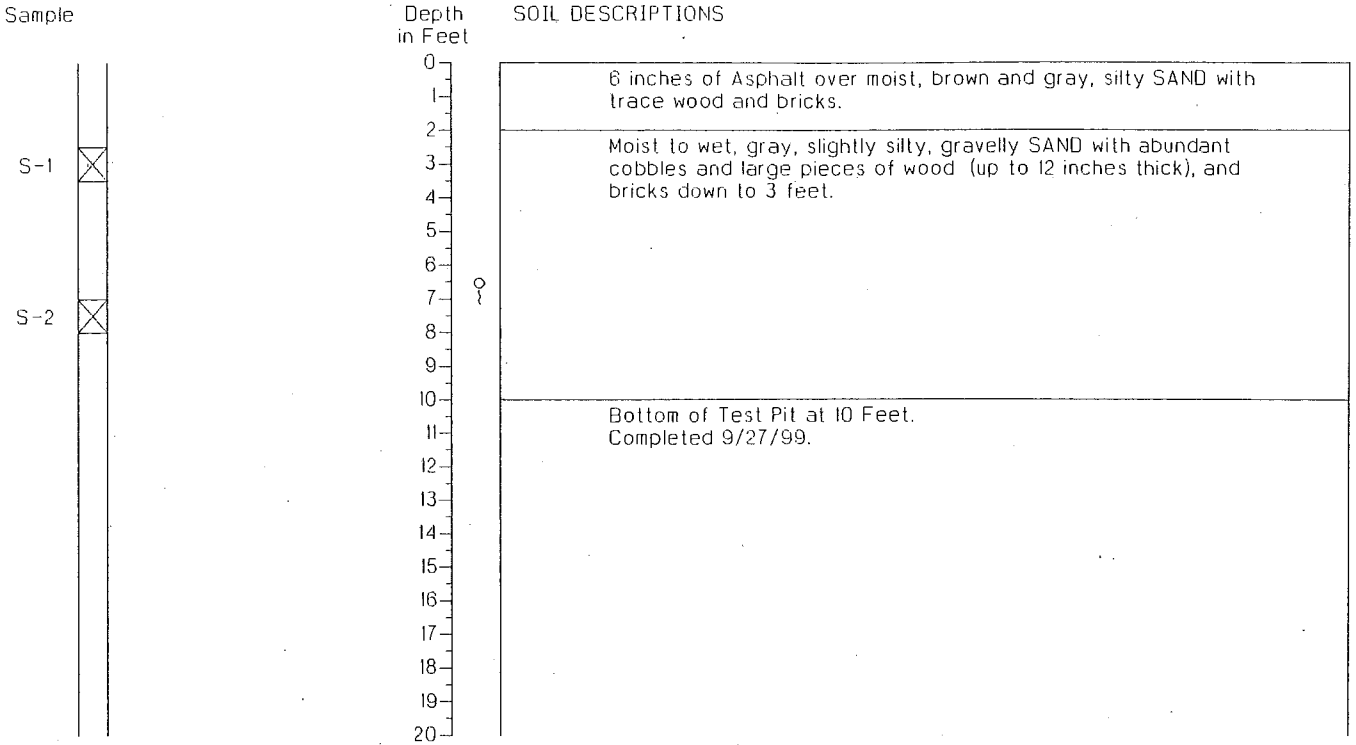
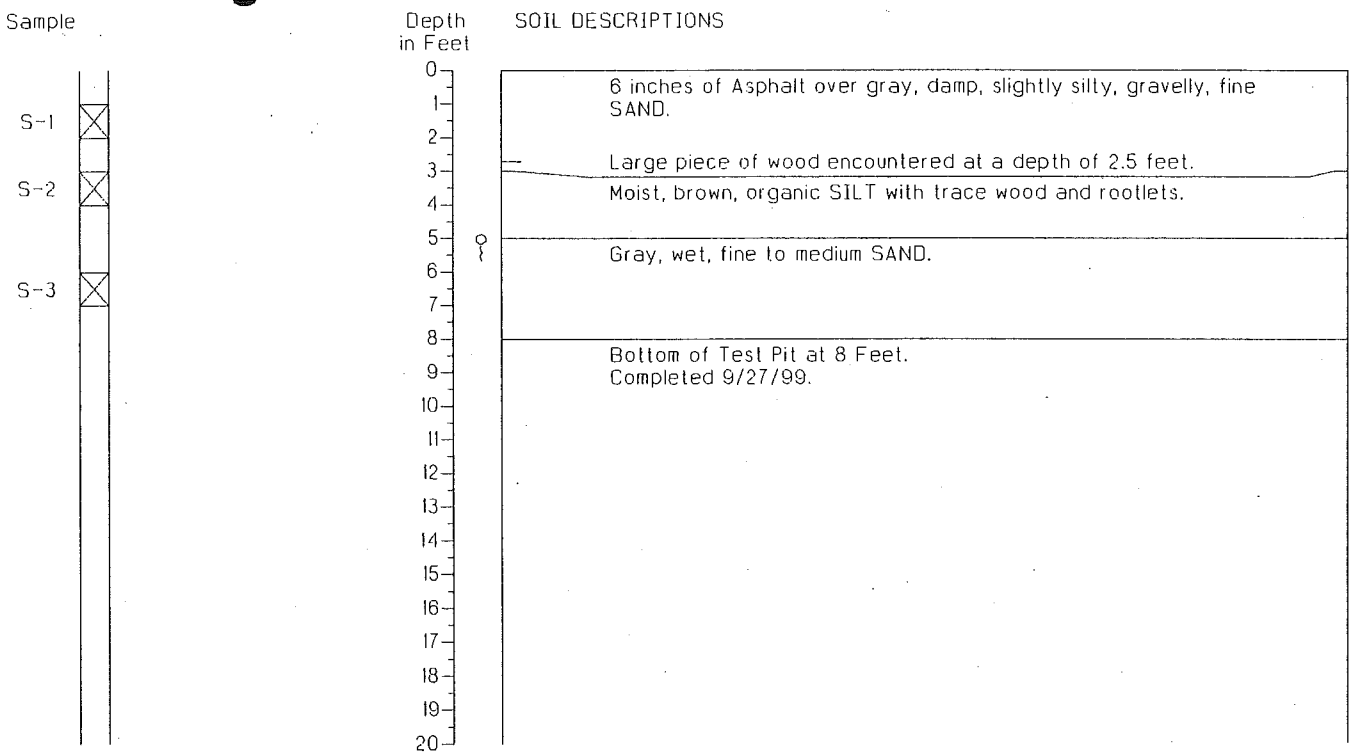
Figure A-66

Test Pit Log TP-3



Test Pit Log TP-4



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

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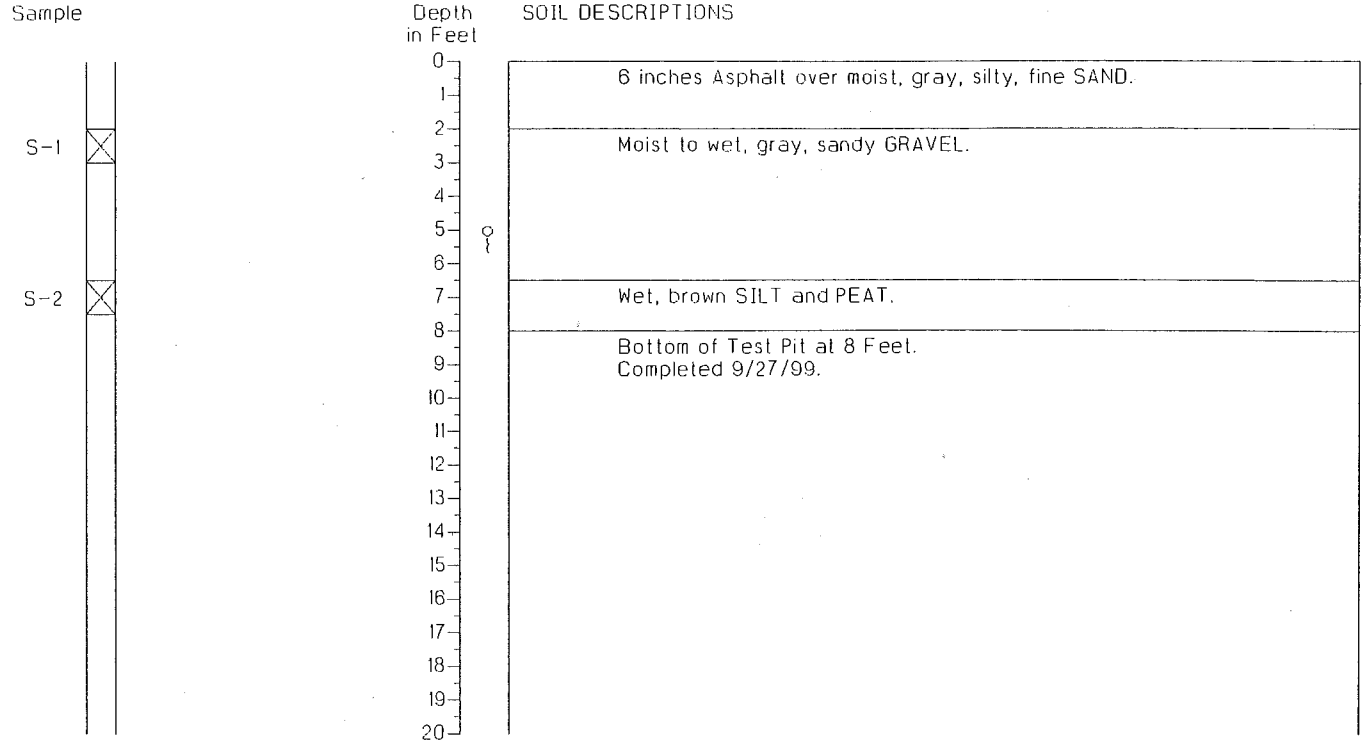
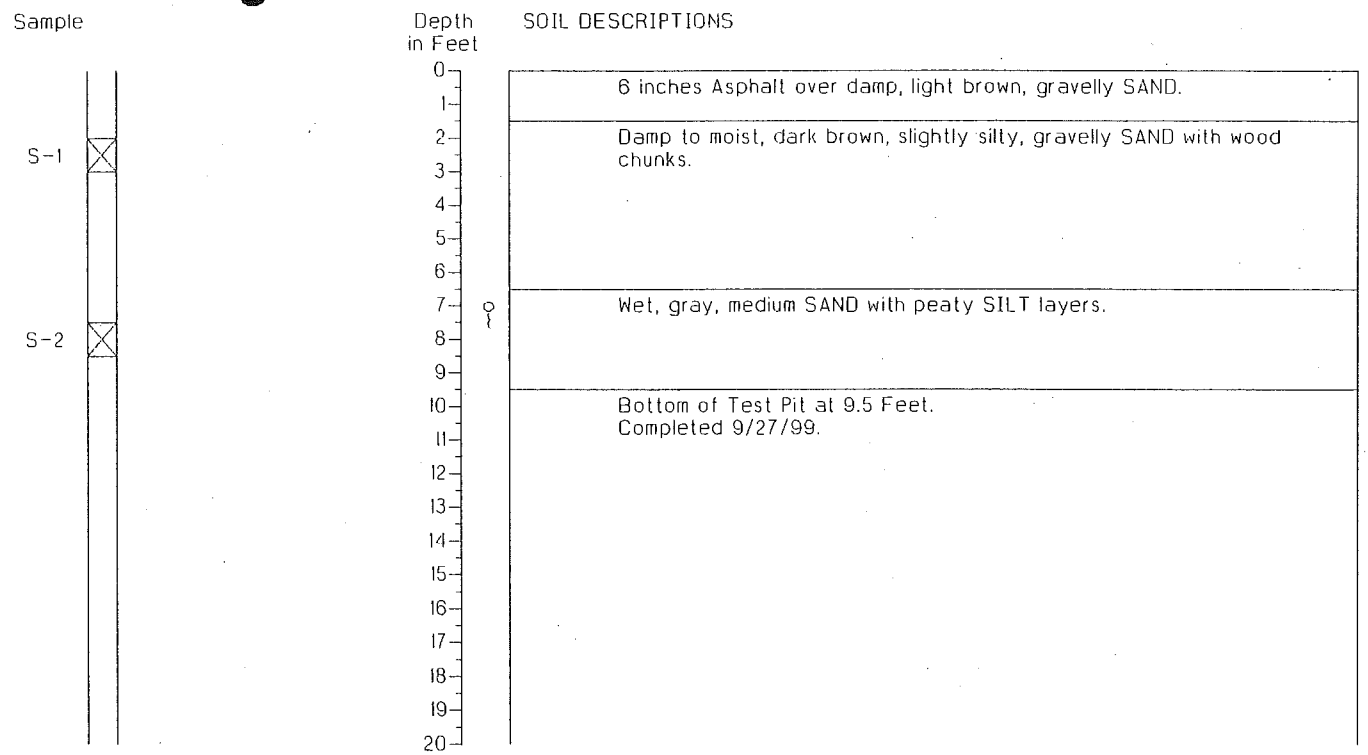
Figure A-67

Test Pit Log TP-5



Test Pit Log TP-6



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

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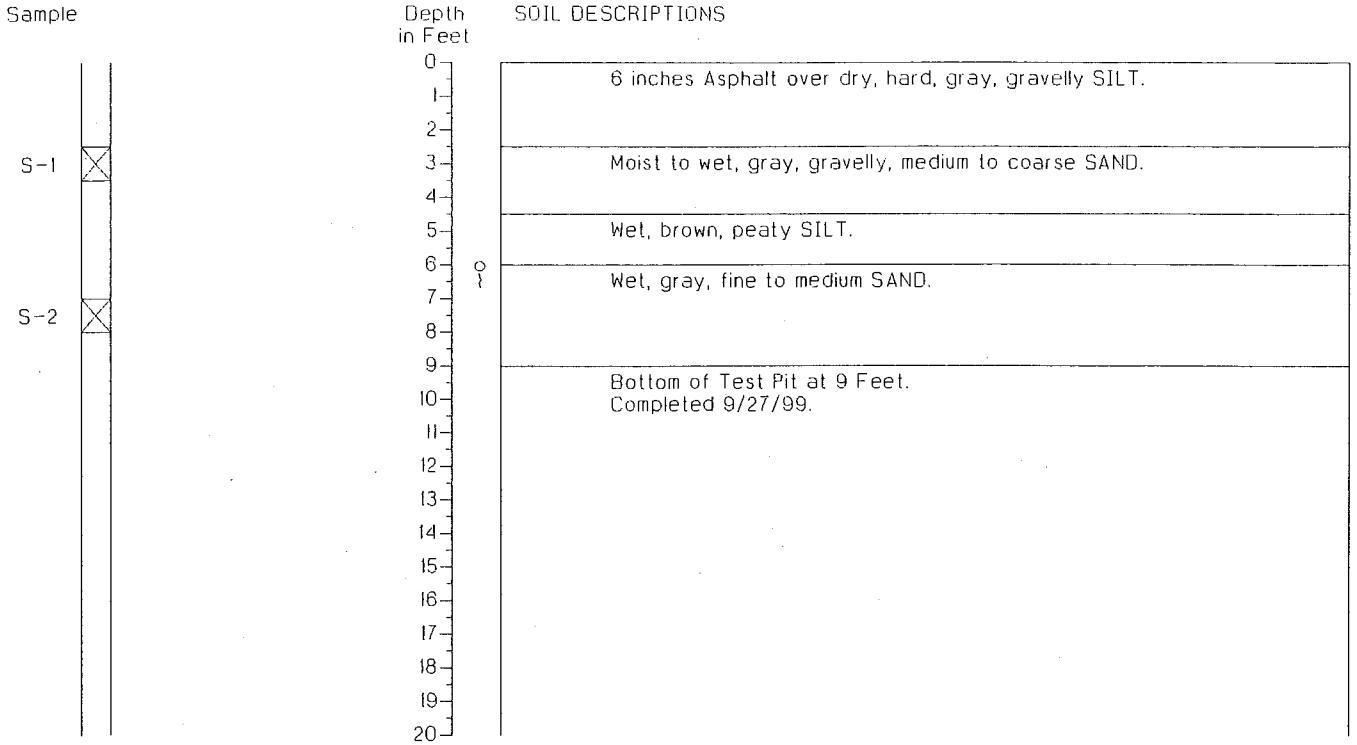
Figure A-68

Test Pit Log TP-7



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

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Figure A-69

ATTACHMENT B5

Test Pits and Boring Logs in Former Pan Abode Area, Aspect, 2006.

- Test Pits AA13, AA15, AA17, Y14, Y16, Y18, and TP-PA6
- Soil Borings PY-17 and PAA-17

LOG OF EXPLORATION PIT NO. TP-PA6

Location: **Elevation (approx. ft msl):**

Depth, ft	Elev., ft	T-Probe	Sample type	Graphic Symbol	Description
					This log is part of the report prepared by Aspect Consulting, LLC for the named project and should be read together only with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
0					Asphalt
					Gravel
1					(Loose), moist, gray, medium to fine SAND; with gravel and cobbles.
2					
3					
4					
5					Wood piling.
6		▽			Water: Sheen, no apparent color.
7					Bottom of Trench: 7'

ASPECT TP W/ SAMPLE DEPTH (CAD-SR) BARBEE_MILL_TP.GPJ February 15, 2006

T-Probe
SW: Distance of penetration into pit side wall
F: Distance of penetration into pit floor

Sample Type
Grab Sample

Barbee Mill

Renton

Project No.
050004

Aspect consulting
IN-DEPTH PERSPECTIVE

Date: 1/17/2006
Logged By: TDC

Figure No.
1

LOG OF EXPLORATION PIT NO. AA-17

Location: **Elevation (approx. ft msl):**

Depth, ft	Elev., ft	T-Probe	Sample type	Graphic Symbol	Description
					This log is part of the report prepared by Aspect Consulting, LLC for the named project and should be read together only with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
					Description
					Asphalt
					Gravel
1					(Loose), moist, brown, gravelly, medium to fine SAND with cobbles.
2					(Loose), moist, gray, medium to fine SAND.
3					
4					Timber, slightly burned.
5					Water: No sheen, no odor.
6					(Loose), wet, gray, sandy GRAVEL.
7		▽			Bottom of Trench = 7'

ASPECT TP W/ SAMPLE DEPTH (CAD-SR) BARBEE_MILL_TP.GPJ February 15, 2006

T-Probe
SW: Distance of penetration into pit side wall
F: Distance of penetration into pit floor

Sample Type
Grab Sample

Barbee Mill

Renton

Project No.
050004

Aspect consulting
IN-DEPTH PERSPECTIVE

Date: 1/17/2006
Logged By: TDC

Figure No.
2

LOG OF EXPLORATION PIT NO. AA-15

Location: **Elevation (approx. ft msl):**

Depth, ft	Elev., ft	T-Probe	Sample type	Graphic Symbol	Description
					This log is part of the report prepared by Aspect Consulting, LLC for the named project and should be read together only with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
					Description
					Asphalt
					Gravel
1					(Loose), moist, gray, slightly gravelly, medium to fine SAND.
2					Wood piling.
3					Peat/wood chips.
					(Loose), wet, brown, gravelly, coarse to medium SAND with cobbles.
4					Water: Turbid, brown, no sheen.
5		▽			
6					Clear water seeping at depth.

ASPECT TP W/ SAMPLE DEPTH (CAD-SR) BARBEE_MILL_TP.GPJ February 15, 2006

T-Probe
SW: Distance of penetration into pit side wall
F: Distance of penetration into pit floor

Sample Type
Grab Sample

Barbee Mill

Renton

Project No.
050004

Aspect consulting
IN-DEPTH PERSPECTIVE

Date: 1/17/2006
Logged By: TDC

Figure No.
3

LOG OF EXPLORATION PIT NO. AA-13

Location: **Elevation (approx. ft msl):**

Depth, ft	Elev., ft	T-Probe	Sample type	Graphic Symbol	Description
					This log is part of the report prepared by Aspect Consulting, LLC for the named project and should be read together only with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
					Description
					Asphalt
1					Gravel
2					(Loose), moist, gravelly fine to medium SAND with cobbles.
3					Timber (partly burned) at 3 feet.
4					Peat/wood layer.
5		▽			(Loose), brown, very peaty SAND.
					Slow water seepage from south side, no apparent sheen. Pit very unstable. Bottom of Trench = 5.5'

ASPECT TP W/ SAMPLE DEPTH (CAD-SR) BARBEE_MILL_TP.GPJ February 15, 2006

T-Probe
SW: Distance of penetration into pit side wall
F: Distance of penetration into pit floor

Sample Type
Grab Sample

Barbee Mill

Renton

Project No.
050004

Aspect consulting
IN-DEPTH PERSPECTIVE

Date: 1/17/2006
Logged By: TDC

Figure No.
4

LOG OF EXPLORATION PIT NO. Y-18

Location: **Elevation (approx. ft msl):**

Depth, ft	Elev., ft	T-Probe	Sample type	Graphic Symbol	This log is part of the report prepared by Aspect Consulting, LLC for the named project and should be read together only with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **Description**
0					Asphalt
					Gravel
1					
					(Loose), damp, gray, medium to fine SAND; occasional gravel.
2					
3					
		▽			
4					(Loose), wet, gray, medium to fine SAND; occasional gravel, large wood debris.
5					
6					
7					Caving, very unstable excavation.
8					
9					
10					Bottom of Trench = 10'

ASPECT TP W/ SAMPLE DEPTH (CAD-SR) BARBEE_MILL_TP.GPJ February 15, 2006

T-Probe
SW: Distance of penetration into pit side wall
F: Distance of penetration into pit floor

Sample Type
Grab Sample

Barbee Mill

Renton

Project No.
050004

Aspect consulting
IN-DEPTH PERSPECTIVE

Date: 1/17/2006
Logged By: TDC

Figure No.
5

LOG OF EXPLORATION PIT NO. Y-16

Location: **Elevation (approx. ft msl):**

Depth, ft	Elev., ft	T-Probe	Sample type	Graphic Symbol	This log is part of the report prepared by Aspect Consulting, LLC for the named project and should be read together only with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **Description**
					Asphalt
					Gravel
1					(Loose), moist, gray, medium to fine SAND with gravel.
2					Very large timber on east side.
3					
4		▽			
5					(Loose), wet, gray, medium to fine SAND with gravel; sheen, faint odor.
6					Gravel layer
7					Large wood debris
					Sheen on water table.
8					
					Bottom of Trench = 8'

ASPECT TP W/ SAMPLE DEPTH (CAD-SR) BARBEE_MILL_TP.GPJ February 15, 2006

T-Probe
SW: Distance of penetration into pit side wall
F: Distance of penetration into pit floor

Sample Type
Grab Sample

Barbee Mill

Renton

Project No.
050004

Aspect consulting
IN-DEPTH PERSPECTIVE

Date: 1/17/2006
Logged By: TDC

Figure No.
6

LOG OF EXPLORATION PIT NO. Y-14

Location: **Elevation (approx. ft msl):**

Depth, ft	Elev., ft	T-Probe	Sample type	Graphic Symbol	This log is part of the report prepared by Aspect Consulting, LLC for the named project and should be read together only with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **Description**
					Asphalt
					Gravel
1					(Loose), moist, gray, medium to fine SAND.
2					
3					
4		▽			Timber. Some decomposed organic material.
5					Gravel and cobbles. Water brown, sheen, from southeast corner, clear water from west side.
6					
					Bottom of Trench = 6.5'

ASPECT TP W/ SAMPLE DEPTH (CAD-SR) BARBEE_MILL_TP.GPJ February 15, 2006

T-Probe
SW: Distance of penetration into pit side wall
F: Distance of penetration into pit floor

Sample Type
Grab Sample

Barbee Mill

Renton

Project No.
050004

Aspect consulting
IN-DEPTH PERSPECTIVE

Date: 1/17/2006
Logged By: TDC

Figure No.
7

LOG OF SOIL PROBE NO. PY-17

Location:

Depth, ft	Samples collected for lab analysis	Sample Type	PID	Remarks	Graphic Symbol	This log is part of the report prepared by Aspect Consulting, LLC, for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this boring at the time of installation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
						No Samples to 11 feet.
10						Very moist, brown, organic silt and amorphous peat.
	PY-17-13	P		No free water		Occasional wet, fine to medium SAND interbeds
	PY-17-15	P				
15						Bottom of Boring = 15'

Sampler Type (ST):

P Piston sample Geoprobe, 2-ft. long, 2-in. dia.

Water Level ATD

Barbee Mill

Renton

Project No.

050004

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Figure No.

8

ECTSP1-BARBEE_MILL BARBEE_MILL_GP.GPJ February 15, 2006

LOG OF SOIL PROBE NO. PAA-17

Location:

Depth, ft	Samples collected for lab analysis	Sample Type	PID	Remarks	Graphic Symbol	This log is part of the report prepared by Aspect Consulting, LLC, for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this boring at the time of installation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
						No samples to 11 feet.
5						
10						Wet, brown, organic silt with SAND interbeds to 3".
	PAA-17-13	P				
	PAA-17-15	P				
15						Bottom of Boring = 15'

Sampler Type (ST):

P Piston sample Geoprobe, 2-ft. long, 2-in. dia.

Water Level ATD

Barbee Mill

Renton

Project No.

050004

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Figure No.

9

ECTSP1-BARBEE_MILL BARBEE_MILL_GP.GPJ February 15, 2006

ATTACHMENT B6

Test Pits for Assessment of Environmental Conditions, Urban Redevelopment, 2006

- Test Pit Logs TP- 1 through TP-8

Appendix A

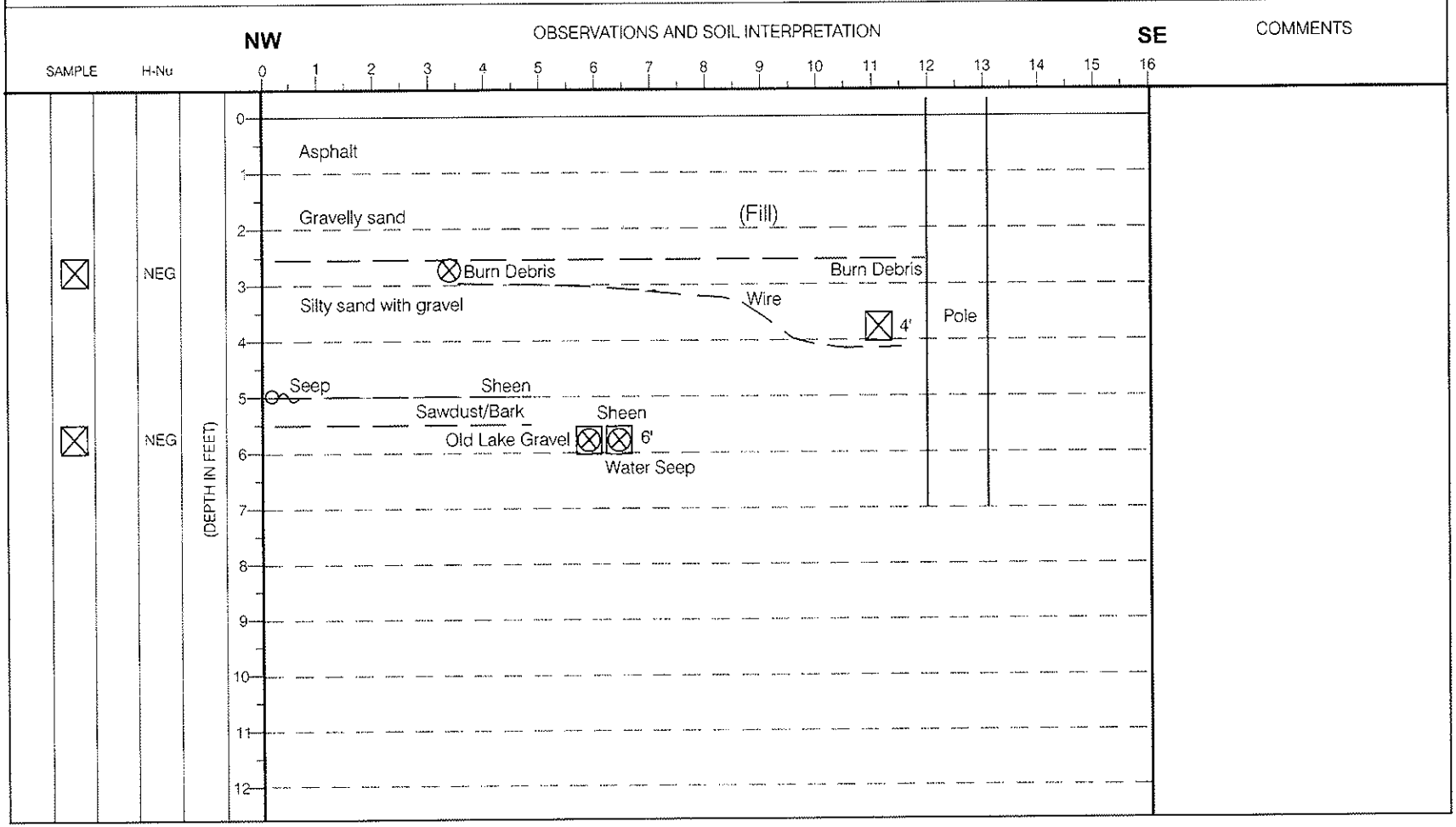
Logs of Explorations – Test Pits

URBAN REDEVELOPMENT, LLC

Test Pit Log TP-1

Project: Conner
Location: Old Substation
Observer: JRF

Date: 1/19/06



Remarks:

URBAN REDEVELOPMENT, LLC

Test Pit Log TP-2

Project: Conner
Location: Old Substation
Observer: JRF

Date: 1/19/06

SAMPLE	H-Nu	(DEPTH IN FEET)	OBSERVATIONS AND SOIL INTERPRETATION	COMMENTS
☒	NEG	0	Asphalt Base gravel	
		1		
		2	Brown medium sand with gravel, no silt (Fill)	
		3		
		4	Wood debris in silty sand Organic silt	
		5		
		6		
		7	Sand ⊗ Old creek bed	
		8		
		9		
		10		
		11	Peat	
		12		

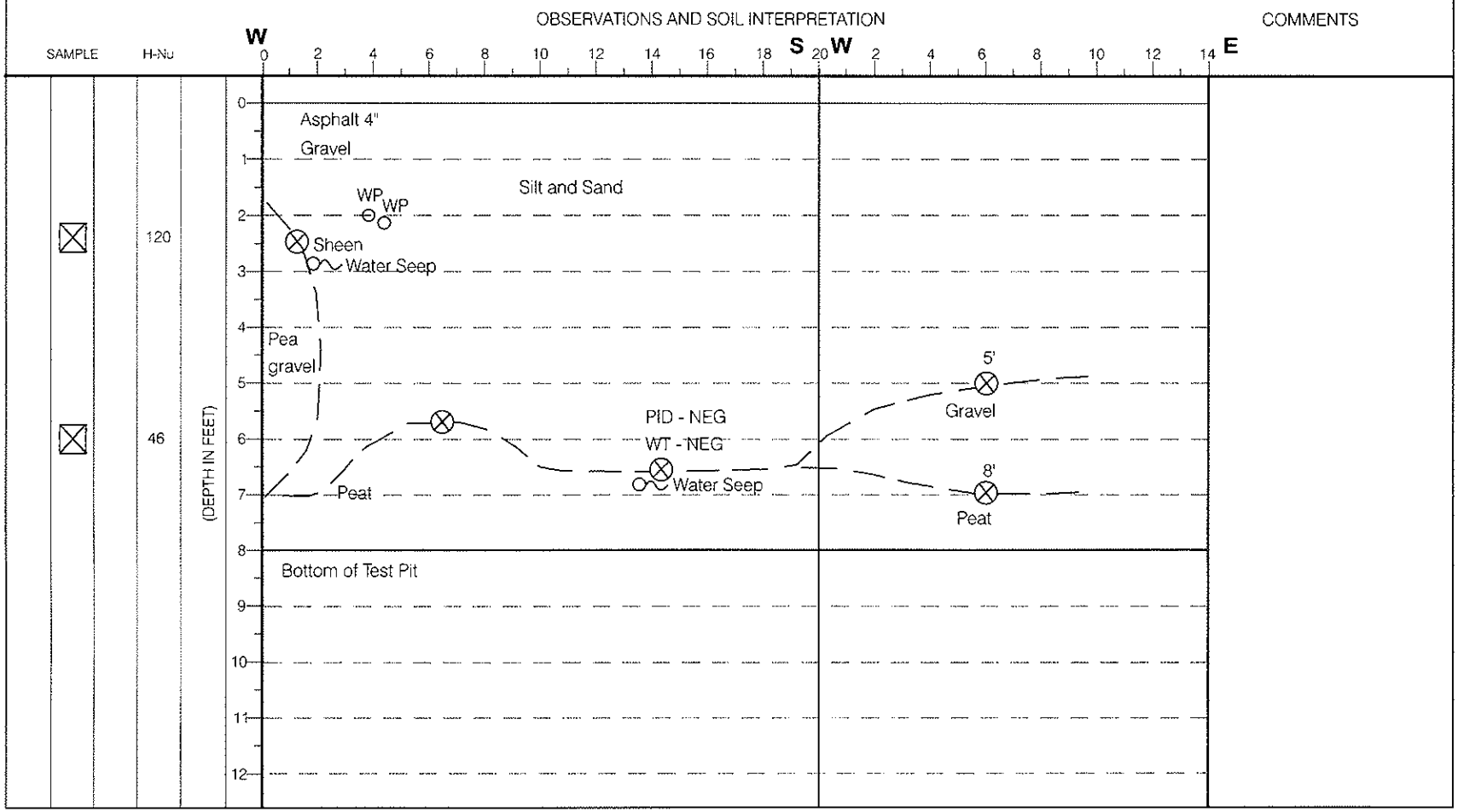
Remarks:

URBAN REDEVELOPMENT, LLC

Test Pit Log TP-3/3E

Project: Conner
Location: Old Substation
Observer: JRF

Date: 1/19/06



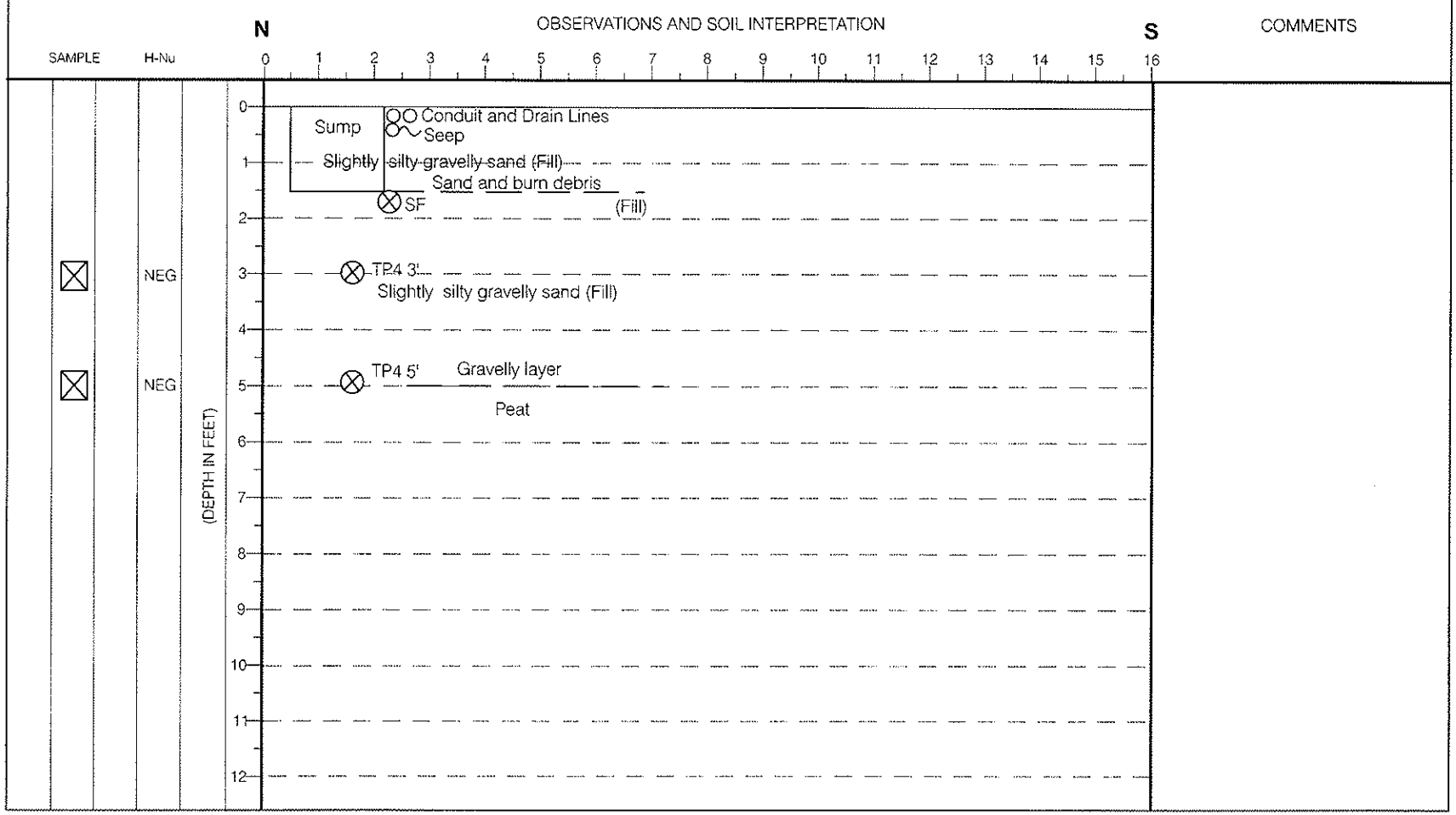
Remarks: Sheen in water from pea gravel at 7 feet appears clean

URBAN REDEVELOPMENT, LLC

Test Pit Log TP-4

Project: Conner
Location: Planer - Barbee
Observer: JRF

Date: 1/19/06



Remarks:

URBAN REDEVELOPMENT, LLC

Test Pit Log TP-5

Project: Conner
Location: Debris
Observer: JRF

Date: 1/19/06

SAMPLE	H-Nu	(DEPTH IN FEET)	N — OBSERVATIONS AND SOIL INTERPRETATION — S	COMMENTS
		0	Asphalt	
☒	NEG	2	⊗ Debris/Metal	
		4	Sandy silt	
		6	Sand ▽	
		7	Sand	

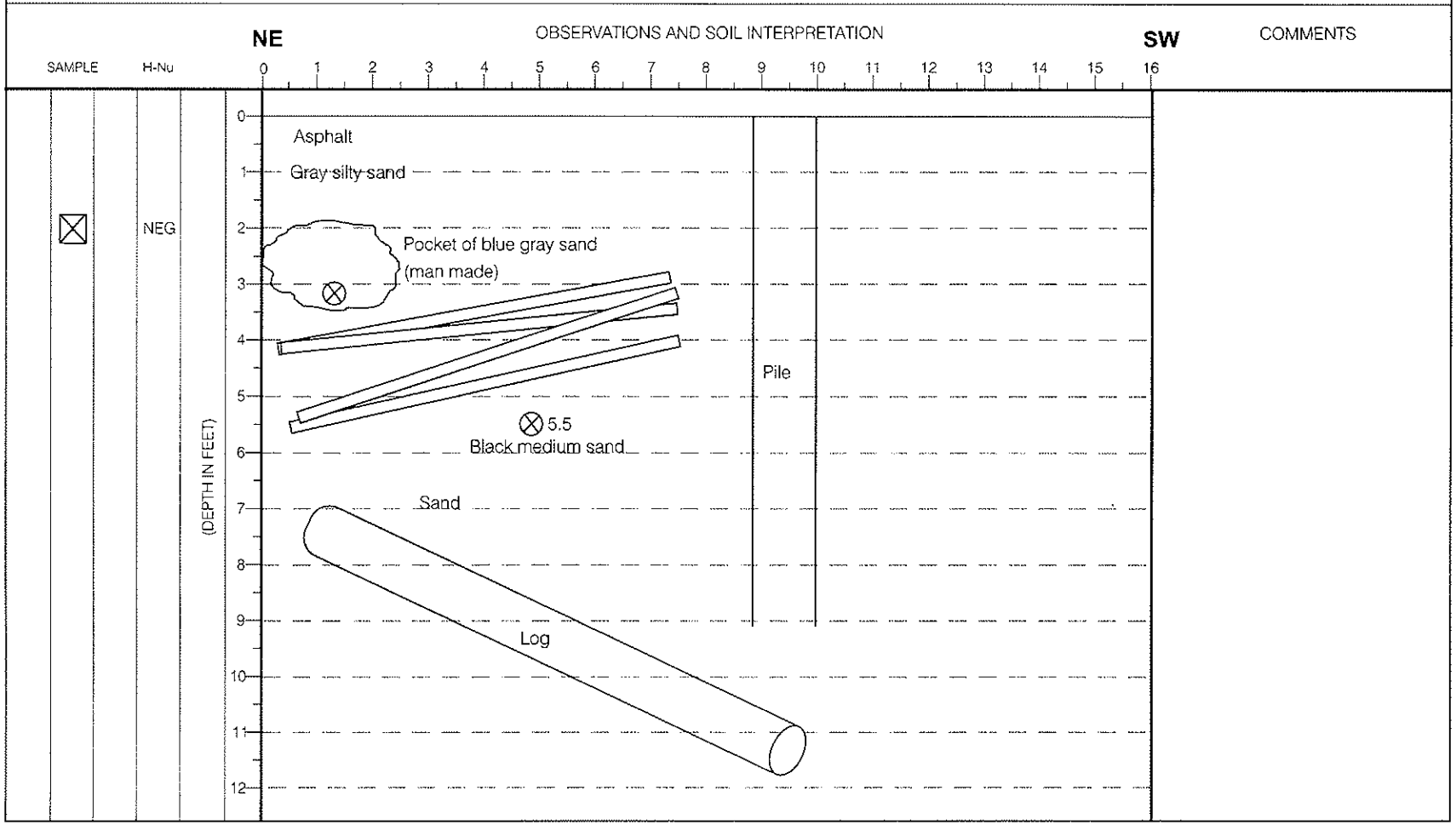
Remarks:

Test Pit Log TP-6

URBAN REDEVELOPMENT, LLC

Project: Conner
Location: Shipyard - S
Observer: JRF

Date: 1/19/06



Remarks:

URBAN REDEVELOPMENT, LLC

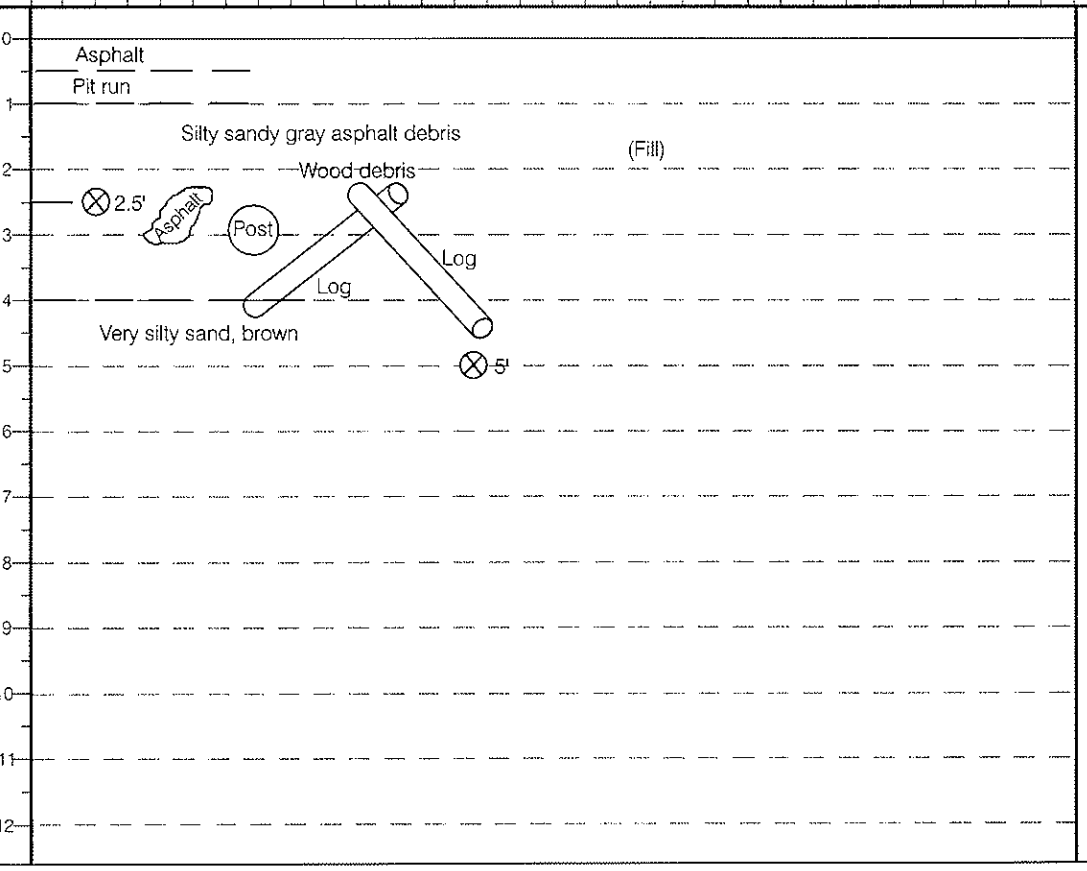
Test Pit Log TP-7

Project: Conner
Location: W Shipyard
Observer: JRF

Date: 1/19/06

NW — OBSERVATIONS AND SOIL INTERPRETATION — SE

SAMPLE	H-Nu	(DEPTH IN FEET)	COMMENTS
☒	NEG		



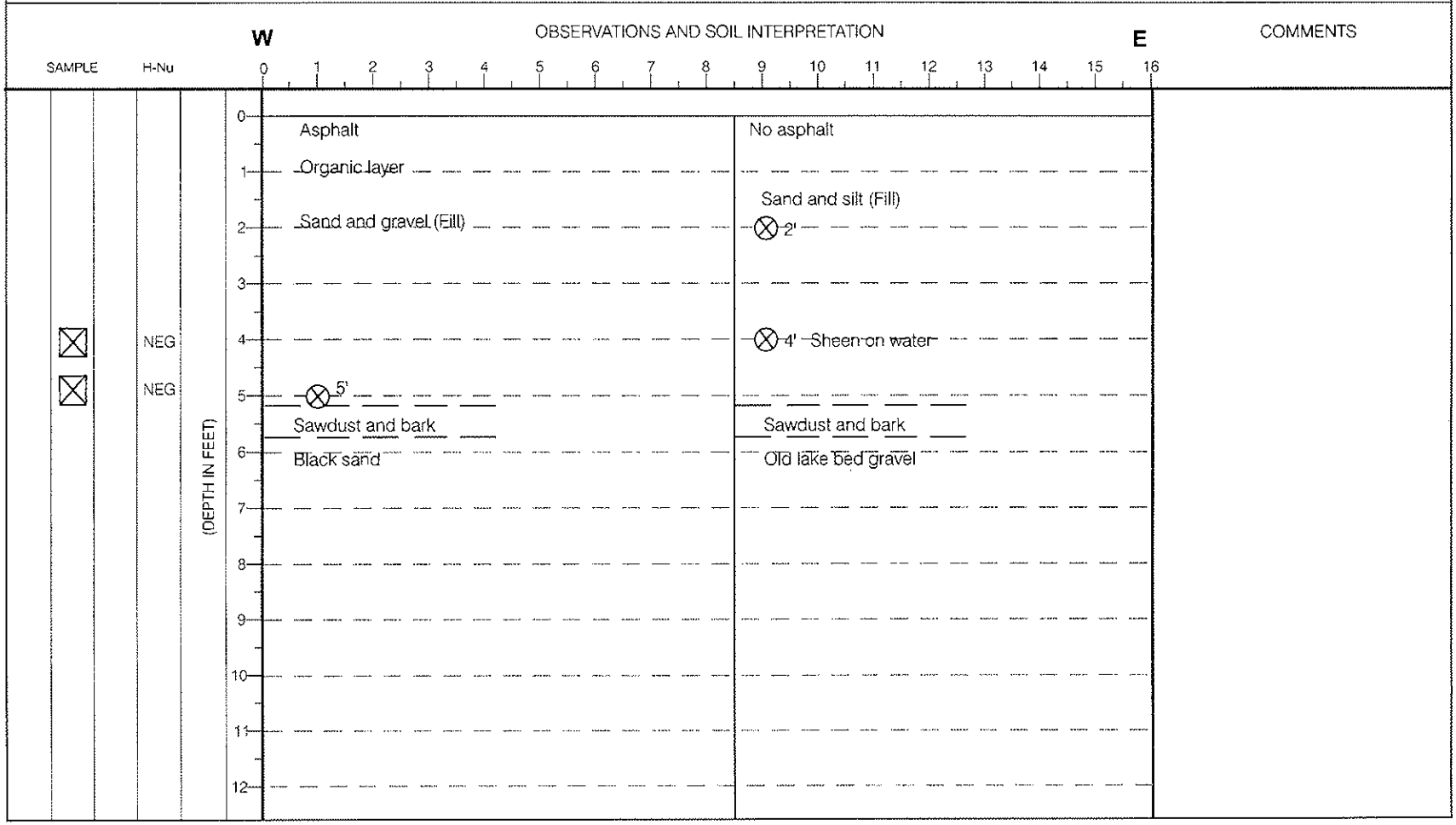
Remarks:

URBAN REDEVELOPMENT, LLC

Test Pit Log TP-8N

Project: Conner
Location: Shoreline
Observer: JRF

Date: 1/19/06

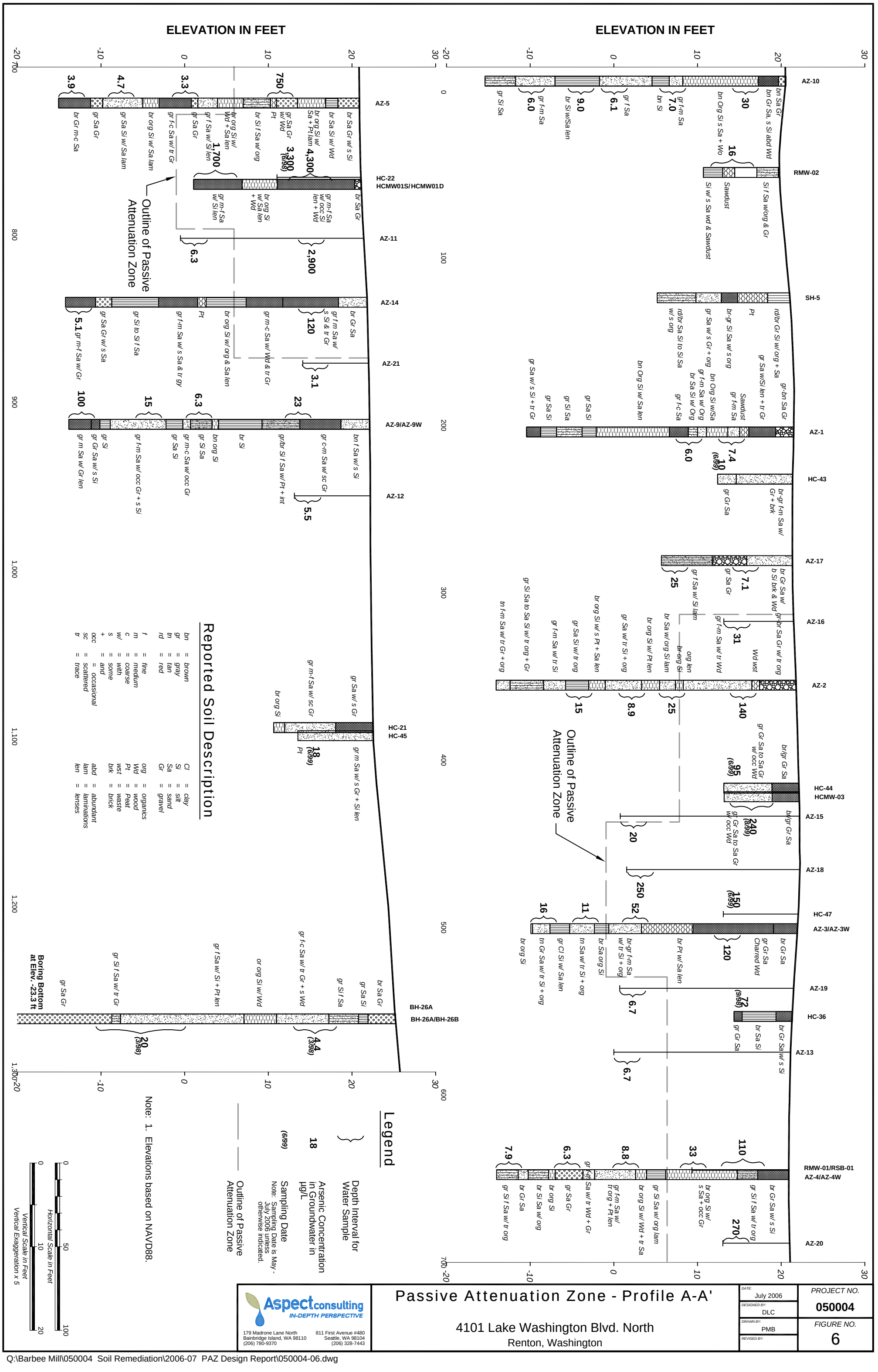


Remarks:

ATTACHMENT B7

Engineering Design Report. Barbee Mill Groundwater Remediation, Aspect, 2006.

- Figure 6 – Passive Attenuation Zone – Cross Section A-A’



Reported Soil Description

bn = brown		Cl = clay	
gr = gray		Si = silt	
tn = tan		Sa = sand	
rd = red		Gr = gravel	
f = fine		org = organics	
m = medium		Wd = wood	
c = coarse		Pt = Peat	
w/ = with		wst = waste	
s = some		brk = brick	
+ = and		abd = abundant	
occ = occasional		lam = laminations	
sc = scattered		len = lenses	
tr = trace			

Note: 1. Elevations based on NAVD88.

Legend

- Depth Interval for Water Sample
- 18 — Arsenic Concentration in Groundwater in µg/L
- (6/99) — Sampling Date
  Note: Sampling Date is May - July 2006 unless otherwise indicated.
- Outline of Passive Attenuation Zone

Horizontal Scale in Feet: 0, 50, 100

Vertical Scale in Feet: 0, 10, 20

Vertical Exaggeration x 5

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179 Madrone Lane North
Bainbridge Island, WA 98110
(206) 780-9370

811 First Avenue #480
Seattle, WA 98104
(206) 328-7443

Passive Attenuation Zone - Profile A-A'

4101 Lake Washington Blvd. North
Renton, Washington

DATE: July 2006	PROJECT NO. 050004
DESIGNED BY: DLC	
DRAWN BY: PMB	FIGURE NO. 6
REVISED BY:	

Q:\Barbee Mill\050004 Soil Remediation\2006-07 PAZ Design Report\050004-06.dwg

ATTACHMENT B8

Passive Attenuation Zone Performance Monitoring Wells, Aspect, 2010b.

- Monitoring Well Logs CMW-1, 2S/D, 3, 4S/D, 5, and 6
- Extraction Well Logs EW-1 through EW-8
- Piezometer Logs PZ-1 and PZ-2
- Wellpoint Logs WP-1A and WP-8

Coarse-Grained Soils - More than 50 %[1] Retained on No. 200 Sieve	Gravels - More than 50 %[1] of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines[5]	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≥15% Fines[5]	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50%[1] or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines[5]	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≥15% Fines[5]	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50 %[1] or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diato-maceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

Coarse-Grained Soils	Density	SPT[2] blows/foot
	Very Loose	0 to 4
	Loose	4 to 10
	Medium Dense	10 to 30
	Dense	30 to 50
	Very Dense	>50

Fine-Grained Soils	Consistency	SPT[2] blows/foot
	Very Soft	0 to 2
	Soft	2 to 4
	Medium Stiff	4 to 8
	Stiff	8 to 15
	Very Stiff	15 to 30
	Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

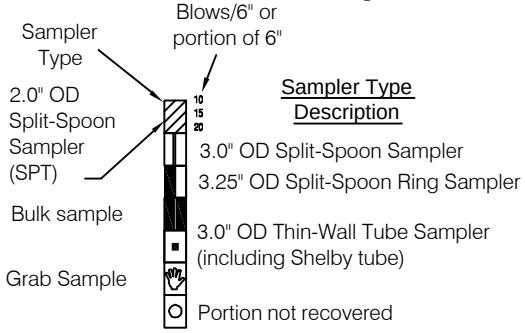
[3] Estimated Percentage

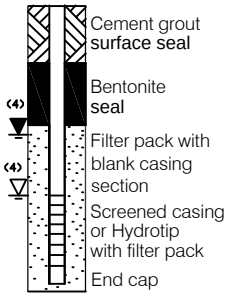
Percentage by Weight	Modifier
<5	Trace
5 to 15	Slightly (sandy, silty, clayey, gravelly)
15 to 30	Sandy, silty, clayey, gravelly)
34 to 49	Very (sandy, silty, clayey, gravelly)

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

Symbols





(1) Percentage by dry weight
(2) (SPT) Standard Penetration Test (ASTM D-1586)
(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)
(4) Depth of groundwater — ATD = At time of drilling; Static water level (date)
(5) Combined USCS symbols used for fines between 5% and 15% as estimated in General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

Aspect consulting
IN-DEPTH PERSPECTIVE
179 Madrone Lane North
Bainbridge Island, WA 98110
(206) 780-9370
811 First Avenue #480
Seattle, WA 98104
(206)-328-7443

Exploration Log Key

DATE:
DESIGNED BY:
DRAWN BY:
REVISED BY:

PROJECT NO.

FIGURE NO.
A-1

P:_ACAD Standards\Drawings\Exploration Log Key.dwg

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earth + water

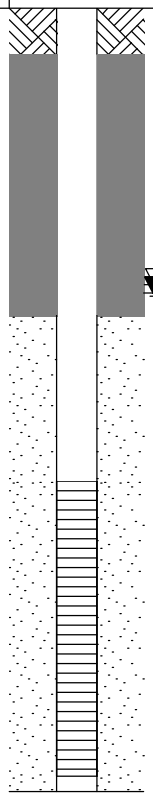
Well Construction Log

Project Number	Well Number	Sheet
050004	CMW-1	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Northwest Probe / Geoprobe
Sampling Method: Continuous Core

Ground Surface Elev
Top of Casing Elev. 22.75
Depth to Water (ft BGS) 4.63
Start/Finish Date 8/23/2007

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID		Material Type	Description	Depth (ft)



5
10
15
20

Sampler Type:
No Recovery

Static Water Level
Water Level (ATD)

Logged by: MJN
Approved by: JJP
Figure No. A- 2

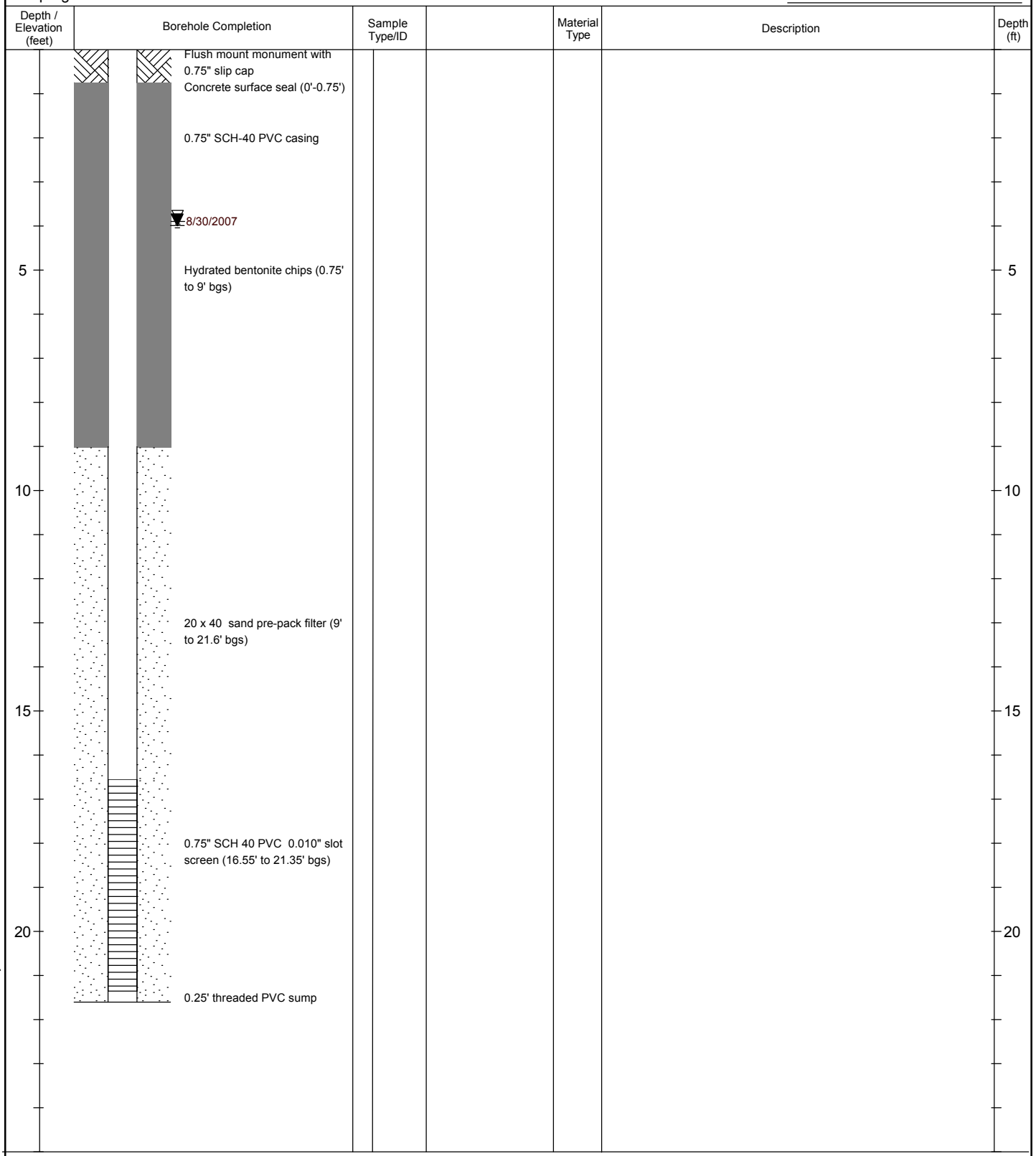
_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	CMW-2D	1 of 1

Project Name:	Barbee Mill	Ground Surface Elev	
Location:	Renton, WA	Top of Casing Elev.	22.11
Driller/Method:	Northwest Probe / Geoprobe	Depth to Water (ft BGS)	3.99
Sampling Method:	Continuous Core	Start/Finish Date	8/23/2007



Sampler Type:

○ No Recovery

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MJN

Approved by: JJP

Figure No. A- 3

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	CMW-2S	1 of 1

Project Name:	Barbee Mill	Ground Surface Elev	
Location:	Renton, WA	Top of Casing Elev.	22.19
Driller/Method:	Northwest Probe / Geoprobe	Depth to Water (ft BGS)	4.32
Sampling Method:	Continuous Core	Start/Finish Date	8/22/2007

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID		Material Type	Description	Depth (ft)
	Flush mount monument with 0.75" slip cap Concrete surface seal (0'-0.5') 0.75" SCH-40 PVC casing Hydrated bentonite chips (0.75' to 5' bgs) 8/30/2007 20 x 40 sand pre-pack filte (5' to 12.6' bgs) 0.75" SCH 40 PVC 0.010" slot screen (7.7' to 12.3' bgs) 0.25' threaded PVC sump					

Sampler Type:

○ No Recovery

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MJN

Approved by: JJP

Figure No. A- 4

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

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Well Construction Log

Project Number	Well Number	Sheet
050004	CMW-3	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Northwest Probe / Geoprobe
Sampling Method: Continuous Core

Ground Surface Elev
Top of Casing Elev. 22.41
Depth to Water (ft BGS) 3.78
Start/Finish Date 8/22/2007

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID		Material Type	Description	Depth (ft)
0	Flush mount monument with 0.75" slip cap Concrete surface seal (0.2'-0.5') 0.75" SCH-40 PVC casing Hydrated bentonite chips (0.5' to 5' bgs) 8/30/2007					0
5	20 x 40 sand pre-pack filter (5' to 12.5' bgs) 0.75" SCH 40 PVC 0.010" slot screen (7.7' to 12.25' bgs)					5
10	0.25' threaded PVC sump					10
15						15
20						20

Sampler Type:
○ No Recovery

▼ Static Water Level
▽ Water Level (ATD)

Logged by: MJN
Approved by: JJP
Figure No. A- 5

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	CMW-4D	1 of 1

Project Name:	Barbee Mill	Ground Surface Elev	
Location:	Renton, WA	Top of Casing Elev.	27.87
Driller/Method:	Northwest Probe / Geoprobe	Depth to Water (ft BGS)	9.51
Sampling Method:	Continuous Core	Start/Finish Date	8/22/2007

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Material Type	Description	Depth (ft)
0	Flush mount monument with 0.75" slip cap Concrete surface seal (+0.3'-0') 0.75" SCH-40 PVC casing Hydrated bentonite chips (0.0' to 5' bgs)				0
5					5
10	8/30/2007 20 x 40 sand pre-pack filter (5' to 26' bgs)				10
15					15
20	0.75" SCH 40 PVC 0.010" slot screen (20.95' to 25.75' bgs) 0.25' threaded PVC sump				20
25					25

Sampler Type:

○ No Recovery

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MJN

Approved by: JJP

Figure No. A- 6

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

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Well Construction Log

Project Number	Well Number	Sheet
050004	CMW-4S	1 of 1

Project Name:	Barbee Mill	Ground Surface Elev	
Location:	Renton, WA	Top of Casing Elev.	27.44
Driller/Method:	Northwest Probe / Geoprobe	Depth to Water (ft BGS)	9.4
Sampling Method:	Continuous Core	Start/Finish Date	8/22/2007

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID		Material Type	Description	Depth (ft)
	Flush mount monument with 0.75" slip cap Concrete surface seal (0'-0.3') 0.75" SCH-40 PVC casing Hydrated bentonite chips (0.3' to 9' bgs) 8/30/2007 20 x 40 sand pre-pack filter (9' to 16.6' bgs) 0.75" SCH 40 PVC 0.010" slot screen (11.55' to 16.35' bgs) 0.25' threaded PVC sump					

Sampler Type:

○ No Recovery

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MJN

Approved by: JJP

Figure No. A- 7

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	CMW-5	1 of 1

Project Name:	Barbee Mill	Ground Surface Elev	
Location:	Renton, WA	Top of Casing Elev.	31.07
Driller/Method:	Northwest Probe / Geoprobe	Depth to Water (ft BGS)	12.32
Sampling Method:	Continuous Core	Start/Finish Date	8/22/2007

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Material Type	Description	Depth (ft)
5	Flush mount monument with 0.75" slip cap Concrete surface seal (0.4'-0.75') 0.75" SCH-40 PVC casing Hydrated bentonite chips (0.7' to 11.2' bgs)				5
10	20 x 40 sand pre-pack filter (9' to 16.6' bgs) 8/30/2007 0.75" SCH 40 PVC 0.010" slot screen (11.55' to 16.35' bgs)				10
15	0.25' threaded PVC sump				15
20					20

Sampler Type:

○ No Recovery

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MJN

Approved by: JJP

Figure No. A- 8

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	CMW-6	1 of 1

Project Name:	Barbee Mill	Ground Surface Elev	
Location:	Renton, WA	Top of Casing Elev.	31.03
Driller/Method:	Northwest Probe / Geoprobe	Depth to Water (ft BGS)	11.61
Sampling Method:	Continuous Core	Start/Finish Date	8/22/2007

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID		Material Type	Description	Depth (ft)
0	Flush mount monument with 0.75" slip cap Concrete surface seal (0.4'-0.75') 0.75" SCH-40 PVC casing					0
5	Hydrated bentonite chips (0.75' to 12.5' bgs)					5
10	8/30/2007					10
15	20 x 40 sand pre-pack filter (12.5' to 18.75' bgs) 0.75" SCH 40 PVC 0.010" slot screen (13.7' to 18.5' bgs)					15
20	0.25' threaded PVC sump					20

Sampler Type:

○ No Recovery

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MJN

Approved by: JJP

Figure No. A- 9

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

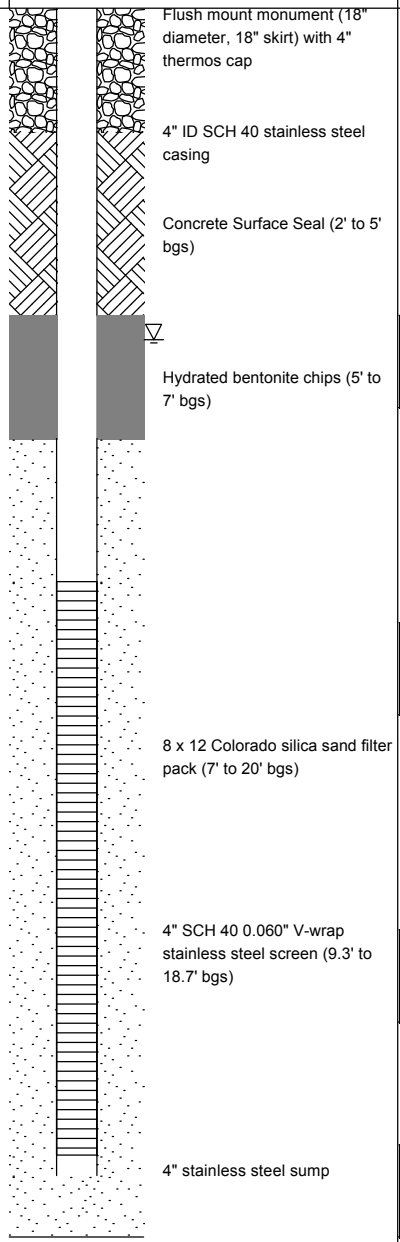
Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-1	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Cascade / Hollow Stem Auger
Sampling Method: D&M Split-Spoon

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS)
Start/Finish Date 5/14/2006



Depth / Elevation (feet)	Sample Type/ID	Material Type	Description	Depth (ft)
			4" Base course fill	
5	S-1		Dense, slightly moist, dark brown, very gravelly SAND (SW); fine subrounded gravels; fine to coarse sand, predominantly medium	5
10	S-2		Medium dense, wet, dark gray, SAND (SP); medium to coarse sand, predominantly medium; trace fine gravels	10
15	S-3		Scattered very thinly bedded (2cm) oxidized sand interbeds	15
	S-4		Medium dense, wet, dark gray, very sandy SILT (ML); fine to medium sand, predominantly fine	
20			Bottom of boring at 20' bgs Ecology ID APS-941	20

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

Static Water Level
Water Level (ATD)

Logged by: DFR
Approved by: JJP
Figure No. A- 10

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

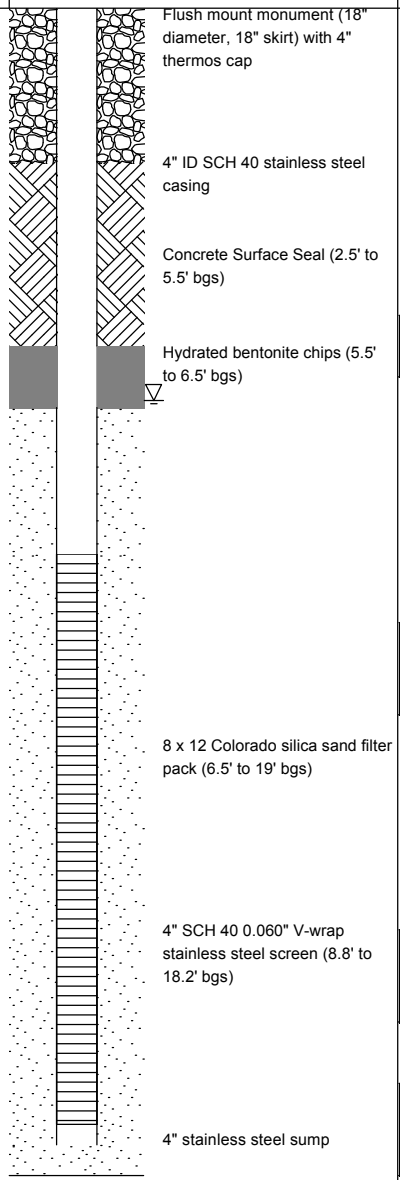
Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-2	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Cascade / Hollow Stem Auger
Sampling Method: D&M Split-Spoon

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS)
Start/Finish Date 5/15/2006



Depth / Elevation (feet)	Sample Type/ID	Material Type	Description	Depth (ft)
			4" Base course fill	
5	S-1		Very dense, slightly moist, dark gray, slightly silty, very sandy GRAVEL (GW); fine subangular to subrounded gravels; fine to medium subrounded sand, predominantly fine	5
10	S-2		Medium dense, wet, dark gray, SAND (SP); medium to coarse sand, predominantly medium	10
15	S-3		Slightly gravelly; fine subrounded gravels	15
	S-4		Medium dense, wet, dark gray, very sandy SILT (ML); fine to medium sand, predominantly fine	
20			Bottom of boring at 19' bgs Ecology ID APS-942	20

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

Static Water Level
Water Level (ATD)

Logged by: DFR
Approved by: JJP
Figure No. A- 11

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

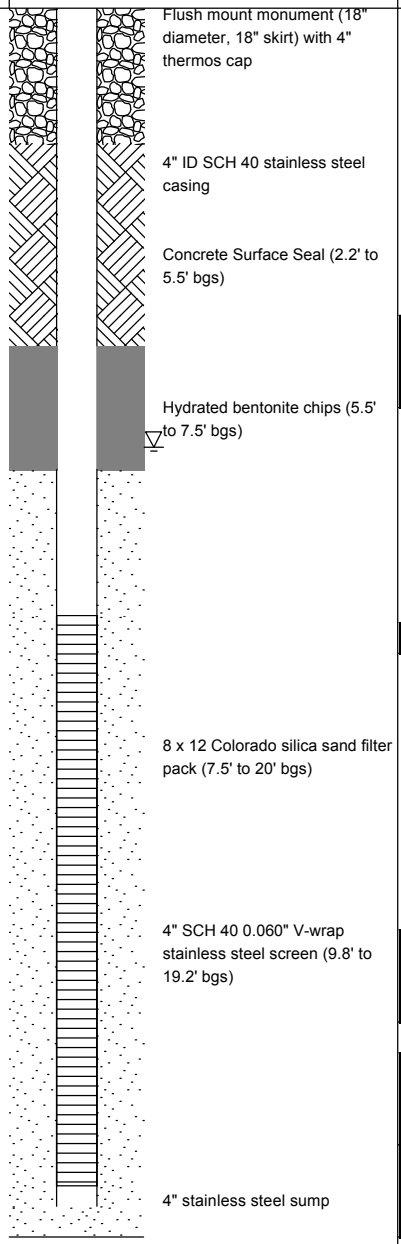
Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-3	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Cascade / Hollow Stem Auger
Sampling Method: D&M Split-Spoon

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS)
Start/Finish Date 5/15/2006



Depth / Elevation (feet)	Sample Type/ID	Material Type	Description	Depth (ft)
0			4" Base course fill	0
			Very dense, dry, dark gray, slightly silty, very sandy GRAVEL (GW); fine subangular to subrounded gravels; fine to medium subrounded sand, predominantly fine	
5	S-1			5
10	S-2		Wet, large wood fragment encountered	10
15	S-3		Medium dense, wet, dark gray, slightly gravelly SAND (SP); fine subrounded gravels; fine to coarse sand, predominantly medium	15
	S-4			
	S-5			
20			Bottom of boring at 20' bgs Ecology ID APS-943	20

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

Static Water Level
Water Level (ATD)

Logged by: DFR
Approved by: JJP
Figure No. A- 12

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

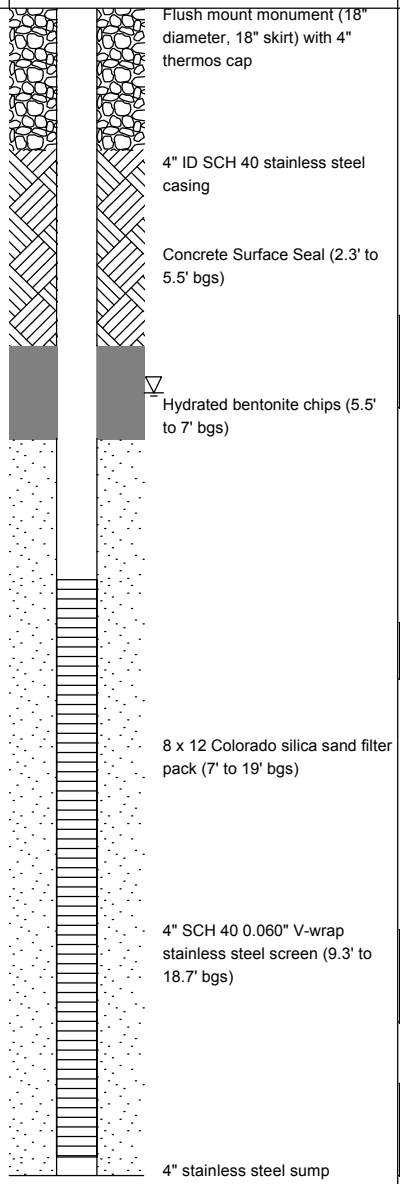
Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-4	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Cascade / Hollow Stem Auger
Sampling Method: D&M Split-Spoon

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS)
Start/Finish Date 5/15/2006



Depth / Elevation (feet)	Sample Type/ID	Material Type	Description	Depth (ft)
0			4" Base course fill	0
			Very dense, slightly moist, dark gray, slightly silty, very sandy GRAVEL (GW); fine rounded gravels; fine to medium subrounded sand, predominantly fine	
5	S-1			5
	S-2		Wet, occaisonal wood fragments	
10				10
	S-3		Medium dense, wet, dark gray, slightly gravelly SAND (SW); fine subrounded gravels; fine to coarse sand, predominantly medium	
15	S-4			15
			Medium dense, wet, dark gray, sandy SILT (ML); fine to medium sand, predominantly fine	
			Bottom of boring at 19' bgs	
20			Ecology ID APS-944	20

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

Static Water Level
Water Level (ATD)

Logged by: DFR
Approved by: JJP
Figure No. A- 13

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

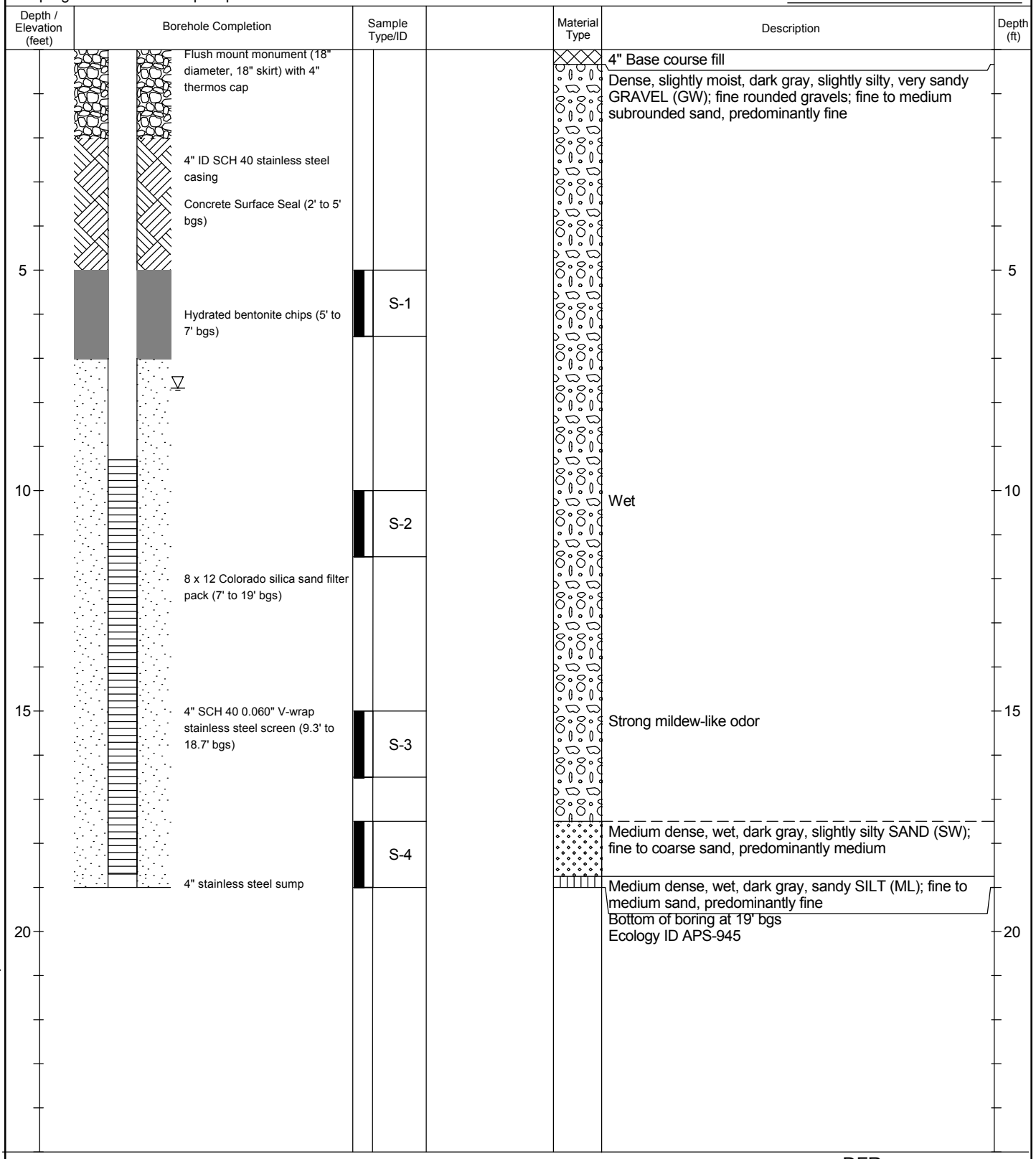
Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-5	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Cascade / Hollow Stem Auger
Sampling Method: D&M Split-Spoon

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS)
Start/Finish Date 5/15/2006



Sampler Type:
No Recovery
3.25" OD D&M Split-Spoon Ring Sampler

Static Water Level
Water Level (ATD)

Logged by: DFR
Approved by: JJP
Figure No. A- 14

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

Aspect consulting
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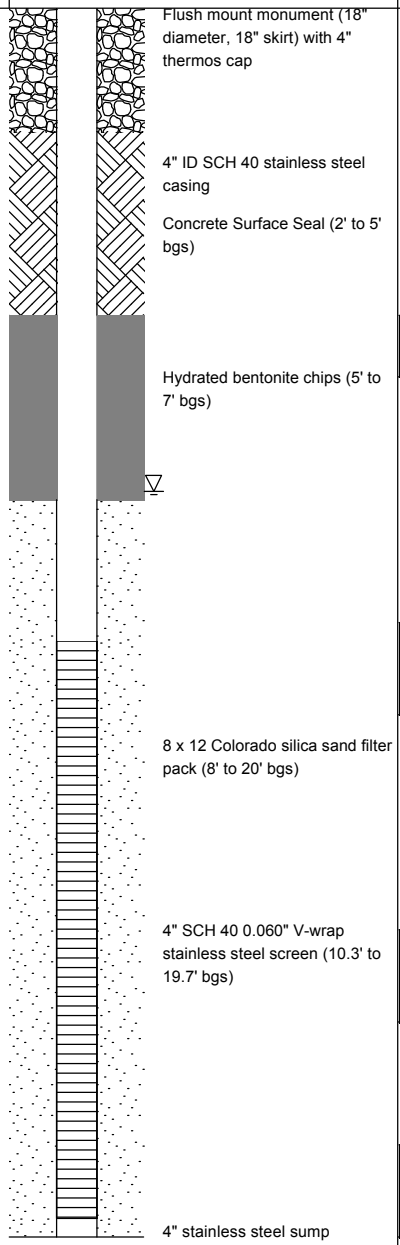
Well Construction Log

Project Number	Well Number	Sheet
050004	EW-6	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Cascade / Hollow Stem Auger
Sampling Method: D&M Split-Spoon

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS)
Start/Finish Date 5/16/2006



Depth / Elevation (feet)	Sample Type/ID	Material Type	Description	Depth (ft)
			4" Base course fill	
			Dense, moist, dark gray, slightly silty, very sandy GRAVEL (GW); fine rounded gravels; fine to medium subrounded sand, predominantly medium	
5	S-1			5
10	S-2		Wet	10
15	S-3		Medium dense, wet, dark gray, slightly gravelly SAND (SP); fine to medium subrounded gravels; fine to coarse sand, predominantly medium	15
	S-4			
20			Bottom of boring at 19' bgs Ecology ID APS-946	20

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

Static Water Level
Water Level (ATD)

Logged by: DFR
Approved by: JJP
Figure No. A- 15

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

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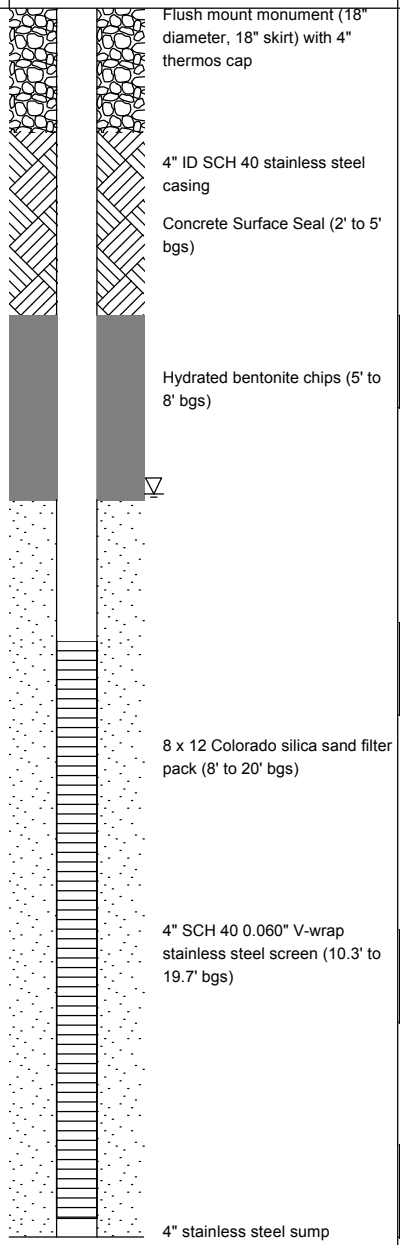
Well Construction Log

Project Number	Well Number	Sheet
050004	EW-7	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Cascade / Hollow Stem Auger
Sampling Method: D&M Split-Spoon

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS)
Start/Finish Date 5/16/2006



Depth / Elevation (feet)	Sample Type/ID	Material Type	Description	Depth (ft)
			4" Base course fill	
			Dense, moist, dark gray, slightly silty, very sandy GRAVEL (GW); fine rounded gravels; fine to medium subrounded sand, predominantly medium	
5	S-1			5
10	S-2		Wet, slightly sandy GRAVEL (GW)	10
15	S-3			15
			Medium dense, wet, dark gray, slightly gravelly SAND (SP); fine to medium subrounded gravels; fine to coarse sand, predominantly medium	
	S-4			
20			Medium dense, wet, dark gray, sandy SILT (ML); fine to medium sand, predominantly fine	20
			Bottom of boring at 20' bgs Ecology ID APS-947	

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

Static Water Level
Water Level (ATD)

Logged by: DFR
Approved by: JJP
Figure No. A- 16

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

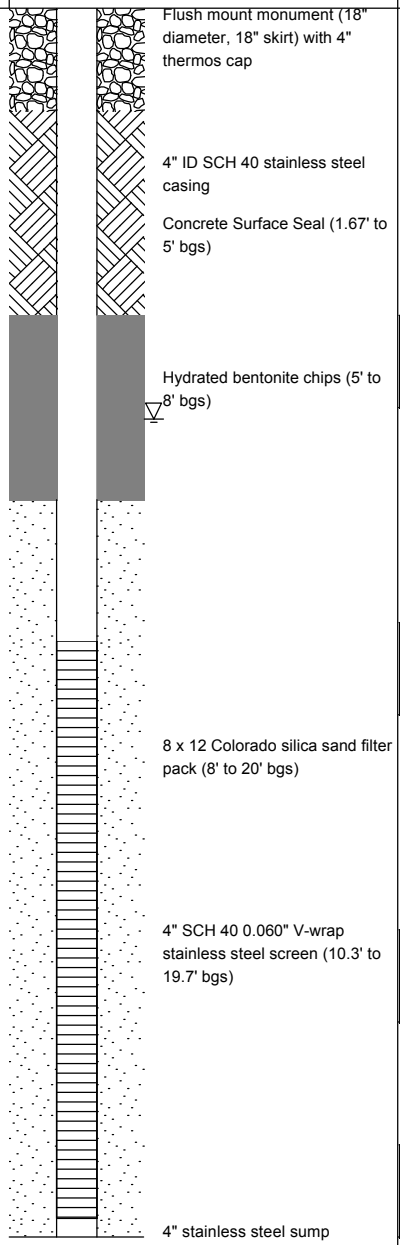
Aspect consulting
earth + water

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-8	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Cascade / Hollow Stem Auger
Sampling Method: D&M Split-Spoon

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS)
Start/Finish Date 5/16/2006



Depth / Elevation (feet)	Sample Type/ID	Material Type	Description	Depth (ft)
			4" Base course fill	
			Dense, slightly moist, dark gray, slightly silty, very sandy GRAVEL (GW); fine rounded gravels; fine to medium subrounded sand, predominantly medium	
			Large cobble encountered	
5	S-1			5
10	S-2		Medium dense, wet, dark gray, slightly gravelly SAND (SP); fine to medium subrounded gravels; fine to coarse sand, predominantly medium	10
15	S-3			15
	S-4			
20			Medium dense, wet, dark gray, sandy SILT (ML); fine to medium sand, predominantly fine Bottom of boring at 20' bgs Ecology ID APS-948	20

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

Static Water Level
Water Level (ATD)

Logged by: DFR
Approved by: JJP
Figure No. A- 17

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

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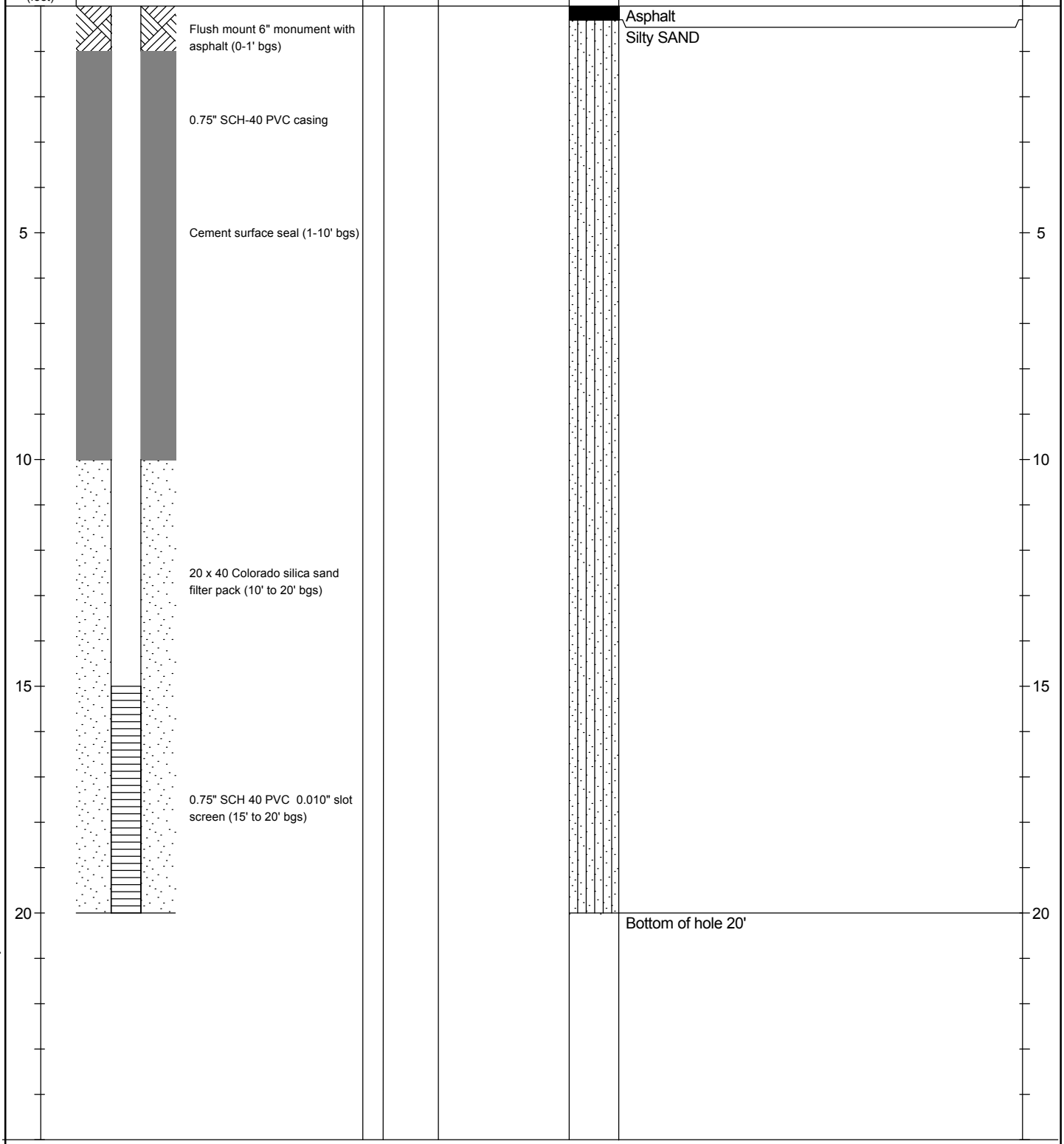
Well Construction Log

Project Number	Well Number	Sheet
050004	PZ-1	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: NW Probe / Geoprobe
Sampling Method: Continuous Core

Ground Surface Elev
Top of Casing Elev.
Depth to Water
Start/Finish Date 11/6/2007



Sampler Type:
○ No Recovery

▼ Static Water Level
▽ Water Level (ATD)

Logged by: JTL
Approved by: JJP
Figure No. A- 18

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

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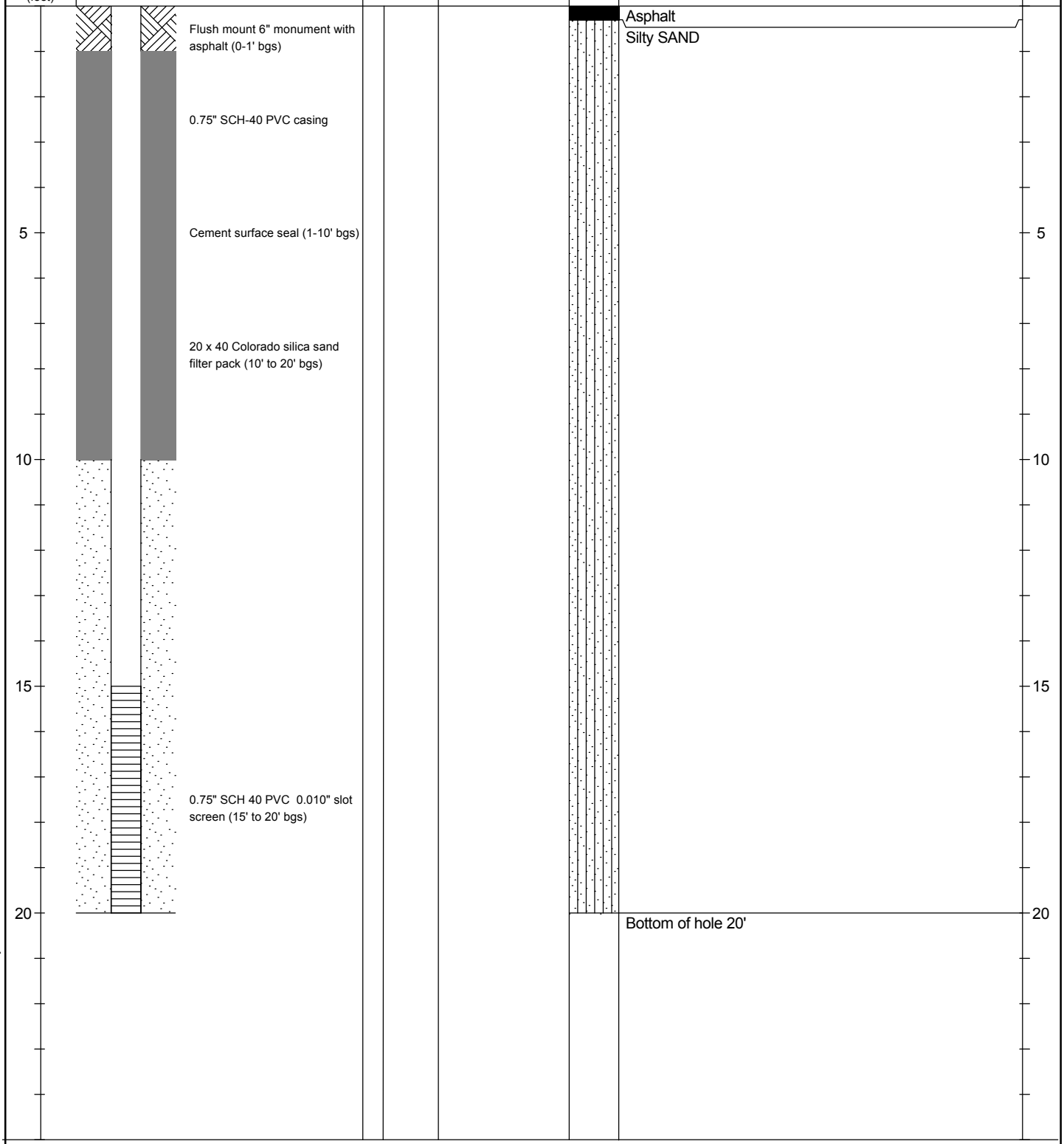
Well Construction Log

Project Number	Well Number	Sheet
050004	PZ-2	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: NW Probe / Geoprobe
Sampling Method: Continuous Core

Ground Surface Elev
Top of Casing Elev.
Depth to Water
Start/Finish Date 11/6/2007



Sampler Type:
○ No Recovery

▼ Static Water Level
▽ Water Level (ATD)

Logged by: JTL
Approved by: JJP
Figure No. A- 19

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

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Well Construction Log

Project Number	Well Number	Sheet
050004	WP-1A	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Aspect / Fence Post Hammer
Sampling Method: Hand Installation

Ground Surface Elev
Top of Casing Elev.
Depth to Water
Start/Finish Date 1/6/2009

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Material Type	Description	Depth (ft)
	Stainless Steel 1.5" Riser Pipe to approx 2.5' above lake water level Stainless Steel 1.5" wire wrap screen 0.010 slot size Stainless Steel drive point			Gravel (GW), fine to coarse present at mudline. No samples collected.	

1 2 3 4 5 6 7 8 9

Sampler Type:
○ No Recovery

▼ Static Water Level
▽ Water Level (ATD)

Logged by: DFR
Approved by: JJP
Figure No. A- 20

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

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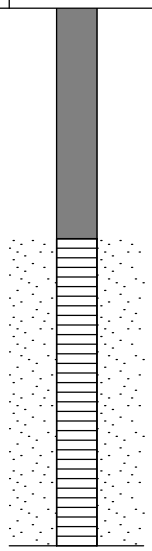
Well Construction Log

Project Number	Well Number	Sheet
050004	WP-8	1 of 1

Project Name: Barbee Mill
Location: Renton, WA
Driller/Method: Aspect / Fence Post Hammer
Sampling Method: Hand Installation

Ground Surface Elev
Top of Casing Elev.
Depth to Water
Start/Finish Date 1/6/2009

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Material Type	Description	Depth (ft)
				Silty sand (SM); with coarse sized gravel quarry spalls present at mudline. No samples collected.	



1 2 3 4 5 6 7 8 9

Sampler Type:
○ No Recovery

▼ Static Water Level
▽ Water Level (ATD)

Logged by: DFR
Approved by: JJP
Figure No. A- 21

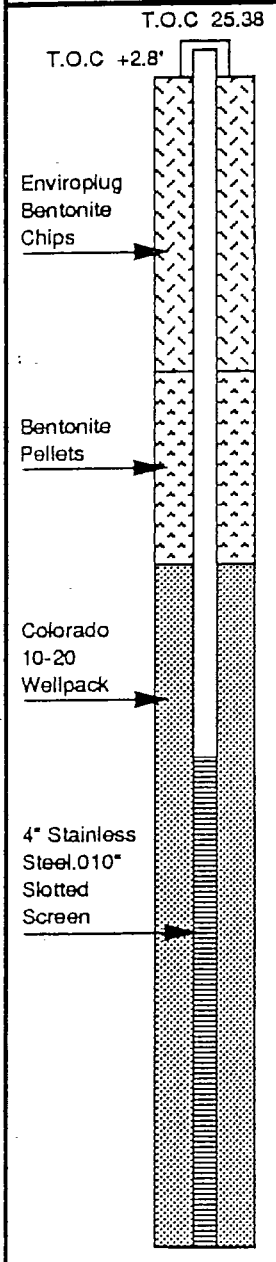
_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 18, 2010

ATTACHMENT B9

Select Field Logs for Quendall Draft FS, Aspect and Anchor, 2012

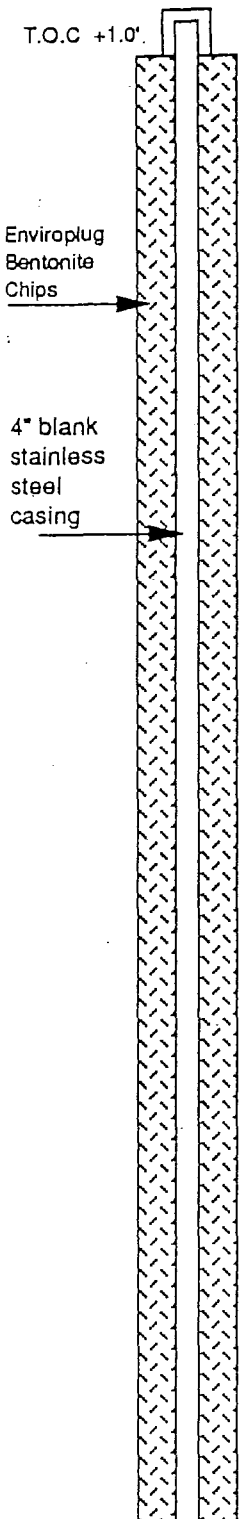
- Monitoring Well Logs BH-29 A/B
- Monitoring Well Logs BH-26 A/B

DRILLING LOG	PROJECT: QUENDALL	PROJECT NO. 86004S	SHEET 1 of 1
LOCATION:	N 196,846 E 1,662,027	TOTAL NO. SAMPLES:	0
DRILLING AGENCY:	SOIL SAMPLING SERVICE	DEPTH TO WATER BELOW GRD SURFACE:	- - -
HOLE NO.	BH-26A	DATE STARTED: 8/9/90	DATE COMPLETED: 8/9/90
NAME OF DRILLER:	WAYNE GUY	DRILLING METHOD:	HOLLOW STEM AUGER
TOTAL DEPTH OF HOLE:	12 FT	INSPECTOR:	DAVE WALKER



DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
0					Brown sandy gravel (GP) — FILL	No Samples stratigraphy from BH-26B.
3					Gray sandy silt (ML), wet.	
5					Gray silty fine sand (SM), medium dense, wet - seams of sandy silt @ 4.0'-4.5'. - saturated @ 5.0'. - silt seam @ 6.5'.	
8					Gray fine to coarse sand (SP),dense, saturated, trace gravel, some wood chunks. Fine sand below 8.0'.	
12						

DRILLING LOG	PROJECT: QUENDALL	PROJECT NO. 86004S	SHEET 1 of 3
LOCATION:	N 196,847 E 1,662,032	TOTAL NO. SAMPLES:	11
DRILLING AGENCY:	SOIL SAMPLING SERVICE	DEPTH TO WATER BELOW GRD SURFACE:	5 FT
HOLE NO.	BH-26B	DATE STARTED: 8/6/90	DATE COMPLETED: 8/6/90
NAME OF DRILLER:	WAYNE GUY	DRILLING METHOD:	HOLLOW STEM AUGER
TOTAL DEPTH OF HOLE:	48.5 FT	INSPECTOR:	DAVE WALKER

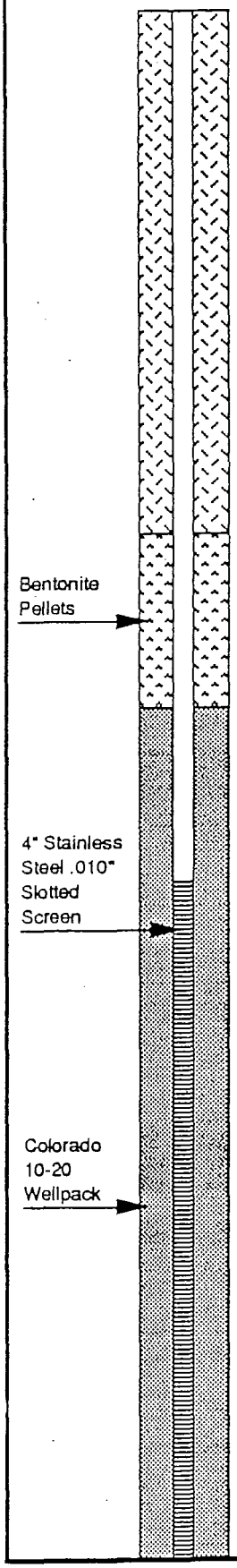


DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
1					Brown sandy gravel (GP). FILL	NOTE: Stratigraphy from 48.5 ft borehole (abandoned). Well installed in 36 ft borehole 4 ft west of abandoned borehole.
3		18		100	Gray sandy silt (ML), wet.	
4						OVA = 45 ppm
5		10		75	Gray silty fine sand (SM), medium dense, wet - seams of sandy silt @ 4.0'-4.5'. - saturated @ 5.0'.	OVA = 9 ppm
7		22		100	- silt seam @ 6.5'.	
8					Gray fine to coarse sand (SP), dense, saturated, trace gravel, some wood chunks.	OVA = 9 ppm(B.G.)
9		31		100	Fine sand below 8.0'.	
10						OVA = 12 ppm
13						OVA = 75 ppm
14		7		100	Brown organic silt (OL) soft, saturated with wood fibers.	
15						

DRILLING LOG (CON'T)

HOLE NO. BH-26B

SHEET 2 of 3



DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
					Brown organic silt (OL)	
16						
17					Contact between silt and sand is uncertain.	
18	X	4		50	Gray fine sand (SP), loose, saturated.	OVA = 14 ppm
19						NOTE: OVA was out of fuel at completion of drilling- OVA readings could be in error.
20						
21						
22						
23	X	53		50	Dense below 23.5'. Silt seam @ 23.5'.	OVA = 45 ppm
24						
25						
26						
27						
28	X	39		50	Peat and silt seams 28.0'-29.0'.	OVA = 45 ppm
29					Gray fine sand below 29.0' silt seam (1") @ 29.5'.	
30						
31						
32						

DRILLING LOG (CON'T)

HOLE NO. BH-26B

SHEET 3 of 3

DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
33	X	37		50	Gray silt (ML) 33.2'-33.7' with 2" brown organic silt seam. Wood 33.7' - 34.2'. Gray silty fine sand (SM) with trace gravel becomes fine sand (SP) with gravel @ 33.5'.	
34						
35					Gray sandy gravel (GP), very dense, saturated, gravel to 1½" diameter.	OVA = 5 ppm (B.G.)
36						
37						
38	X	52		50		OVA = 5 ppm
39						
40						
41						
42						
43	X	59		50		OVA = 5 ppm
44						
45						
46						
47						
48	NR	50/4"		0		

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Boring Log

Project Number	Boring Number	Sheet
020027	BH-29A	1 of 1

Name: Quendall Terminals
Location: Renton, WA
Driller/Method: Cascade / CME85
Sampling Method: HSA

Ground Surface Elev (NAVD88): 24.80
Depth to Water (ft BGS): 6.95
Start - Finish Date: 7/8/2009 - 7/8/2009

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Sheen/NAPL Comments	Sheen	Product	Material Type	Description	Depth (ft)
1 / 24	8" dia steel monument. Expansion style well cap. Cement 0-1.5'						Medium dense, dry, light brown, gravell,y silty SAND (SM); trace organics, abundant cobble (topsoil)	1
							Medium dense, dark brown, silty SAND (SM); abundant organics (topsoil)	
2 / 23				NS				2
3 / 22	2" Sch 40 PVC riser	S-1					Very dense, moist, dark brown to gray, slightly silty, slightly sandy GRAVEL (GP); trace wood, trace bark	3
4 / 21								4
5 / 20	Bentonite chips, hydrated, 1.5'-6.5'	S-2		NS			Dense, moist, dark gray, silty, sandy GRAVEL (GM); angular to subrounded gravel (Olive gray silt in shoe.)	5
6 / 19		S-3		NS			Hard, moist, olive gray, slightly gravelly, slightly sandy SILT (ML); trace wood	6
7 / 18	▼ 9/9/2009 2/12 Monterey sand, 6.5'-19'			NS			Moist, dark brown wood debris, saw dust	7
		S-4		NS			Loose, wet, gray-green SAND (SP); fine to medium sand (Gravel in shoe.)	
8 / 17								8
9 / 16		S-5					Medium dense, wet, light gray SAND (SW); fine to coarse sand, grades to coarse at depth	9
10 / 15				NS				10
11 / 14	0.020" slot PVC screen, 8.5'-18.5'	S-6		NS				11
12 / 13		S-7		NS			Medium dense, wet, light gray SAND (SP); fine to medium sand	12
13 / 12								13
14 / 11		S-8		NS			Trace coarse sand	14
15 / 10		S-9	Metallic gray colored sheen	SS			Trace fine gravel	15
16 / 9								16
17 / 8		S-10	Florets semicircular multicolored	MS				17
18 / 7	Slip cap, 0.34' sump	S-11	Metallic gray colored sheen	SS			Olive gray SILT (ML)	18
							Loose, wet, light gray SAND (SP); fine to medium sand	
19 / 6				NS			Very moist, dark brown, organic SILT (OL)	19
5							Bottom of boring at 19' BGS.	

Sampler Type:
- ○ No Recovery
- ◧ 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)
- ▼ Static Water Level
- ▽ Water Level (ATD)

Logged by: RRH
Approved by: JJR
Figure No.

EPA ENVIRO LOG - QUENDALL_HSA_WELLS.GPJ February 18, 2010

Aspect consulting
earth + water

Boring Log

Project Number	Boring Number	Sheet
020027	BH-29B	1 of 3

Name: Quendall Terminals
Location: Renton, WA
Driller/Method: Cascade / CME85
Sampling Method: HSA

Ground Surface Elev (NAVD88): 25.09
Depth to Water (ft BGS): 6.02
Start - Finish Date: 7/8/2009 - 7/8/2009

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Sheen/NAPL Comments	Sheen	Product	Material Type	Description	Depth (ft)
25	8" dia steel monument. Expansion style well cap. Cement 0-1.5'							
	2" Sch 40 PVC riser							
5 20	Bentonite chips, hydrated, 1.5'-38'							5
	▼ 9/9/2009						For lithology 0-19', please refer to log for BH-29A	
10 15								10
15 10								15
		S-1	Creosote-like odor, sheen metallic gray colored	SS			Loose, wet gray SAND (SP); fine to medium sand	

Sampler Type:
○ No Recovery
◧ 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)
▼ Static Water Level
▽ Water Level (ATD)

Logged by: RRH
Approved by: JJR
Figure No.

EPA ENVIRO LOG - QUENDALL QUENDALL_HSA_WELLS.GPJ February 18, 2010

Aspect consulting
earth + water

Boring Log

Project Number	Boring Number	Sheet
020027	BH-29B	2 of 3

Name: Quendall Terminals
Location: Renton, WA
Driller/Method: Cascade / CME85
Sampling Method: HSA

Ground Surface Elev (NAVD88): 25.09
Depth to Water (ft BGS): 6.02
Start - Finish Date: 7/8/2009 - 7/8/2009

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Sheen/NAPL Comments	Sheen	Product	Material Type	Description	Depth (ft)
5		S-1					Loose, wet, dark gray SAND (SP); scattered wood debris increasing with depth to abundant wood debris, thin peat laminae, fine to medium sand	
		S-2						
		S-3						
		S-4	Slight creosote-like odor, sheen metallic gray colored	SS			Silt laminae Loose, wet, olive gray SAND (SP); organic silt laminae, fine sand Peat Soft, wet, olive gray, organic SILT (OL)	
25 0	2" Sch 40 PVC riser			NS			Stiff, wet, olive gray, slightly gravelly, sandy SILT (ML); abundant organics, wood, and plant matter, fine and subrounded gravel, fine to coarse sand	25
		S-6		NS			Very dense, wet, dark gray, sandy GRAVEL (GP); fine to coarse sand, fine to medium subrounded gravel	
		S-7		NS				
30 -5	Bentonite chips, hydrated, 1.5'-38'							30
		S-8		NS			Dense, wet, gray, slightly sandy GRAVEL (GP); fine to medium angular to subround gravel	
		S-9		NS				
							Dense, wet, olive gray, silty SAND (SM); fine sand	
		S-10		NS			Very dense, wet, brown-yellow, gravelly SAND (SP); fine to medium gravel, fine to medium sand, gravel decreases with depth	
35 -10								35
		S-11		NS			Very dense, wet, olive gray, slightly silty, sandy GRAVEL (GP-GM)	
		S-12		NS			Very dense, wet, brown yellow, slightly sandy GRAVEL (GP); fine to medium subangular to subrounded gravel	
	2/12 Monterey sand, 38'-50'	S-13					Slight iron oxide staining	

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)
- Static Water Level
- Water Level (ATD)

Logged by: RRH
Approved by: JJR
Figure No.

EPA ENVIRO LOG - QUENDALL_HSA_WELLS.GPJ February 18, 2010

Aspect consulting
earth + water

Boring Log

Project Number	Boring Number	Sheet
020027	BH-29B	3 of 3

Name: Quendall Terminals
Location: Renton, WA
Driller/Method: Cascade / CME85
Sampling Method: HSA

Ground Surface Elev (NAVD88): 25.09
Depth to Water (ft BGS): 6.02
Start - Finish Date: 7/8/2009 - 7/8/2009

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Sheen/NAPL Comments	Sheen	Product	Material Type	Description	Depth (ft)
-15		S-14		NS			Very dense, wet, brown yellow, slightly sandy GRAVEL (GW); fine to coarse subangular to subrounded gravel	
				NS				
	0.020" slot PVC screen, 39.34-49.63'	S-15						
				NS				
45 -20		S-16					Medium dense, wet, brown to olive gray silty SAND (SM); predominantly fine sand	45
		S-17		NS			Medium dense wet, brown, gravelly SAND (SP)	
		S-18					Medium dense, wet, yellow brown silty SAND (SM)	
				NS			Very dense, wet, brown SAND (SP); fine to medium sand	
50 -25	Slip cap, 0.34' sump						Bottom of boring at 50 ft BGS.	50
55 -30								55

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)
- Static Water Level
- Water Level (ATD)

Logged by: RRH
Approved by: JJR
Figure No.

EPA ENVIRO LOG - QUENDALL QUENDALL_HSA_WELLS.GPJ February 18, 2010

ATTACHMENT B10

Boring Logs for Data Gaps Memo, Aspect, 2018

- Offshore borings B-01 through B-05
- Upland borings B-06 through B-17

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, W of B05		47.59909, -122.33164 (est)	**B-01**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	17.08' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	09/14/2018	NA	0' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	15	▽ 09/14/2018					**Lake Washington** Water; Lake Washington (Depth to mudline 12 feet)	0
5	10							5
10	5	Backfilled with bentonite grout	B01-17-091418	B01-12.0-13.0			SILT (ML); wet, gray, low plasticity; 10% fine sand, 15% black fine disintegrated organics	10
15	0						3" diameter wood pieces	15
20	-5		B01-21-091418	B01-19.0-20.0			SAND WITH SILT (SW-SM); wet, gray	20
25	-10		B01-25-091418	B01-23.0-24.0			GRAVEL WITH SAND (GP); wet, gray; fine subangular to subrounded gravel, 20% fine to coarse sand, trace silt	25
							Bottom of exploration at 27 ft. bgs. Note: Drillling from barge. Water sample IDs printed vertically next to water sample symbol.	

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ⊠ Water Sample
- ▮▮ Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: BMG
Approved by: DIM 2018-10-26

Exploration Log B-01
Sheet 1 of 1

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, W of B30		*Coordinates (Lat,Lon WGS84)* 47.53149, -122.20530 (est)	*Exploration Number* **B-02**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev. (NAVD88)* 17.08' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 09/13/2018	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)*

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
		▽ 09/13/2018					**Lake Washington** Water; Lake Washington (Depth to mudline 9 feet)	
5	15							5
10	10						No Recovery 9 to 19 ft	10
15	5	Backfilled with bentonite grout						15
20	0		B02-17-091318 B02-21-091318	B02-21.0-22.0			SILT (ML); wet, gray; 20% black fine disintegrated organics SILTY SAND (SM); wet, gray; fine sand	20
25	-5		B02-25-091318	B02-26.0-27.0			SILT WITH SAND (ML); wet, gray; fine sand SILTY SAND (SM); wet, gray; fine sand	25
	-10						Bottom of exploration at 27 ft. bgs. Note: Drillling from barge. Water sample IDs printed vertically next to water sample symbol.	

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ⊠ Water Sample
- ▮▯ Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: BMG
Approved by: DIM 2018-10-26

Exploration Log B-02
Sheet 1 of 1

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, S of B04		47.53137, -122.20514 (est)	**B-03**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	17.08' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	09/13/2018	NA	

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	15	▽ 09/13/2018					**Lake Washington** Water; Lake Washington (Depth to mudline 6 feet)	0
5	10						WOODY DEBRIS; wet, brown wood chips	5
							SAND (SP); wet, gray; 30% wood chips, trace silt, medium sand	
							SANDY SILT (ML); wet, gray; trace black fine disintegrated organics, fine sand	
				B03-8.0-9.0			SAND WITH SILT AND GRAVEL (SP-SM); wet, gray; medium sand	
10	5			B03-21.0-23.0*			SANDY SILT (ML); wet, gray; trace black fine disintegrated organics, fine sand	10
							WOODY DEBRIS; wet, brown; 80% sawdust sized woody debris, 20% silty fine sand	
							No recovery 11 to 23 ft. *Sample B-03-21.0-23.0 was mislabeled. Actual sample depth is 9.0 to 11.0 ft.	
15	0	Backfilled with bentonite grout	B03-17-091318 B03-21-091318					15
20	-5		B03-25-091318				SILTY SAND (SM); wet, gray; fine sand	20
25	-10			B03-25.0-26.0			Bottom of exploration at 27 ft. bgs. Note: Drillling from barge. Water sample IDs printed vertically next to water sample symbol.	25

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ⊠ Water Sample
- ▮▯ Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: BMG
Approved by: DIM 2018-10-26

Exploration Log B-03
Sheet 1 of 1

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, S of B05		*Coordinates (Lat,Lon WGS84)* 47.53158, -122.20498 (est)	*Exploration Number* **B-04**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev. (NAVD88)* 17.08' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 09/12/2018	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)*

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	15	▽ 09/12/2018					**Lake Washington** Water; Lake Washington (Depth to mudline 8 feet)	0
5	10							5
							WOODY DEBRIS; wet, brown, sawdust sized	
10	5						No Recovery 9 to 18 ft.	10
15	0	Backfilled with bentonite grout	B04-17-091218	B04-18.0-19.0			SAND WITH SILT (SP-SM); wet, gray; fine sand	15
20	-5		B04-21-091318	B04-20.0-21.0			SAND WITH SILT AND GRAVEL (SP-SM); wet, gray; fine sand, fine gravel	20
25	-10		B04-25-091218	B04-24.0-25.0			SAND WITH GRAVEL (SW); wet, gray; fine to coarse sand, fine subangular to subrounded gravel, trace silt	25
							Bottom of exploration at 27 ft. bgs. Note: Drillling from barge. Water sample IDs printed vertically next to water sample symbol.	

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ⊠ Water Sample
- ▮▮ Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

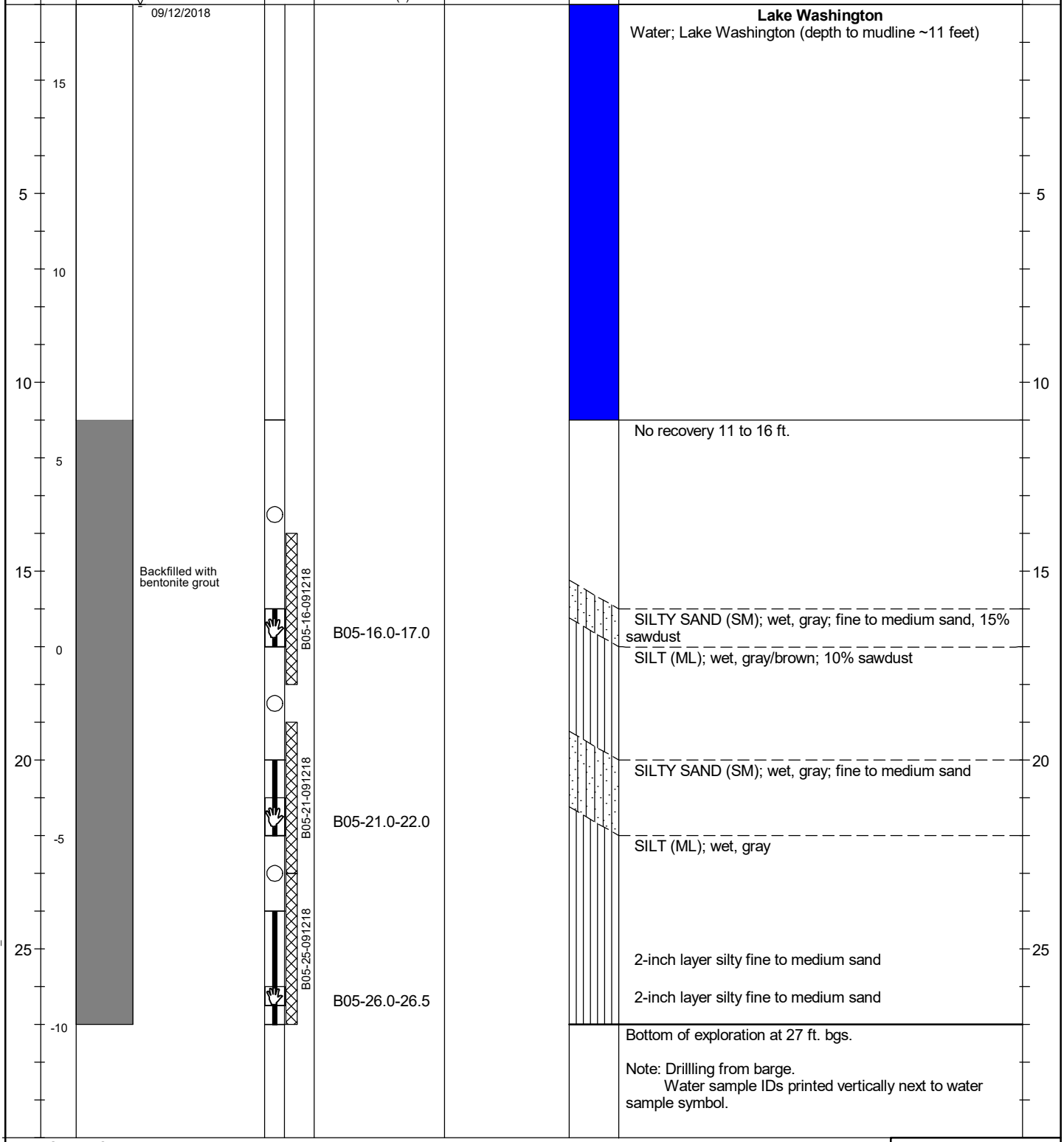
See Exploration Log Key for explanation of symbols

Logged by: BMG
Approved by: DIM 2018-10-26

Exploration Log B-04
Sheet 1 of 1

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, W of TWP2		*Coordinates (Lat,Lon WGS84)* 47.53177, -122.20490 (est)	*Exploration Number* **B-05**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev. (NAVD88)* 17.08' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 09/12/2018	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)* 0' (ATD)



Legend

Sample Type
- No Soil Sample Recovery
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: BMG
Approved by: DIM 2018-10-26

Exploration Log B-05
Sheet 1 of 1

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, NE of B07		*Coordinates (Lat,Lon WGS84)* 47.53165, -122.20443 (est)	*Exploration Number* **B-06**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev. (NAVD88)* 22.85' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 01/24/2018	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)* 5.75' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	22.85	Backfilled with bentonite chips	B06-08-012418	B06-4.0-4.5			SILTY SAND WITH GRAVEL (SM); moist, dark brown; with woody debris and chunks of concrete	0
5	20	▽ 01/24/2018	B06-12-012418	B06-7.5-8.0			SAND WITH SILT AND GRAVEL (SP-SM); moist, gray; fine to coarse sand, fine to coarse gravel	5
10	15		B06-16-012418	B06-12.0-12.5			SAND WITH SILT AND GRAVEL (SP-SM); moist, gray; medium to coarse sand, coarse gravel	10
15	10		B06-20-012418	B06-16.0-16.5			Trace woody debris	15
20	5		B06-24-012418	B06-19.5-20.0			WOODY DEBRIS; moist, brown; with silty sand and hydrocarbon-like odor and sheen SILTY SAND (SM); moist, gray; trace gravel, slight sheen	20

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ⊠ Water Sample
- ▮▯ Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-06

Sheet 1 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, NE of B07		47.53165, -122.20443 (est)	**B-06**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	22.85' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/24/2018	NA	5.75' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
	0		B06-24-012418				SAND WITH GRAVEL (SP); moist, gray; coarse sand and gravel, distinct sheen	
							SANDY SILT (ML); moist, gray with brown staining; with trace woody debris	
25				B06-24.0-24.5				25
							Becomes dark gray	
	-5			B06-27.5-28.0				
							Bottom of exploration at 28 ft. bgs.	
							Note: Water sample IDs printed vertically next to water sample symbol.	
30								30
	-10							
35								35
	-15							
40								40
	-20							

Legend

Sample Type
- No Soil Sample Recovery
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-06
Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, NE of B08		47.53158, -122.20451 (est)	**B-07**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	23.42' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/24/2018	NA	6.25' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	20	Backfilled with bentonite chips	B7-08-012418	B07-3.5-4.0			SILTY SAND (SM); moist, dark brown to black; interbedded with 0.5-ft-thick layers of woody debris	0
5	15	▽ 01/24/2018	B7-12-012418	B07-7.5-8.0			With concrete chunks Becomes dark gray to blue gray, fine to coarse sand with trace gravel	5
10	10		B7-16-012418	B07-12.0-12.5			Becomes fine to medium sand	10
15	5		B7-20-012418	B07-16.5-17.0			Becomes medium to coarse sand with trace gravel SANDY SILT (ML); moist, brown; with trace woody debris SILTY SAND (SM); moist, dark gray; medium to coarse sand, trace fine gravel, hydrocarbon-like odor and sheen	15
20	0		B7-24-012418	B07-21.5-22.0			Sandy silt 19.5 to 20 ft Trace woody debris 20 to 22.5 ft	20

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ⊠ Water Sample
- ▮▯ Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-07
Sheet 1 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, NE of B08		47.53158, -122.20451 (est)	**B-07**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	23.42' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/24/2018	NA	6.25' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
25	0	B7-24-012418		B07-24-24.5			SILTY SAND (SM); moist, dark gray; medium to coarse sand, trace fine gravel, hydrocarbon-like odor and sheen (continued)	25
		B7-28-012418					SAND (SW); moist, gray with brown stains; trace silt, fine to coarse sand	
				B07-27.5-28.0			SILTY SAND (SM); moist, gray	
	-5						Bottom of exploration at 28 ft. bgs.	
30							Note: Water sample IDs printed vertically next to water sample symbol.	30
35	-10							35
	-15							
40								40
	-20							

Legend

Sample Type
- No Soil Sample Recovery
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-07
Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINT\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, W part of site, N of B09		*Coordinates (Lat,Lon WGS84)* 47.53143, -122.20468 (est)	*Exploration Number* **B-08**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev. (NAVD88)* 25.22' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 01/23/2018	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)* 11.9' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	25	Backfilled with bentonite chips	B08-2.5-3.0	B08-2.5-3.0			SILTY SAND WITH GRAVEL (SM); moist, dark brown; roots and topsoil to 0.5 ft, with concrete, wood, brick	0
5	20		B08-7.5-8.0	B08-7.5-8.0			SANDY SILT (ML); moist, dark brown	5
							GRAVEL WITH SAND (GP); dry, gray	
							SILTY SAND (SM); moist, gray; trace gravel	
10	15	▽ 01/23/2018	B08-12-012318	B08-11.5-12.0			SANDY SILT (ML); moist, dark gray; trace woody debris	10
							WOODY DEBRIS; dark brown wood pulp	
15	10		B08-16-012318	B08-16.0-16.5			SAND (SP); moist, gray; with trace silt and gravel	15
			B08-20-012318				SILTY SAND (SM); moist, gray, trace gravel; trace woody debris	
20	5		B08-24-012318	B08-19.5-20.0			SILTY SAND (SM); moist, gray; medium to coarse sand, trace gravel	20

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ⊠ Water Sample
- ▮▯ Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-08
Sheet 1 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, W part of site, N of B09		47.53143, -122.20468 (est)	**B-08**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	25.22' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/23/2018	NA	11.9' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
25	0		B08-24-012318	B08-23.5-24.0			SILTY SAND (SM); moist, gray; medium to coarse sand, trace gravel (continued)	25
							SANDY SILT (ML); moist, dark brown; trace organics, hydrocarbon-like odor	
			B08-28-012318	B08-28.0-28.5			SILTY SAND (SM); wet, gray; medium to coarse sand, trace gravel, trace woody debris	
30	-5		B08-32-012318				1" thick layers of sandy silt	30
							Bottom of exploration at 32 ft. bgs.	
							Note: Water sample IDs printed vertically next to water sample symbol.	
35	-10							35
40	-15							40

Legend

Sample Type
- No Soil Sample Recovery
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-08
Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, SW corner of site		*Coordinates (Lat,Lon WGS84)* 47.53129, -122.20472 (est)	*Exploration Number* **B-09**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev. (NAVD88)* 24.2' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 01/22/2018	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)* 7.55' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	24						SILTY SAND WITH GRAVEL (SM); dry, dark brown; angular gravel, woody debris	0
		Backfilled with bentonite chips					Concrete debris, organic debris	
5	20			B09-4.5-5.0			Becomes moist	5
		▽ 01/22/2018		B09-7.5-8.0			SILT (ML); moist, blue gray, stained brown; trace sand and gravel, organic debris	
10	15		B09-12-012218				SILTY SAND WITH GRAVEL (SM); very moist, dark brown to orange; with woody pulp	10
				B09-11.5-12.0			6" thick medium to coarse sand layer	
15	10		B09-16-012318				SAND WITH SILT (SP-SM); Moist, gray; fine to medium sand	15
				B09-16.0-16.5			WOODY DEBRIS; .	
			B09-20-012318				SILT WITH SAND (ML); Moist, gray-brown; fine sand, trace woody debris	
20	5			B09-19.5-20.0			Hydrocarbon-like odor	20
			B09-24-012318					

Legend

Sample Type
- ☒ Water Sample
- ◫ Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-09
Sheet 1 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, SW corner of site		*Coordinates (Lat,Lon WGS84)* 47.53129, -122.20472 (est)	*Exploration Number* **B-09**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev. (NAVD88)* 24.2' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 01/22/2018	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)* 7.55' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
							SILT WITH SAND (ML); Moist, gray-brown; fine sand, trace woody debris (continued)	
			B09-24-012318				SAND WITH SILT (SP-SM); Moist, gray; fine to medium sand	
25	0		B09-28-012318	B09-24.0-24.5				25
	-5							
30			B09-32-012318	B09-29.5-30.0			SANDY SILT (ML); Moist, gray-brown; fine to medium sand	30
							Bottom of exploration at 32 ft. bgs. Note: Water sample IDs printed vertically next to water sample symbol.	
	-10							
35								35
	-15							
40								40

Legend

Sample Type
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-09

Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING

Barbee Mill - 050004

Environmental Exploration Log

Project Address & Site Specific Location	Coordinates (Lat,Lon WGS84)	Exploration Number
4101 Lake Washington Blvd. North, S-central part of site	47.53134, -122.20448 (est)	**AB-10**

Contractor	Equipment	Sampling Method	Ground Surface (GS) Elev. (NAVD88)	
Holt Services	Geoprobe 7822DT	Grab	24.21' (est)	
Operator	**Exploration Method(s)**	**Work Start/Completion Dates**	**Top of Casing Elev. (NAVD88)**	**Depth to Water (Below GS)**
Michael	Direct push	01/22/2018	NA	8.32' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0							SILTY SAND WITH GRAVEL (SM); moist, dark brown; trace roots & seashells	
		Backfilled with bentonite chips					SAND WITH SILT (SP-SM); dark brown to black; fine sand	
							SAND WITH GRAVEL (SP); dry, light gray; trace silt, trace wood debris	
5	20		AB10-08-012218	AB10-4.5-5.0			Becomes moist, dark gray, medium to coarse sand	5
							SILTY SAND WITH GRAVEL (SM); wet, gray	
		▽ 01/22/2018		AB10-7.0-7.5			CLAY (CL); grey to green; trace coarse gravel	
10	15		AB10-12-012218	AB10-11.5-12.0			SILTY SAND (SM); wet, dark brown	10
							SAND WITH GRAVEL (SP); moist, dark gray; trace silt, medium to coarse sand	
15	10		AB10-16-012218	AB10-14.5-15.0			Becomes fine to medium sand, with woody debris	15
	5		AB10-20-012218	AB10-19.0-20.0			Becomes dark gray to green, medium to coarse sand	
20			AB10-24-012218					20

Legend

Sample Type
- ☒ Water Sample
- ◫ Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log AB-10

Sheet 1 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, S-central part of site		47.53134, -122.20448 (est)	**AB-10**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	24.21' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/22/2018	NA	8.32' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
25	0		AB10-24-012218	AB10-24.5-25.0			SAND WITH SILT (SP-SM); moist, brown; medium to coarse sand, with 0.5 inch strata of fine, dark brown sand with silt, trace woody debris Becomes dark gray Becomes dark brown	25
30	-5		AB10-28-012218	AB10-28.0-28.5			SANDY SILT (ML); moist, dark brown to blue-gray; fine to coarse sand	30
35	-10						Bottom of exploration at 30 ft. bgs. Note: Water sample IDs printed vertically next to water sample symbol.	35
40	-15							40

Legend

Sample Type
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log AB-10
Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, E of B06		*Coordinates (Lat,Lon WGS84)* 47.53162, -122.20424 (est)	*Exploration Number* **B-11**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev. (NAVD88)* 26.74' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 01/25/2018	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)* 9.02' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
							FILL TOPSOIL; Topsoil with rootlets	
	25	Backfilled with bentonite chips					SILTY SAND (SM); moist, light brown; trace gravel, woody debris Concrete debris	
5				B11-4.0-4.5			SILTY SAND WITH GRAVEL (SM); moist, dark brown and gray; wood debris, concrete debris Woody debris and concrete debris in layers	5
	20			B11-7.5-8.0				
		01/25/2018	B11-12-012518				SILTY SAND WITH GRAVEL (SM); moist, dark brown; with woody debris	
10								10
	15			B11-11.5-12.0			SILTY SAND (SM); moist, dark gray; fine to medium sand with 2-inch thick interbeds of dark gray sandy silt	
15			B11-16-012518					15
	10			B11-16.0-16.5			SAND WITH SILT (SP-SM); moist, gray and brown; fine to coarse sand, woody debris 1.5-inch-thick gravel layer	
			B11-20-012518				SILTY SAND (SM); wet, light gray; fine to medium sand, trace woody debris	
20				B11-20.0-20.5			SILTY SAND WITH GRAVEL (SM); moist, gray; medium to coarse sand, trace organics	20
	5		B11-24-012518					

Legend

Sample Type
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-11
Sheet 1 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, E of B06		47.53162, -122.20424 (est)	**B-11**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	26.74' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/25/2018	NA	9.02' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
25	0		B11-24-012518	B11-24.0-24.5			SILTY SAND WITH GRAVEL (SM); moist, gray; medium to coarse sand, trace organics (continued) Becomes dark gray	25
			B11-28-012518	B11-25.5-26.0			SILT WITH SAND (ML); moist, dark brown; fine sand	
							SAND WITH SILT (SP-SM); moist, gray and brown interbeds of silt with fine to medium sand	
30	-5		B11-32-012518	B11-28.0-28.5			SILTY SAND (SM); moist, gray, fine to coarse sand; interbedded with moist, dark gray, sandy silt with trace gravel	30
							Bottom of exploration at 32 ft. bgs. Note: Water sample IDs printed vertically next to water sample symbol.	
35	-10							35
40	-15							40

Legend

Sample Type
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-11
Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, E of B11		47.53148, -122.20394 (est)	**B-12**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	25' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/25/2018	NA	6.69' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	25						TOPSOIL; moist soil with rootlets	0
							SILTY SAND WITH GRAVEL (SM); moist, dark brown interbedded with light gray; fine to coarse sand, woody debris, concrete debris	
		Backfilled with bentonite chips		B12-3.5-4.0				
5	20	▽ 01/25/2018	B12-08-012518					5
				B12-7.5-8.0			SILT (ML); moist, light gray to green; moderate plasticity, trace sand, trace gravel, rootlets	
10	15		B12-12-012518				SILTY SAND (SM); moist, brown; medium to coarse sand, trace gravel, trace woody debris	10
				B12-11.5-12.0				
			B12-16-012518				SAND WITH SILT AND GRAVEL (SP-SM); moist, dark gray; fine to coarse gravel	
15	10						SANDY SILT (ML); moist, dark brown; fine to medium sand, trace organics	15
				B12-16.0-16.5			Interbeds of fine sand with silt	
			B12-20-012518					
20	5			B12-19.5-20.0			SILTY SAND (SM); moist, gray, fine to medium sand, trace gravel	20
			B12-24-012518					

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ⊠ Water Sample
- ▮▮ Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-12

Sheet 1 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, E of B11		47.53148, -122.20394 (est)	**B-12**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	25' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/25/2018	NA	6.69' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
25	0		B12-24-012518	B12-23.0-23.5			SILT WITH SAND (ML); wet, brown-yellow; trace wood debris	25
				B12-24.5-25.0			No recovery	
30	-5		B12-28-012518				Bottom of exploration at 28 ft. bgs. Note: Water sample IDs printed vertically next to water sample symbol.	30
35	-10							35
40	-15							40

Legend

Sample Type
- No Soil Sample Recovery
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-12

Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, S of large puddle, SW of B12		47.53136, -122.20420 (est)	**B-13**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	24.12' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/26/2018 to 01/29/2018	NA	5.21' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	25						SILTY SAND (SM); Dark brown, moist	0
		Backfilled with bentonite chips					Becomes light gray, sand-sized concrete debris	
				B13-3.5-4.0			Becomes dark gray Medium to coarse sand, wood debris, concrete debris	
5	20	▽ 01/26/2018	B13-08-012618	B13-7.5-8.0			Becomes light green 5 to 7 ft Woody debris	5
10	15		B13-12-012918	B13-13.0-13.5			SILTY SAND WITH GRAVEL (SM); wet, gray; fine to coarse sand with fine gravel	10
	10		B13-16-012918	B13-16.0-16.5			SAND WITH SILT AND GRAVEL (SP-SM); wet, gray; fine to medium sand, woody debris	
15	5		B13-20-012918	B13-19.5-20.0			SAND (SP); wet, gray; fine to medium sand, trace fine gravel	15
20			B13-24-012918				SILTY SAND (SM); we, gray; fine to medium sand	20

Legend

Sample Type
- ☒ Water Sample
- ◫ Continuous core 1.85" ID
- ⊠ Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-13

NEW STANDARD LOG FORM P:\GINT\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, S of large puddle, SW of B12		47.53136, -122.20420 (est)	**B-13**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	24.12' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/26/2018 to 01/29/2018	NA	5.21' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
25	0		B13-24-012918 B13-28-012918	B13-23.5-24.0 B13-27.0-27.5			SILTY SAND (SM); we, gray; fine to medium sand (continued) SILT (ML); moist to wet, brown with woody staining SILTY SAND (SM); moist, gray; fine to medium sand Bottom of exploration at 28 ft. bgs. Note: Water sample IDs printed vertically next to water sample symbol.	25
30	-5							30
35	-10							35
40	-15							40

Legend

Sample Type
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-13
Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, SE of B13 on berm		*Coordinates (Lat,Lon WGS84)* 47.53125, -122.20395 (est)	*Exploration Number* **B-14**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev. (NAVD88)* 25.8' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 01/26/2018	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)* 8.25' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	25	Backfilled with bentonite chips					SILTY SAND (SM); moist, brown; trace roots, with woody debris	0
				B14-4.0-4.5			Becomes gray, with gravel-sized concrete debris	
5	20						SILT WITH SAND (ML); moist, light green	5
							SILTY SAND WITH GRAVEL (SM); moist, brown	
				B14-7.5-8.0			SAND WITH SILT (SP-SM); moist, gray	
		01/26/2018					SILTY SAND (SM); moist, light gray; fine to coarse sand, trace gravel, woody debris	
10	15		B14-12-012618					10
				B14-12.0-12.5				
			B14-16-012618					
15	10						Thin layers dark brown sandy silt	15
				B14-16.5-17.0				
			B14-20-012618					
20	5			B14-20.0-20.5			Becomes medium to coarse sand	20
			B14-24-012618					

Legend

Sample Type
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-14

Sheet 1 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, SE of B13 on berm		*Coordinates (Lat,Lon WGS84)* 47.53125, -122.20395 (est)	*Exploration Number* **B-14**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev. (NAVD88)* 25.8' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 01/26/2018	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)* 8.25' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
			B14-24-012618				SILTY SAND (SM); moist, light gray; fine to coarse sand, trace gravel, woody debris (continued) Becomes fine to medium sand	
				B14-24.0-24.5			SILT WITH SAND (ML); moist, light brown; trace woody debris	
25	0		B14-28-012618				SILTY SAND (SM); wet, reddish to brown, gray; trace gravel, trace woody debris	25
				B14-27.5-28.0				
30	-5		B14-32-012618	B14-30.0-30.5			SILTY SAND WITH GRAVEL (SM); moist, gray; fine to medium sand	30
							Bottom of exploration at 32 ft. bgs. Note: Water sample IDs printed vertically next to water sample symbol.	
35	-10							35
40	-15							40

Legend

Sample Type
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: ACO
Approved by: DIM 2018-10-26

Exploration Log B-14
Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, E of B14, S of road		47.53127, -122.20355 (est)	**B-15**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	26.63' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/26/2018 to 07/09/2018	NA	16.1' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	25	Backfilled with bentonite chips	B15-08-012918	B15-4.0-4.5			SILTY SAND WITH GRAVEL (SM); moist, brown; with woody debris, concrete debris	0
5	20						SANDY SILT (ML); moist, dark brown; with woody debris	5
		▽ 01/26/2018	B15-12-012918	B15-8.5-9.0			SILTY SAND WITH GRAVEL (SM); moist, gray	
10	15		B15-16-012918	B15-12.0-12.5				10
15	10	▽ 07/09/2018	B15-20-012918	B15-16.0-16.5			SILT WITH GRAVEL (ML); moist, brown; trace woody debris	15
20	5		B15-24-012918	B15-20.0-20.5			SILTY SAND WITH GRAVEL (SM); wet, gray; fine to coarse sand, fine to coarse gravel, with 6-inch layers of silty sand	20

Legend

Sample Type
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: BMG
Approved by: DIM 2018-10-26

Exploration Log B-15

Sheet 1 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, E of B14, S of road		47.53127, -122.20355 (est)	**B-15**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev. (NAVD88)*	
Holt Services	Geoprobe 7822DT	Grab	26.63' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Michael	Direct push	01/26/2018 to 07/09/2018	NA	16.1' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
25	0		B15-24-012918 B15-28-012918	B15-24.0-24.5			SILTY SAND WITH GRAVEL (SM); wet, gray; fine to coarse sand, fine to coarse gravel, with 6-inch layers of silty sand (continued) Becomes moist, brown	25
30	-5		B15-32-012618	B15-28.0-28.5 B15-30.5-31.0			Becomes wet, gray	30
35	-10		B15-36-070918				SAND (SP); wet, gray; trace silt, fine to medium sand	35
40	-15		B15-40-070918				Bottom of exploration at 40 ft. bgs. Note: Water sample IDs printed vertically next to water sample symbol.	40

Legend

Sample Type
- Water Sample
- Continuous core 1.85" ID
- Grab sample

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: BMG
Approved by: DIM 2018-10-26

Exploration Log B-15

Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location		*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	4101 Lake Washington Blvd. North, E of B15		47.53125, -122.20299 (est)	**B-16**
Contractor	*Equipment*	*Sampling Method*	*Ground Surface (GS) Elev.*	
Holt Services	Geoprobe 7822DT	Grab	25' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*	*Top of Casing Elev.*	*Depth to Water (Below GS)*
Michael	Direct push	07/09/2018	NA	6.3' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	25	Backfilled with bentonite chips					SILTY SAND (SM); dry, brown; fine to medium sand, trace organics	0
5	20	▽ 07/09/2018					SAND (SP); slightly moist, brown; trace silt, 2-inch layer of woodchips	5
							SILT (ML); Wet, gray	
							SAND WITH SILT (SP-SM); Wet, gray; fine to medium sand	
							SILT (ML); Wet, gray	
							SAND WITH SILT (SP-SM); Wet, gray; fine to medium sand	
10	15							10
							SILT (ML); moist, brown; with 2-inch thick sand layers, with sawdust	
15	10							15
							SAND (SP); very moist, gray; fine to medium sand	
20	5							20
							SILT WITH SAND (ML); wet, gray; fine to medium sand	
							SAND (SP); very moist, gray, fine sand	

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ⊠ Water Sample
- ◧ Continuous core 1.85" ID

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: BMG
Approved by: DIM 2018-10-26

Exploration Log B-16
Sheet 1 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, E of B15		*Coordinates (Lat,Lon WGS84)* 47.53125, -122.20299 (est)	*Exploration Number* **B-16**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev.* 25' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 07/09/2018	*Top of Casing Elev.* NA	*Depth to Water (Below GS)* 6.3' (ATD)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
25	0		B16-28-070918				SAND (SP); very moist, gray, fine sand (continued)	25
							SILT WITH SAND (ML); Moist, gray, fine sand	
							SAND WITH GRAVEL (SW); Wet, gray; fine to coarse sand, fine gravel	
							SAND (SP); wet, gray, fine to medium sand	
30	-5		B16-32-070918					30
							SANDY SILT (ML); wet, gray	
							Bottom of exploration at 33 ft. bgs. Note: Water sample IDs printed vertically next to water sample symbol.	
35	-10							35
40	-15							40

Legend

Sample Type
- No Soil Sample Recovery
- Water Sample
- Continuous core 1.85" ID

Water Level
- Water Level ATD

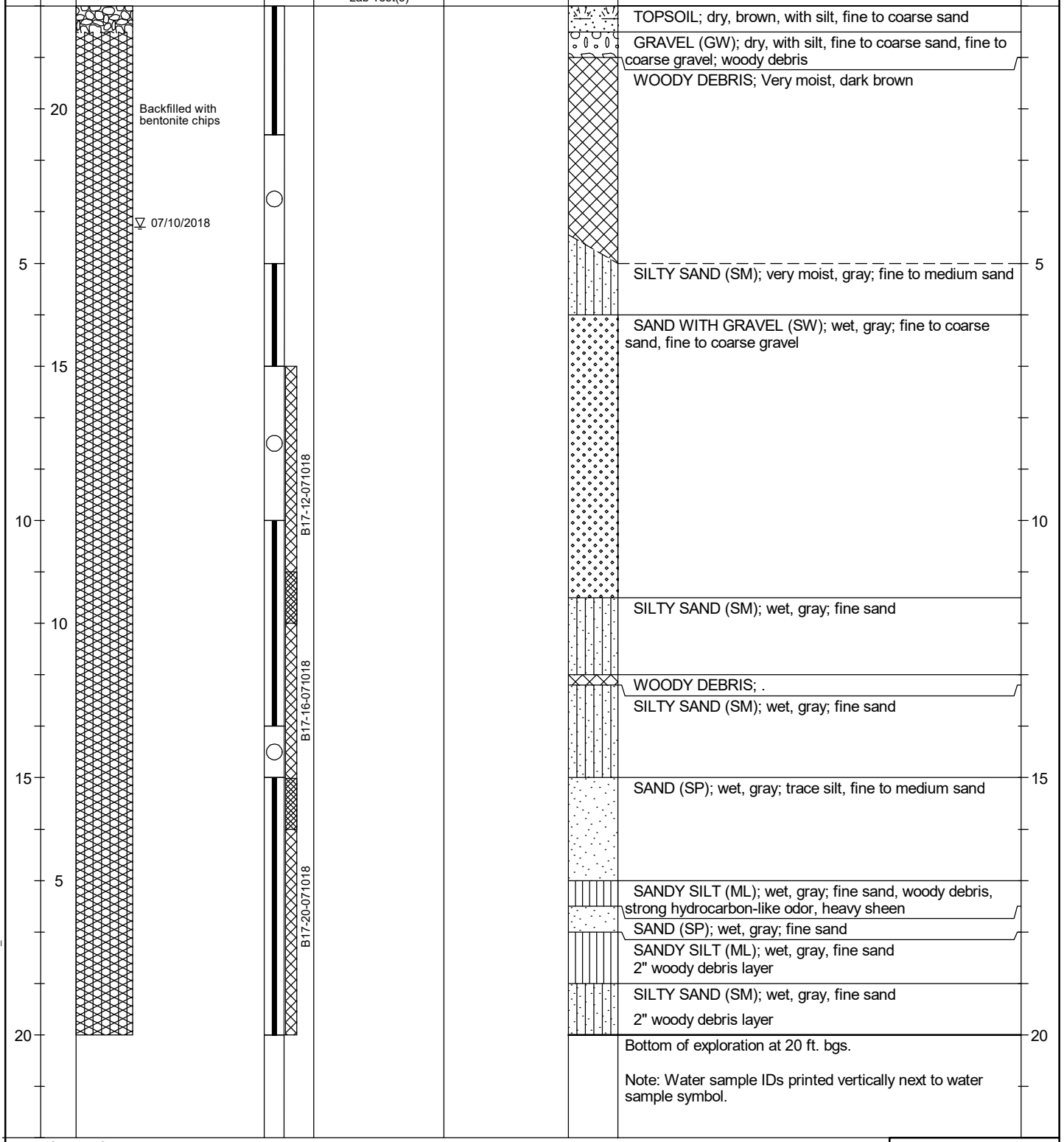
See Exploration Log Key for explanation of symbols

Logged by: BMG
Approved by: DIM 2018-10-26

Exploration Log B-16
Sheet 2 of 2

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

Aspect CONSULTING	Barbee Mill - 050004		Environmental Exploration Log	
	Project Address & Site Specific Location 4101 Lake Washington Blvd. North, N of B6		*Coordinates (Lat,Lon WGS84)* 47.53176, -122.20435 (est)	*Exploration Number* **B-17**
Contractor Holt Services	*Equipment* Geoprobe 7822DT	*Sampling Method* Grab	*Ground Surface (GS) Elev.* 22' (est)	
Operator Michael	*Exploration Method(s)* Direct push	*Work Start/Completion Dates* 07/10/2018	*Top of Casing Elev.* NA	*Depth to Water (Below GS)* 4.3' (ATD)



Legend

Sample Type
- No Soil Sample Recovery
- Water Sample
- Continuous core 1.85" ID

Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: BMG
Approved by: DIM 2018-10-26

Exploration Log B-17
Sheet 1 of 1

NEW STANDARD LOG FORM P:\GINTW\PROJECTS\BARBEE MILL_JTL.GPJ 2018 October 26

ATTACHMENT B11

Monitoring Well Logs for RI Data Report, Aspect, 2023

- Monitoring Well Log BH-31B

Coarse-Grained Soils - More than 50%[1] Retained on No. 200 Sieve	Gravels - More than 50%[1] of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines	GW	Well-graded GRAVEL Well-graded GRAVEL WITH SAND
			GP	Poorly-graded GRAVEL Poorly-graded GRAVEL WITH SAND
		≥15% Fines	GM	SILTY GRAVEL SILTY GRAVEL WITH SAND
			GC	CLAYEY GRAVEL CLAYEY GRAVEL WITH SAND
	Sands - 50%[1] or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines	SW	Well-graded SAND Well-graded SAND WITH GRAVEL
			SP	Poorly-graded SAND Poorly-graded SAND WITH GRAVEL
		≥15% Fines	SM	SILTY SAND SILTY SAND WITH GRAVEL
			SC	CLAYEY SAND CLAYEY SAND WITH GRAVEL
Fine-Grained Soils - 50%[1] or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50%		ML	SILT SANDY or GRAVELLY SILT SILT WITH SAND SILT WITH GRAVEL
			CL	LEAN CLAY SANDY or GRAVELLY LEAN CLAY LEAN CLAY WITH SAND LEAN CLAY WITH GRAVEL
			OL	ORGANIC SILT SANDY or GRAVELLY ORGANIC SILT ORGANIC SILT WITH SAND ORGANIC SILT WITH GRAVEL
	Silts and Clays Liquid Limit 50% or More		MH	ELASTIC SILT SANDY or GRAVELLY ELASTIC SILT ELASTIC SILT WITH SAND ELASTIC SILT WITH GRAVEL
			CH	FAT CLAY SANDY or GRAVELLY FAT CLAY FAT CLAY WITH SAND FAT CLAY WITH GRAVEL
			OH	ORGANIC CLAY SANDY or GRAVELLY ORGANIC CLAY ORGANIC CLAY WITH SAND ORGANIC CLAY WITH GRAVEL
Highly Organic Soils			PT	PEAT and other mostly organic soils

"WITH SILT" or "WITH CLAY" means 5 to 15% silt and clay, denoted by a "-" in the group name; e.g., SP-SM • "SILTY" or "CLAYEY" means >15% silt and clay • "WITH SAND" or "WITH GRAVEL" means 15 to 30% sand and gravel. • "SANDY" or "GRAVELLY" means >30% sand and gravel. • "Well-graded" means approximately equal amounts of fine to coarse grain sizes • "Poorly graded" means unequal amounts of grain sizes • Group names separated by "/" means soil contains layers of the two soil types; e.g., SM/ML.

Soils were described and identified in the field in general accordance with the methods described in ASTM D2488. Where indicated in the log, soils were classified using ASTM D2487 or other laboratory tests as appropriate. Refer to the report accompanying these exploration logs for details.

1. Estimated or measured percentage by dry weight
2. (SPT) Standard Penetration Test (ASTM D1586)
3. Determined by SPT, DCPT (ASTM STP399) or other field methods. See report text for details.

GEOTECHNICAL LAB TESTS

MC	=	Natural Moisture Content
PS	=	Particle Size Distribution
FC	=	Fines Content (% < 0.075 mm)
GH	=	Hydrometer Test
AL	=	Atterberg Limits
C	=	Consolidation Test
Str	=	Strength Test
OC	=	Organic Content (% Loss by Ignition)
Comp	=	Proctor Test
K	=	Hydraulic Conductivity Test
SG	=	Specific Gravity Test

CHEMICAL LAB TESTS

Organic Chemicals

BTEX	=	Benzene, Toluene, Ethylbenzene, Xylenes
TPH-Dx	=	Diesel and Oil-Range Petroleum Hydrocarbons
TPH-G	=	Gasoline-Range Petroleum Hydrocarbons
VOCs	=	Volatile Organic Compounds
SVOCs	=	Semi-Volatile Organic Compounds
PAHs	=	Polycyclic Aromatic Hydrocarbon Compounds
PCBs	=	Polychlorinated Biphenyls

Metals

RCRA8	=	As, Ba, Cd, Cr, Pb, Hg, Se, Ag, (d = dissolved, t = total)
MTCA5	=	As, Cd, Cr, Hg, Pb (d = dissolved, t = total)
PP-13	=	Ag, As, Be, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn (d=dissolved, t=total)

FIELD TESTS

PID	=	Photoionization Detector
Sheen	=	Oil Sheen Test
SPT[2]	=	Standard Penetration Test
NSPT	=	Non-Standard Penetration Test
DCPT	=	Dynamic Cone Penetration Test

COMPONENT DEFINITIONS

Descriptive Term		*Size Range and Sieve Number*
Boulders	=	Larger than 12 inches
Cobbles	=	3 inches to 12 inches
Coarse Gravel	=	3 inches to 3/4 inches
Fine Gravel	=	3/4 inches to No. 4 (4.75 mm)
Coarse Sand	=	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	=	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	=	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	=	Smaller than No. 200 (0.075 mm)

ESTIMATED[1] PERCENTAGE

% by Weight		*Modifier*	*% by Weight*		*Modifier*
<1	=	Subtrace	15 to 25	=	Little
1 to <5	=	Trace	30 to 45	=	Some
5 to 10	=	Few	>50	=	Mostly

MOISTURE CONTENT

Dry	=	Absence of moisture, dusty, dry to the touch
Slightly Moist	=	Perceptible moisture
Moist	=	Damp but no visible water
Very Moist	=	Water visible but not free draining
Wet	=	Visible free water, usually from below water table

RELATIVE DENSITY

Non-Cohesive or Coarse-Grained Soils

Density[3]		*SPT*[2] *Blows/Foot*	*Penetration with 1/2" Diameter Rod*
Very Loose	=	0 to 4	≥ 2'
Loose	=	5 to 10	1' to 2'
Medium Dense	=	11 to 30	3" to 1'
Dense	=	31 to 50	1" to 3"
Very Dense	=	> 50	< 1"

CONSISTENCY

Cohesive or Fine-Grained Soils

Consistency[3]		*SPT*[2] *Blows/Foot*	*Manual Test*
Very Soft	=	0 to 1	Penetrated >1" easily by thumb. Extrudes between thumb & fingers.
Soft	=	2 to 4	Penetrated 1/4" to 1" easily by thumb. Easily molded.
Medium Stiff	=	5 to 8	Penetrated >1/4" with effort by thumb. Molded with strong pressure.
Stiff	=	9 to 15	Indented ~1/4" with effort by thumb.
Very Stiff	=	16 to 30	Indented easily by thumbnail.
Hard	=	> 30	Indented with difficulty by thumbnail.

GEOLOGIC CONTACTS

Observed and Distinct ——— Observed and Gradual ——— Inferred - - - -

Aspect CONSULTING

Exploration Log Key

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Aspect CONSULTING	Barbee Mill - 050004		Monitoring Well Log	
	Project Address & Site Specific Location Barbee Mill Site, Renton, WA, N of property boundary		*Coordinates (Lat,Lon WGS84)* 47.5315, -122.2031	*Exploration Number* **BH-31B**
Contractor Holocene Drilling	*Equipment* Rotary drill rig	*Sampling Method* Autohammer; 140 lb hammer; 30" drop	*Ground Surface Elev. (NAVD88)* 24.04'	Ecology Well Tag No. BNR-075
Operator Eric Swanson	*Exploration Method(s)* 8.5" OD X 4.25" ID Hollow-Stem Auger	*Work Start/Completion Dates* 9/8/2021	*Top of Casing Elev. (NAVD88)* 27.24'	*Depth to Water (Below GS)* 5' (ATD) 7.62' (Static)

Depth (feet)	Elev. (feet)	Exploration Notes and Completion Details	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
0	25	Locking well monument, 3.2' aboveground Ground Surface Concrete					**TOPSOIL** SANDY SILT (ML); soft, moist, dark gray; non-plastic.	0
5	20	▽ 9/8/2021			PID=0.0 Sheen=None SPT=8,12,9		SAND WITH SILT (SP-SM); medium dense, wet, dark gray; fine sand 0'-6', becomes medium to coarse subangular sand at 6'; fermentation-like odor.	5
10	15	▼ 9/8/2021 Sealed with 3/8" hydrated bentonite chips			PID=0.1 Sheen=None SPT=5,6,7		Becomes medium to coarse sand, subtrace fine, subangular gravel.	10
15	10				PID=0.1 Sheen=None SPT=0,0,3		Becomes very loose, subtrace fine gravel.	15
20	5				PID=0.1 Sheen=None SPT=0,0,4		PEAT (PT); soft, wet, brown; peat; organic fragments ~1mm throughout; low plasticity; slight fermentation-like odor. ORGANIC SILT (OL); soft, wet, brown; low plasticity fines; organic fragments ~1-15mm throughout; slight fermentation-like odor. SANDY SILT (ML); soft, wet, dark gray; low to medium plasticity; fine subangular sand; very slight	20

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ◪ Split Barrel 2" X 1.375" (SPT)

Water Level
- ▼ Static Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: DWU
Approved by: ACO. 2023.02.09

Exploration Log BH-31B
Sheet 1 of 2

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\050004 BARBEE MILL.GPJ February 14, 2023

Aspect CONSULTING	Barbee Mill - 050004		Monitoring Well Log	
	Project Address & Site Specific Location Barbee Mill Site, Renton, WA, N of property boundary		*Coordinates (Lat,Lon WGS84)* 47.5315, -122.2031	*Exploration Number* **BH-31B**
Contractor Holocene Drilling	*Equipment* Rotary drill rig	*Sampling Method* Autohammer; 140 lb hammer; 30" drop	*Ground Surface Elev. (NAVD88)* 24.04'	Ecology Well Tag No. BNR-075
Operator Eric Swanson	*Exploration Method(s)* 8.5" OD X 4.25" ID Hollow-Stem Auger	*Work Start/Completion Dates* 9/8/2021	*Top of Casing Elev. (NAVD88)* 27.24'	*Depth to Water (Below GS)* 5' (ATD) 7.62' (Static)

Depth (feet)	Elev. (feet)	Exploration Notes and Completion Details	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
							fermentation-like odor. SANDY SILT (ML); soft, wet, dark gray; low to medium plasticity; fine subangular sand; very slight fermentation-like odor. (continued)	
25	0				PID=0.1 Sheen=None SPT=5,9,11			25
							SILTY SAND (SM); medium dense, wet, dark gray; fine to coarse subangular to subrounded sand; low to medium plasticity fines; trace fine subrounded gravel; no odor.	
30	-5				PID=0.1 Sheen=None SPT=0,3,8		SILT WITH SAND (ML); stiff, wet, dark gray; low plasticity fines; fine subangular sand; no odor.	30
		0.010" SCH 40 Slotted Screen					SANDY SILT (ML); stiff, very moist, dark gray; low plasticity fines; fine subangular sand; some brown mottling; subtrace fine subrounded gravel; no odor.	
35	-10	12/10 Silica sand			PID=0.1 Sheen=None SPT=6,15,22		SAND WITH SILT (SP-SM); medium dense, wet, dark gray; fine to medium subangular to subrounded sand; low plasticity fines; no odor.	35
							SILTY GRAVEL (GM); dense, wet, gray; fine subrounded gravel; low plasticity fines; fine to coarse subrounded to subangular sand; no odor.	
40	-15				SPT=3,3,8		SAND WITH SILT AND GRAVEL (SP-SM); medium dense, wet, gray; fine to coarse subangular to subrounded sand; fine to coarse subangular gravel; low plasticity fines; no odor.	40
							Bottom of exploration at 40 ft. bgs.	
45	-20							45

Legend

Sample Type
- No Soil Sample Recovery
- Split Barrel 2" X 1.375" (SPT)

Water Level
- Static Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: DWU
Approved by: ACO. 2023.02.09

Exploration Log BH-31B
Sheet 2 of 2

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\050004 BARBEE MILL.GPJ February 14, 2023

APPENDIX C

Hydrogeologic Data

Attachments

Attachment C1 – Groundwater Pump and Treat System Extraction Well Installation and Testing Memo, Aspect, 2007

Attachment C2 – Independent Remedial Action Plan, Upland Areas, Hart Crowser, 2000

- Table 2 – Measured Hydraulic Conductivities at Barbee Mill

Attachment C3 – Interim Action Design and Implementation Report, Aspect, 2010

- Table 1 – Well Construction Summary

ATTACHMENT C1

Groundwater Pump and Treat System Extraction Well Installation and Testing Memo, Aspect, 2007

MEMORANDUM

Project No.: 050004-007-05

August 9, 2007

To: Robert Cugini, Barbee Mill Co., Inc

From: Dave Rugh, Tyson Carlson, LHG, and Dave Heffner, P.E.

Re: **Groundwater Pump and Treat System Extraction Well Installation and Testing**
Barbee Mill Arsenic Remediation Project

As part of groundwater pump and treat system installation, eight groundwater extraction wells were recently installed at the former Barbee Mill property in Renton, Washington. The purpose of this memorandum is to document the well installation, summarize hydraulic testing performed, and assess design flow rates for optimal system operation (i.e. hydraulic capture) and wastewater discharge permitting.

Well Installation and Development

Eight groundwater extraction wells (EW-1 through EW-8) were drilled, installed, and developed from May 14 to 17, 2007. Cascade Drilling, Inc., of Woodinville, Washington, was contracted to construct the wells under the supervision of an Aspect Consulting Hydrogeologist.

The 4-inch extraction wells were advanced to approximately 20 feet below ground surface (bgs) and completed with 10 feet of 60-slot stainless steel screen, per the specification in the Draft Engineering Design (Aspect Consulting 2006). Construction details are summarized in Table 1. Boring logs describing subsurface conditions encountered and the well completions are included in Attachment A.

All wells were installed in "clean" soils with the exception of the deepest portions of EW-5, EW-6, and EW-7 (below a depth of 15 feet bgs, and beneath the bottom of the 2006 soil excavation that removed soil above 15 ft bgs containing arsenic concentrations above 20 mg/kg). Soils from these intervals were drummed, tested for waste characterization and profiling, and are temporarily being stored on-site pending disposal. The remainder of the soil cuttings were spread on-site. A composite sample collected from the drummed cuttings was analyzed for arsenic. Analytical results are summarized in Table 2, and the laboratory certificates of analysis are provided in Attachment B. The laboratory reported an arsenic concentration of 33.2 milligrams per kilogram (mg/kg).

Well development was completed by using a combination of surging, bailing, and pumping. Each well was first surged for five minutes with a rubber surge block. Then, a stainless steel bailer was used to remove sediment from the borehole until the water was visibly free of sediment. Bailing volumes ranged from 20 to 70 gallons per well. Development was

completed by pumping approximately 100 gallons from each well with a submersible electric pump. All water generated during development and pump testing was temporarily stored in a tank prior to testing, and later discharged to the sanitary sewer under the existing construction discharge permit.

Well Pumping Tests and Data Evaluation

Pumping tests were conducted between May 25 and June 1, 2007, to evaluate aquifer characteristics and assess the design pumping rates. The extraction wells are categorized as being completed in the "native soil area" or "backfill area" based on their location relative to the 2006 soil excavation boundary (Figure 1). Extraction wells installed in the native soil area are representative of undisturbed soils and include EW-1, EW-2, EW-3, EW-4, and EW-8. Extraction wells installed in the backfill area of the remedial excavation footprint include EW-5, EW-6, and EW-7.

Short (approximately 90-minute) step drawdown pumping tests were conducted in each well completed in the native soil area and EW-6. Longer (approximately 8-hour) constant rate pumping tests were conducted in wells EW-2 and EW-6. The step drawdown pumping tests were completed to assess the relative yield of each extraction well, and to establish flow rates for the subsequent constant rate tests. The constant rate pumping tests were intended to quantify the hydraulic parameters of the aquifer and to evaluate pumping interference effects between extraction wells.

Testing Methods

All pumping tests except the MW-6 constant rate test utilized an electric submersible pump capable of approximately 5 gallons per minute (gpm). A larger electric submersible pump (capable of approximately 20 gpm) was required for the EW-6 constant rate test due to the lack of drawdown achieved with the small pump. For all tests, instantaneous discharge rates were recorded with a digital flowmeter.

Drawdown during each test was monitored at the pumping well and two neighboring monitoring wells using pressure transducers. Water levels were periodically verified with a manual water level indicator. Recovery data was collected immediately after each test until the depth to water was within 0.01 feet of the pre-pumping static water level.

Step Drawdown Pumping Tests

Step drawdown pumping tests were conducted using 30-minute steps with incrementally increasing flow rates. All step drawdown pumping tests in the native area consisted of approximately 1, 2, and 3 gpm steps with the exception of EW-4, which was terminated after the 2 gpm step because the pumping capacity of the well would have been exceeded at 3 gpm.

A step drawdown pumping test representing the backfill area was conducted at EW-6 using 30-minute steps at approximately 1, 2, 4, and 5 gpm.

Constant Rate Pumping Tests

Constant rate pumping tests at EW-2 and EW-6 were conducted at flow rates of approximately 2 and 20 gpm, respectively.

Water quality samples were collected during the constant rate pumping tests at 4, 6, and 8 hours following initiation of the test. One composite sample was also collected from the temporary storage tank after all pumping tests were complete. All water samples were analyzed for arsenic. Results are summarized in Table 2, and the laboratory certificates of analysis are provided in Attachment C. All results were well below the 1,000 micrograms per liter (µg/L) King County sewer discharge limit for arsenic.

Testing Results

Native Soil Area

Drawdown and recovery data from step pumping tests at EW-1, EW-2, EW-3, EW-4, and EW-8 are presented on Figures 2 through 6, respectively. Extraction well test parameters and specific capacities are compared in Table 3. EW-1, EW-2, EW-3, and EW-8 had similar specific capacities, ranging from 1.8 to 2.4 gpm/ft. At 0.4 gpm/ft, EW-4 had a relatively low specific capacity compared to other wells in the native soil area.

Previous field testing yielded estimates of hydraulic conductivity ranging from 0.7 to 24 ft/day (Hart Crowser 2000), and previous modeling efforts by RETEC (1998) yielded a site-wide hydraulic conductivity estimate of 40 ft/day for a material similar to the native soil area. Subsequent groundwater modeling efforts by Aspect Consulting (2006) predicted a local hydraulic conductivity of 23 ft/day.

Data gathered from the EW-2 constant rate pumping test was analyzed using the AQTESOLV computer program using the Unconfined Theis solution method (Driscoll, 1986). Assuming an aquifer thickness of 12.3 ft, the transmissivity of the native soil area was calculated to be 439 ft^2/day, which correlates to a hydraulic conductivity of 35.7 ft/day.

Considering the degree of heterogeneity observed in the shallow aquifer, the hydraulic conductivity estimate from the EW-2 constant rate pumping test agrees reasonably well with previous testing and modeling efforts.

As indicated on Figures 2 through 5, pumping interference effects from EW-1, EW-2, and EW-3 propagate to neighboring extraction wells in the native soil area, including EW-4. These effects are discernable at extraction rates above 2 gpm. During full system operation, the additive nature of drawdown effects will further increase system efficiency and promote hydraulic capture in the native soil area.

Excavation/Backfill Area

The step pumping test performed at EW-6 using the small submersible pump did not achieve more than 0.03 ft drawdown due to the extremely high hydraulic conductivity of the backfill material within the excavation footprint. Therefore, a larger submersible pump was obtained

for the EW-6 constant rate test, and 0.45 ft of drawdown was observed after pumping for 8 hours at a rate of 20.2 gpm (Figure 4).

Analysis of the data obtained from the EW-6 constant rate pumping test is not possible using traditional pump test methods due to two factors: the extremely high conductivity of the backfill material and the limited lateral extent of the excavation area (standard aquifer analysis methods assume infinite horizontal aquifer extent). However, several key observations can be made from the data. Groundwater pumping from EW-6 resulted in a nearly uniform head decline across the entire excavated area (Figure 4). This uniform head decline indicates that the EW-6 pumping rate was exceeding the rate of leakage from the native soil area into the backfill area. Thus, hydraulic capture within the excavation area can be inferred at an extraction rate of 20 gpm.

During the design of the pump-and-treat system, the hydraulic conductivity of the backfill material was modeled at 280 ft/day (Aspect Consulting 2006).

Pump-and-Treat System Design Flow Rates

Based on hydraulic conditions observed during the pumping tests, the following design pumping rates are proposed for the individual extraction wells:

- 2 gpm for EW-1, EW-2, EW-3, and EW-8;
- 1 gpm for EW-4; and
- 7 gpm for EW-5, EW-6, and EW-7.

Thus, the design discharge rate for the pump-and-treat system is 30 gpm.

Operation of the extraction wells at these design pumping rates will achieve capture of the contaminant plume as modeled in the Draft Engineering Design Report (Aspect Consulting 2006).

Appropriately sized submersible pumps and components will be selected and installed during Phase II of the pump-and-treat system installation.

References

Aspect Consulting 2006. Draft Engineering Design Report – Barbee Mill Groundwater Remediation. Prepared for Barbee Mill Co., Inc. August 11, 2006.

Driscoll, F.G., 1986. Groundwater and Wells (2nd Edition), Johnson Screens, St. Paul, Minnesota.

Hart Crowser 2000. Independent Remedial Action Plan, Upland Areas, Barbee Mill Company; Renton, Washington. Prepared for Barbee mill Company. September 6, 2000.

Remediation Technologies, Inc., and S.S. Papadopolus & Associates 1998. Port Quendall Groundwater Modeling and Analysis of Alternatives. Prepared for Port Quendall Company. January 9, 1998.

Attachments: Table 1 – Extraction Well Construction Summary
Table 2 – Laboratory Analytical Results
Table 3 – Comparison of Step Pumping Test Parameters
Figure 1 – Groundwater Extraction and Treatment System Layout
Figure 2 – EW-1 Step Drawdown Pumping Test Data
Figure 3 – EW-2 Step Drawdown Pumping Test Data
Figure 4 – EW-3 Step Drawdown Pumping Test Data
Figure 5 – EW-4 Step Drawdown Pumping Test Data
Figure 6 – EW-8 Step Drawdown Pumping Test Data
Figure 7 – EW-2 Constant Rate Pumping Test Data
Figure 8 – EW-6 Constant Rate Pumping Test Data
Attachment A – Extraction Well Logs
Attachment B – Soil Sample Laboratory Certificates of Analysis – Freidman & Bruya
Attachment C – Water Sample Laboratory Certificates of Analysis – OnSite Environmental

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Table 1 - Extraction Well Construction Summary

Barbee Mill
Renton, WA

Extraction Well Number	Completion Date	Ecology ID	Well Casing Diameter (inches)	Drilled Depth (feet)	Screened Depth (feet)	Screened Formation
EW-1	5/14/2007	APS-941	4	20	9.3 to 18.7	native sand
EW-2	5/15/2007	APS-942	4	19	8.9 to 18.2	native sand
EW-3	5/15/2007	APS-943	4	20	9.9 to 19.2	native sand
EW-4	5/15/2007	APS-944	4	19	9.3 to 18.6	native sand
EW-5	5/15/2007	APS-945	4	19	9.3 to 18.6	backfill
EW-6	5/16/2007	APS-946	4	19	10.3 to 19.6	backfill
EW-7	5/16/2007	APS-947	4	19	10.3 to 19.6	backfill
EW-8	5/16/2007	APS-948	4	20	10.3 to 19.6	native sand

Table 2 - Laboratory Analytical Results

Barbee Mill
Renton, WA

Sample ID	Date Collected	Matrix	Anaytical Method	Result		Location	Comment
EW-567-051607	5/16/2007	Soil	Total Arsenic by EPA 200.8	33.2	mg/kg	EW-5, EW-6, and EW-7	Composite soil sample representing depths greater than 15 feet at EW-5, EW-6, and EW-7.
EW2-053007-1	5/30/2007	Water	Total Arsenic by EPA 6020	210	µg/L	EW-2	Collected at t=120 minutes during EW-2 Constant Rate Pumping Test
EW2-053007-2	5/30/2007	Water	Total Arsenic by EPA 6020	210	µg/L	EW-2	Collected at t=240 minutes during EW-2 Constant Rate Pumping Test
EW2-053007-3	5/30/2007	Water	Total Arsenic by EPA 6020	210	µg/L	EW-2	Collected at t=480 minutes during EW-2 Constant Rate Pumping Test
EW6-060107-1	6/1/2007	Water	Total Arsenic by EPA 6020	250	µg/L	EW-6	Collected at t=120 minutes during EW-6 Constant Rate Pumping Test
EW6-060107-2	6/1/2007	Water	Total Arsenic by EPA 6020	240	µg/L	EW-6	Collected at t=240 minutes during EW-6 Constant Rate Pumping Test
EW6-060107-3	6/1/2007	Water	Total Arsenic by EPA 6020	240	µg/L	EW-6	Collected at t=480 minutes during EW-6 Constant Rate Pumping Test
BT1-060107	6/1/2007	Water	Total Arsenic by EPA 6020	230	µg/L	Storage Tank	Collected from storage tank containing all water generated during well development and testing.

Table 3 - Comparison of Step Pumping Test Parameters

Barbee Mill
Renton, WA

			Step 1			Step 2			Step 3			
Extraction Well	Test Length (min)	Step Length (min)	Flow Rate (gpm)	Drawdown (ft)	Specific Capacity (gpm/ft)	Flow Rate (gpm)	Drawdown (ft)	Specific Capacity (gpm/ft)	Flow Rate (gpm)	Drawdown (ft)	Specific Capacity (gpm/ft)	Average Specific Discharge (gpm/ft)
EW-1	90	30	1.0	0.52	1.92	2.0	1.12	1.79	3.0	1.70	1.76	1.82
EW-2	90	30	1.0	0.52	1.94	2.0	1.14	1.75	3.0	1.71	1.75	1.82
EW-3	90	30	1.0	0.40	2.52	2.0	0.85	2.34	3.0	1.35	2.23	2.36
EW-4	60	30	1.0	2.35	0.43	2.0	5.02	0.40	3.0	-	-	0.41
EW-8	90	30	1.0	0.43	2.35	2.0	1.08	1.85	3.0	1.65	1.82	2.01

Legend

- RS — Remediation System Utilities
- Storm Drain
- SS — Sanitary Sewer
- Water
- Manhole
- Fire Hydrant
- Catch Basin
- Extraction Well Handhole
- Sidewalk
- Piezometer

Extraction Well ID	Well Coordinates in Feet	
	Northing	Easting
EW-1	196483	1301716
EW-2	196534	1301710
EW-3	196574	1301711
EW-4	196628	1301751
EW-5	196642	1301803
EW-6	196641	1301880
EW-7	196639	1301947
EW-8	196731	1301728

EW-8
EW-5
EW-6
EW-7
EW-4
EW-3
EW-2
EW-1
PZ-2
PZ-1

Excavation Footprint

Remediation System Vault Area

Gravity Discharge to Sanitary Sewer

SSMH 145

N

0 50 100

Feet

Notes

1. Remediation system layout developed by Aspect Consulting; layout of all other items developed by others.
2. Horizontal Datum: Washington State Plane Coordinate System (SPC), NAD 93/91, North Zone.
3. Remediation system utility runs include electrical conduit and PVC piping carrying arsenic-impacted groundwater (a dedicated pipeline from each extraction well), contained in a common trench. Refer to Figure 9.

Aspect consulting
IN-DEPTH PERSPECTIVE
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(206) 780-9370
811 First Avenue #480
Seattle, WA 98104
(206) 328-7443

Groundwater Extraction and Treatment System Layout

Former Barbee Mill Site

Renton, Washington

DATE: June 2007	PROJECT NO. 050004
DESIGNED BY: DAH	
DRAWN BY: PMB	FIGURE NO. 1
REVISED BY: LAL	

Q:\Barbee Mill\050004 Barbee Mill\2007-06 Pump-and-treat\050004-02.dwg

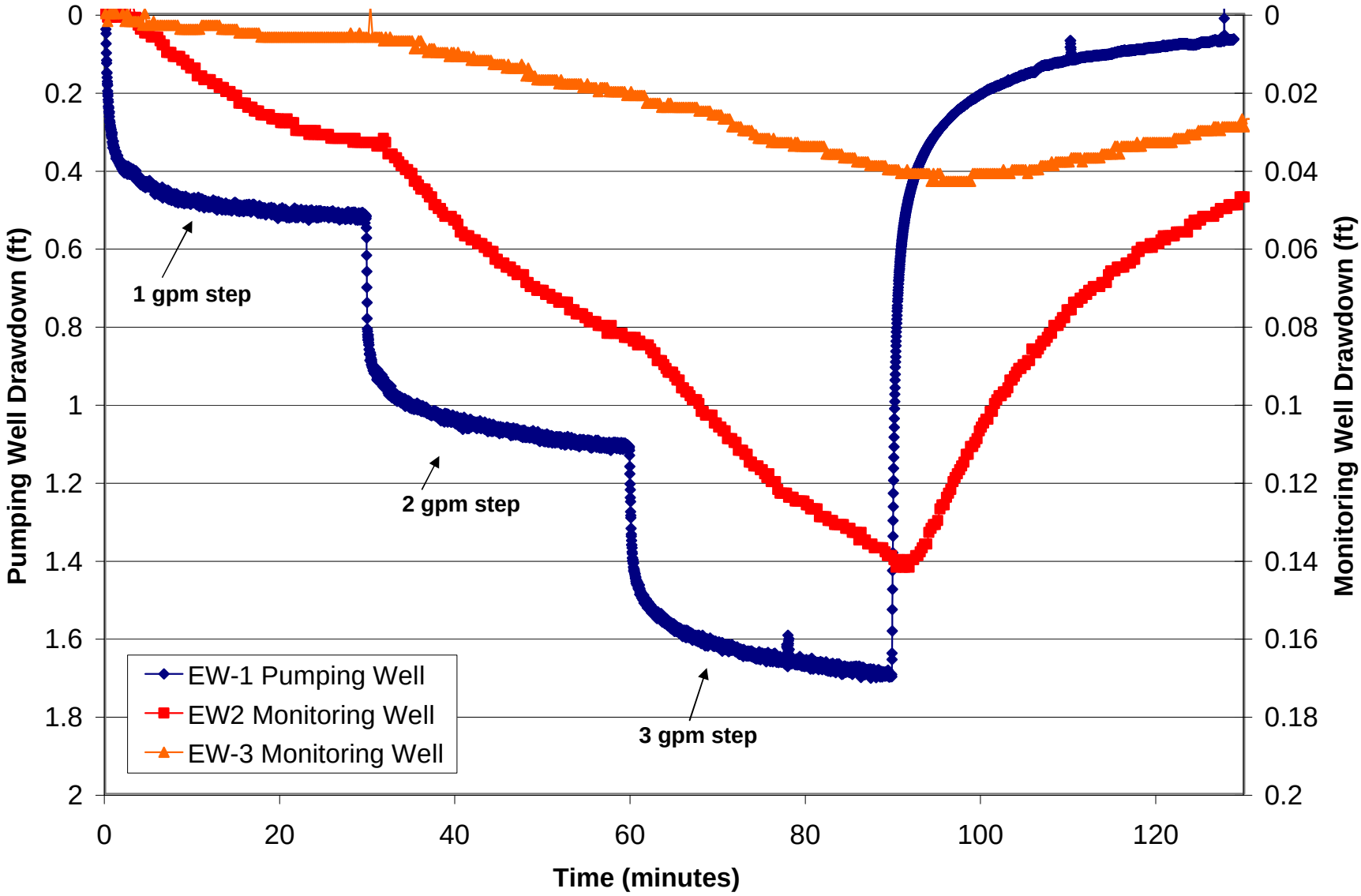

Figure 2
EW-1 Step Drawdown Pumping Test Data
Barbee Mill
Renton, WA

Aspect Consulting
6/29/2007
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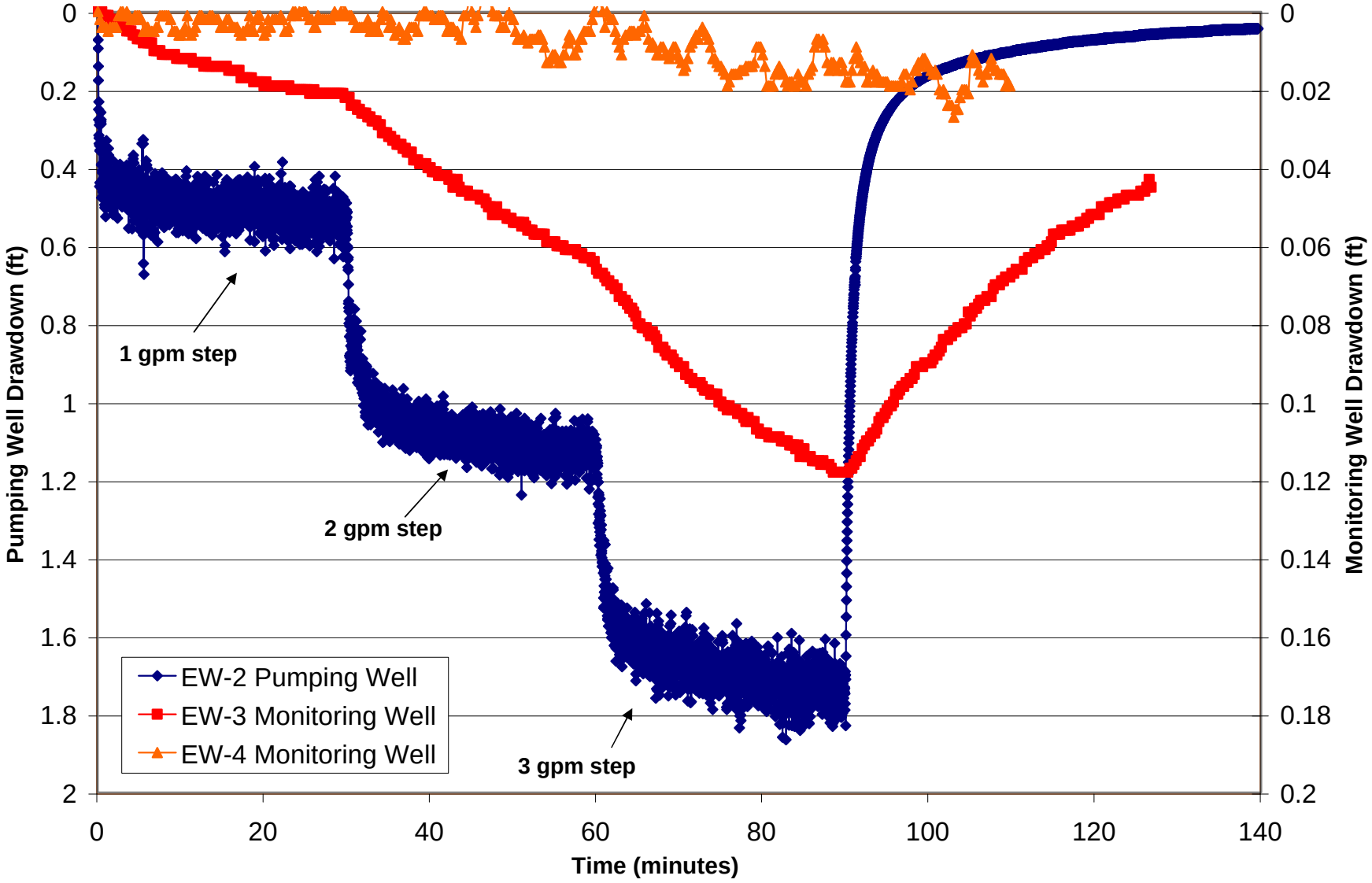

Figure 3
EW-2 Step Drawdown Pumping Test Data
Barbee Mill
Renton, WA

Aspect Consulting
6/29/2007
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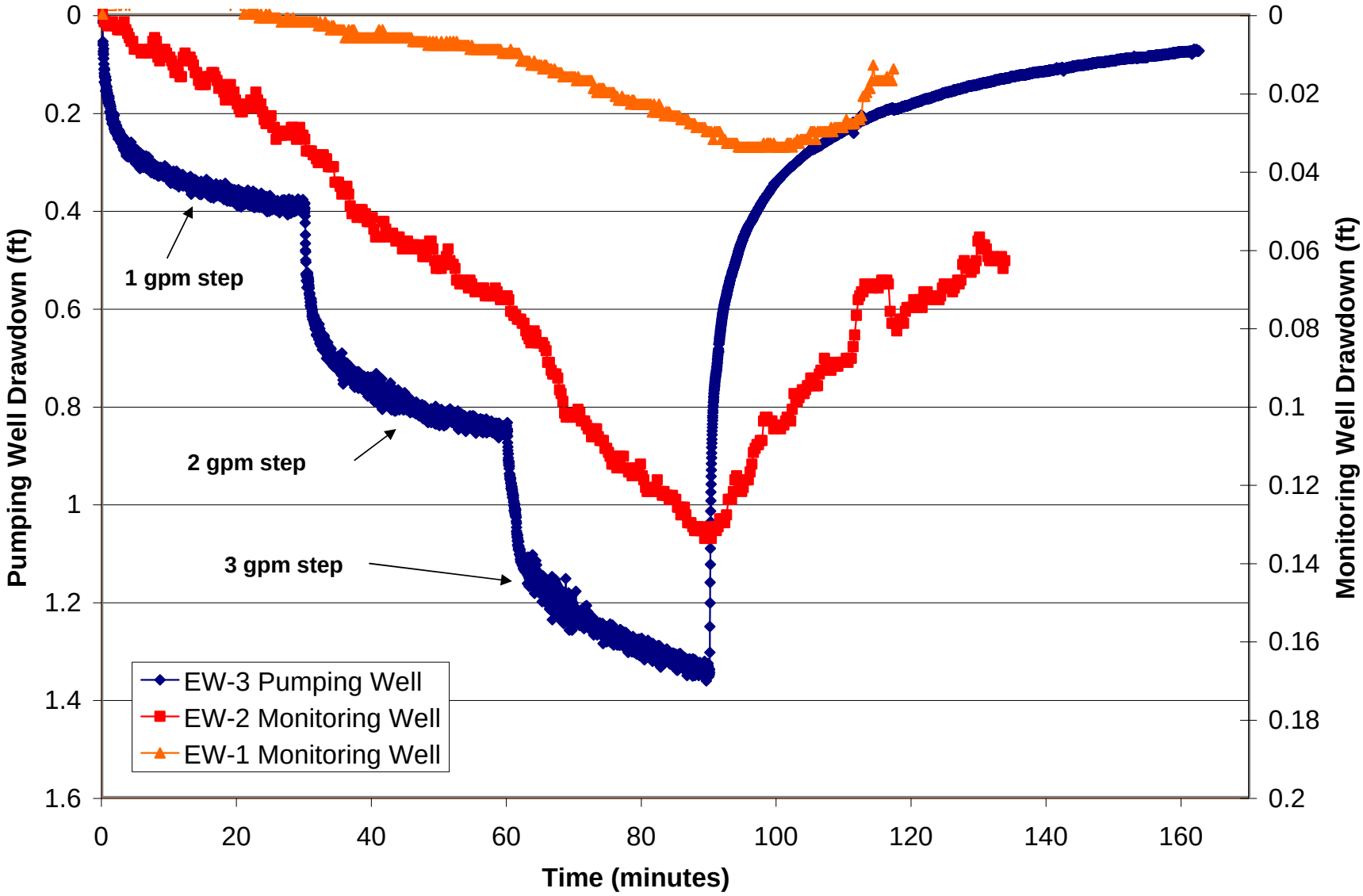

Figure 4
EW-3 Step Drawdown Pumping Test Data
Barbee Mill
Renton, WA

Aspect Consulting
6/29/2007
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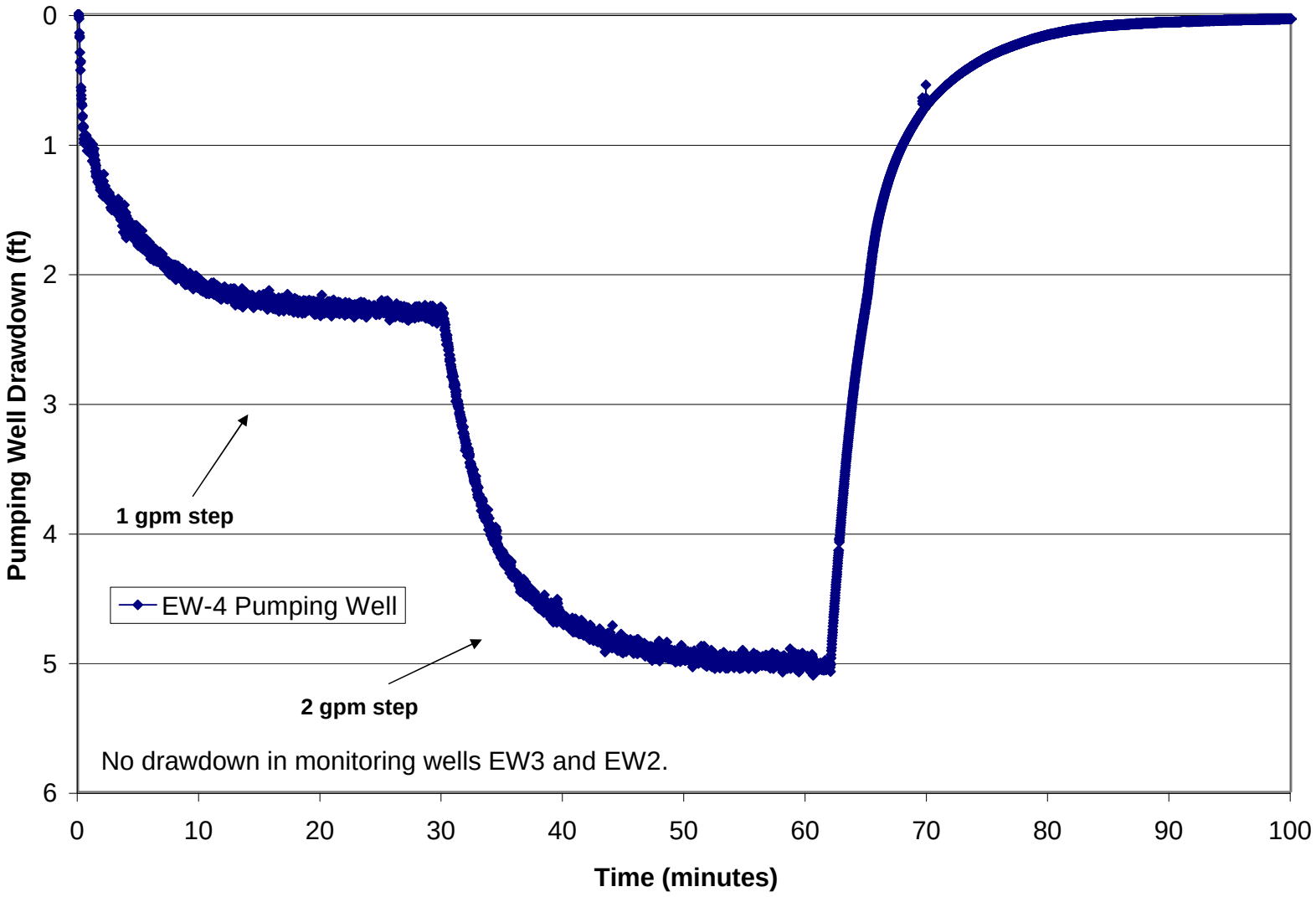

Figure 5
EW-4 Step Drawdown Pumping Test Data
Barbee Mill
Renton, WA

Aspect Consulting
6/29/2007
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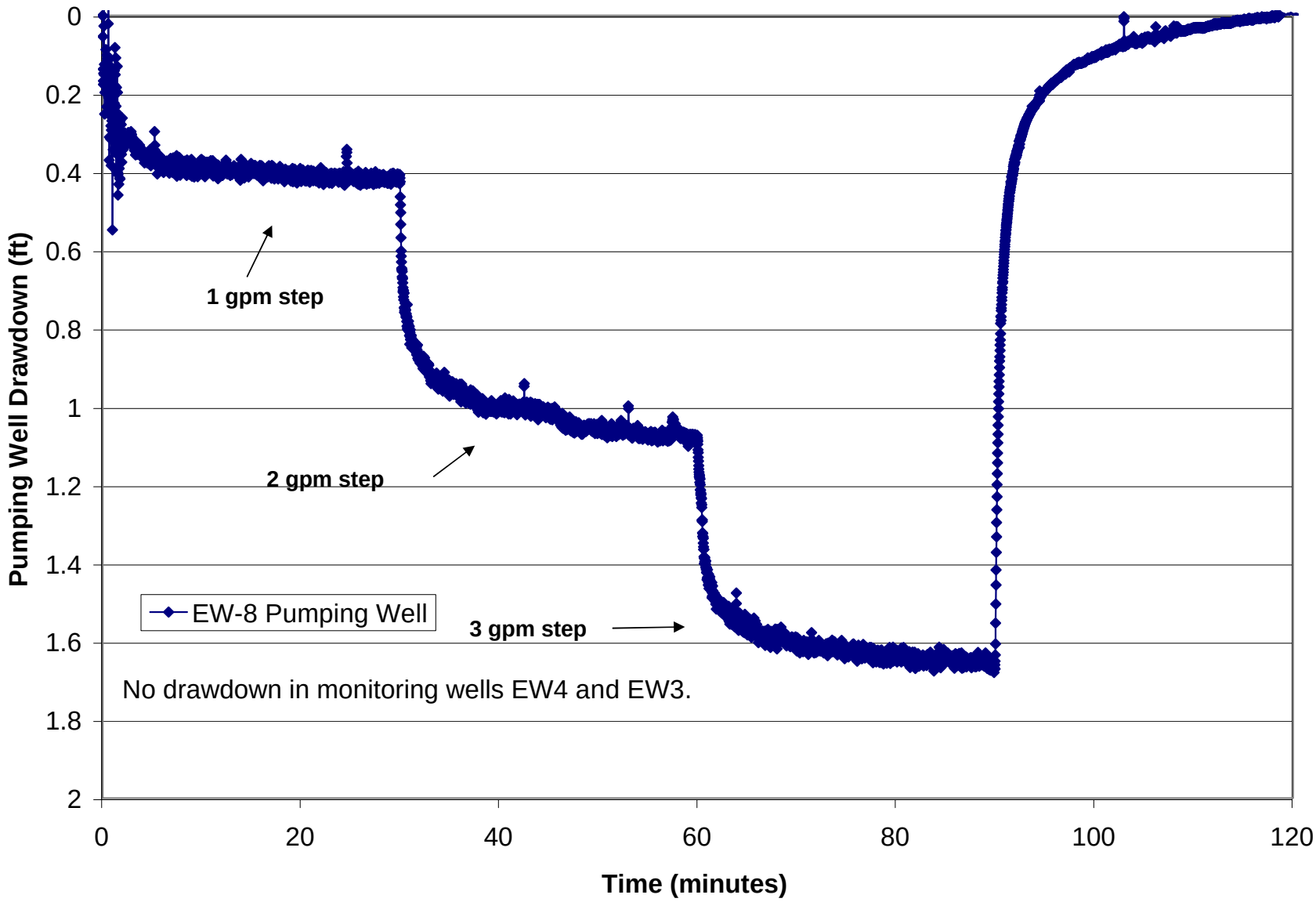

Figure 6
EW-8 Step Drawdown Pumping Test Data
Barbee Mill
Renton, WA

Aspect Consulting
6/29/2007
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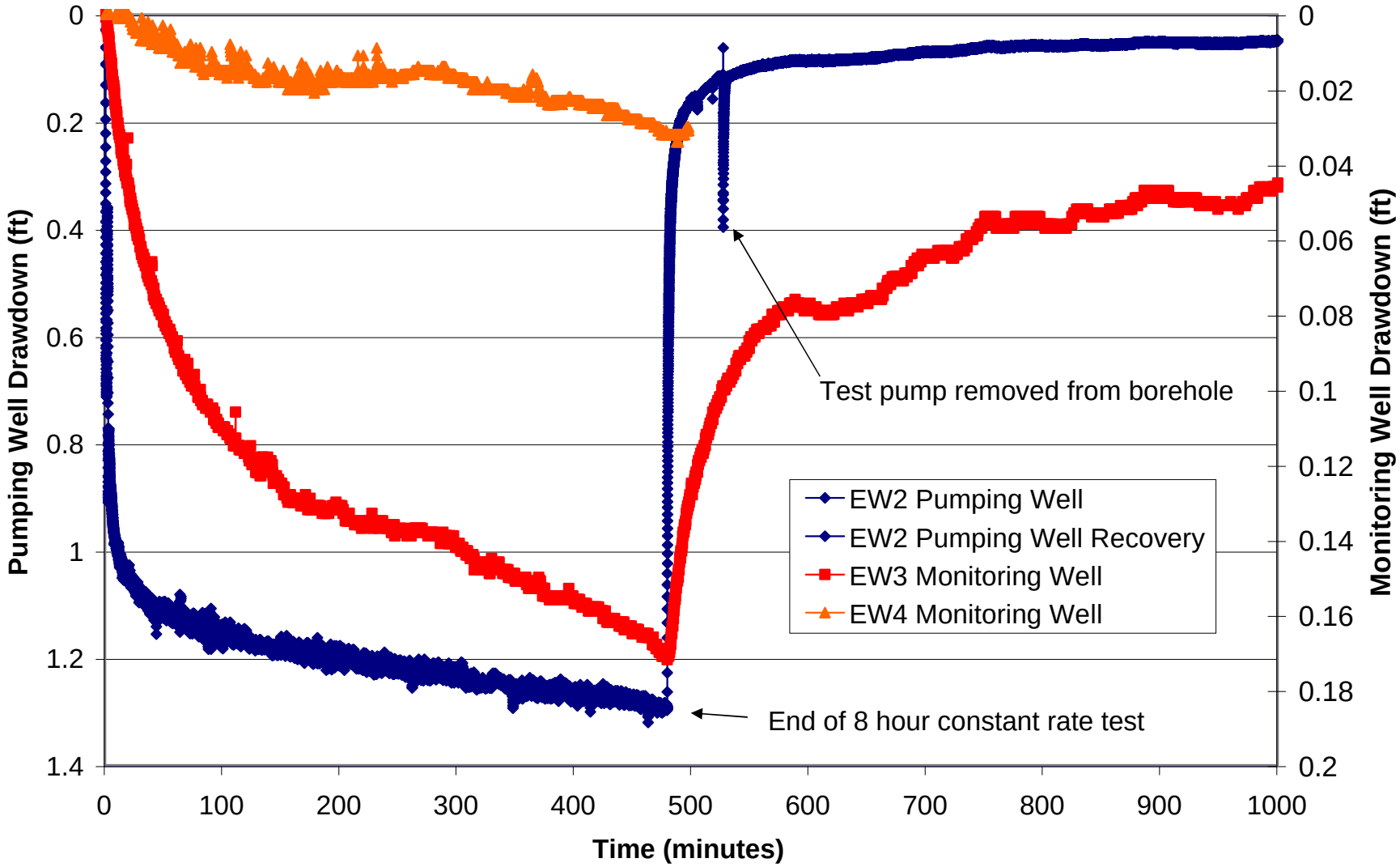


Figure 7
EW-2 Constant Rate Pumping Test Data
Barbee Mill
Renton, WA

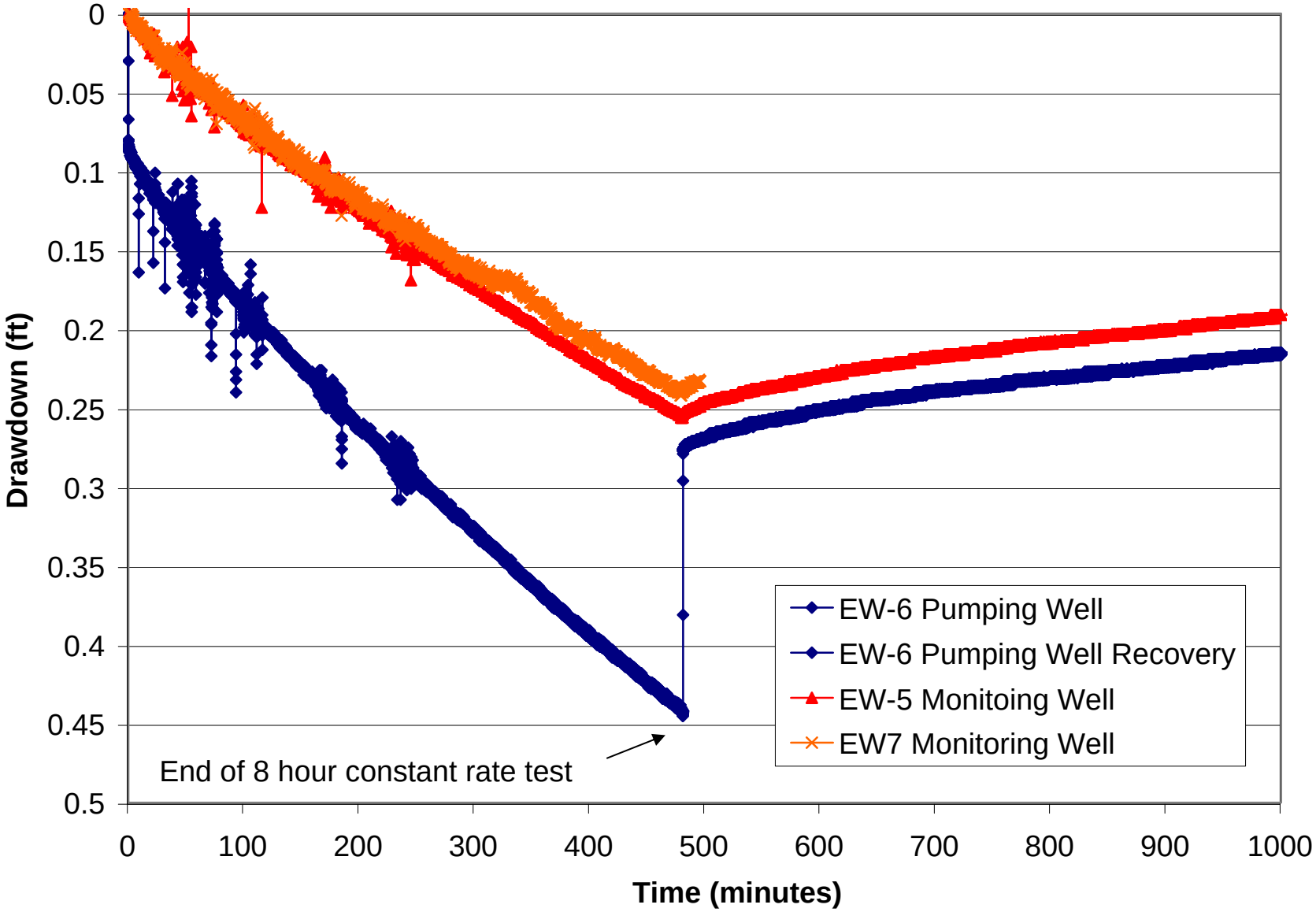


Figure 8
EW-6 Constant Rate Pumping Test Data
Barbee Mill
Renton, WA

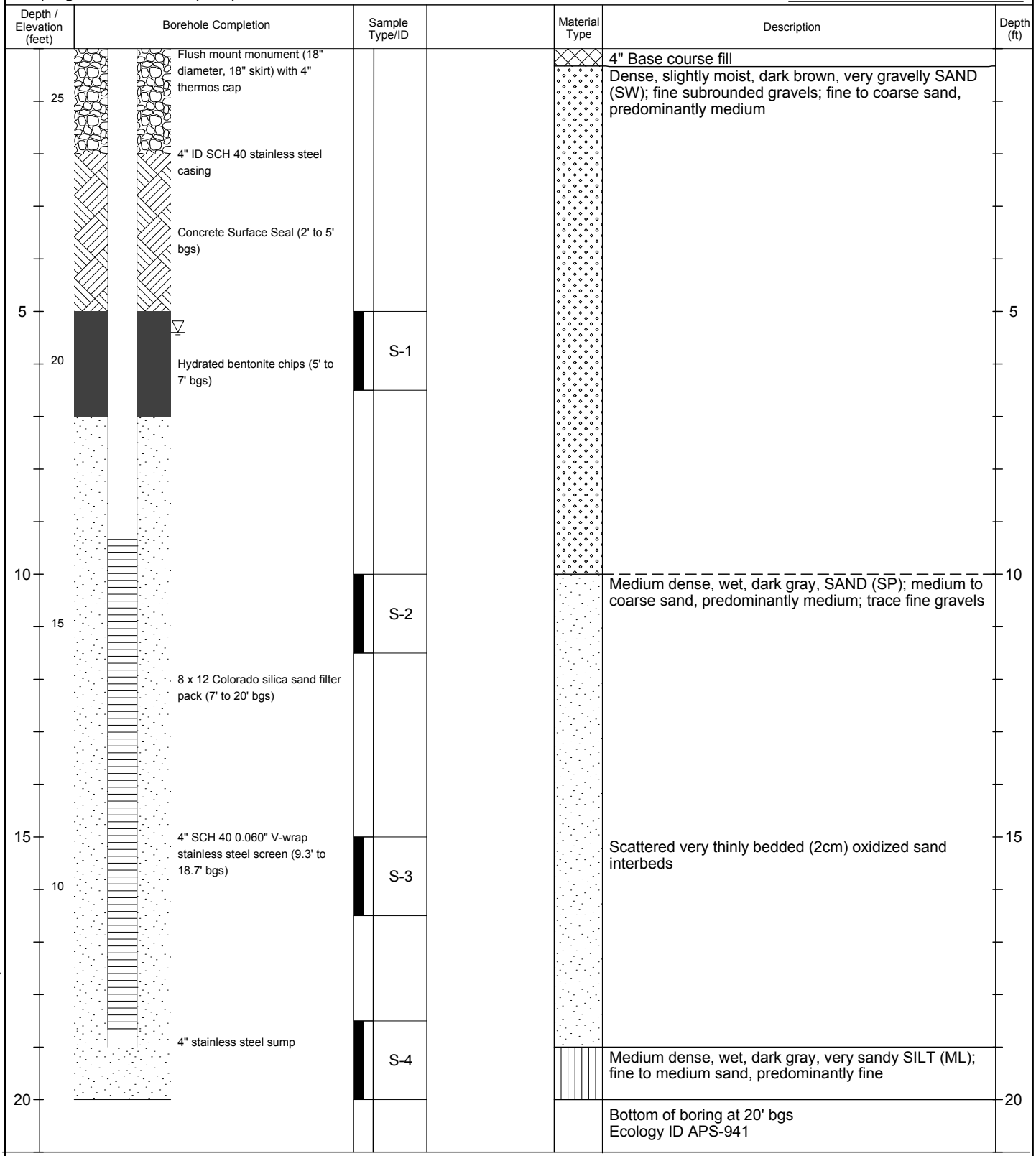
Aspect Consulting
6/29/07
S:\Barbee Mill\Pumping Tests\EW Memo\EW memo Tables and Figs

Aspect consulting
IN-DEPTH PERSPECTIVE

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-1	1 of 1

Project Name	Barbee Mill	Ground Surface Elev	25.93
Location	Renton, WA	Top of Casing Elev.	25.21
Driller/Method	Cascade / Hollow Stem Auger	Depth to Water (ft BGS)	
Sampling Method	D&M Split-Spoon	Start/Finish Date	5/14/2006



Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: DFR

Approved by: DAH

Figure No. A- 2

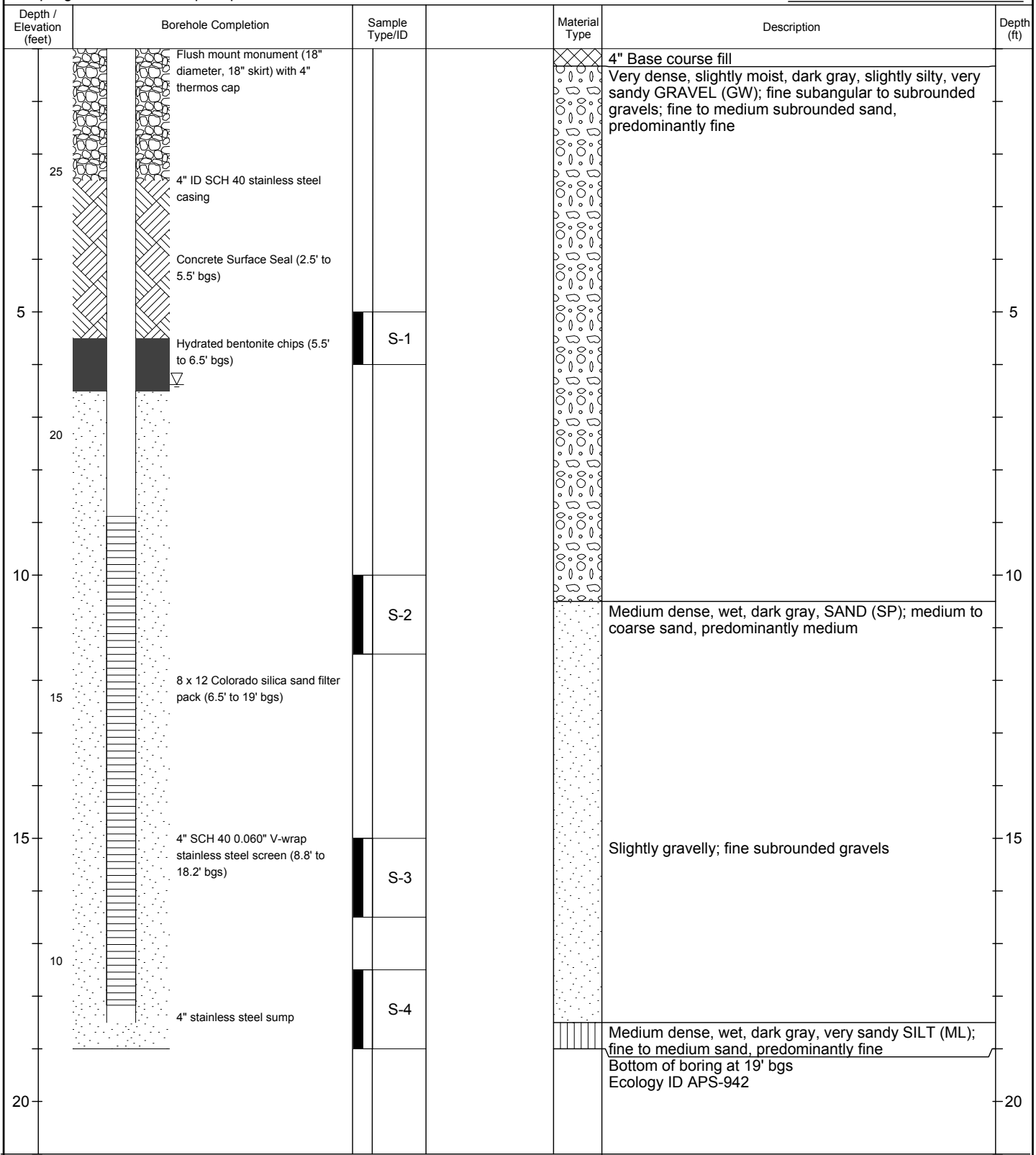
_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 22, 2007

Aspect consulting
IN-DEPTH PERSPECTIVE

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-2	1 of 1

Project Name	Barbee Mill	Ground Surface Elev	27.33
Location	Renton, WA	Top of Casing Elev.	26.17
Driller/Method	Cascade / Hollow Stem Auger	Depth to Water (ft BGS)	
Sampling Method	D&M Split-Spoon	Start/Finish Date	5/15/2006



Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: DFR

Approved by: DAH

Figure No. A- 3

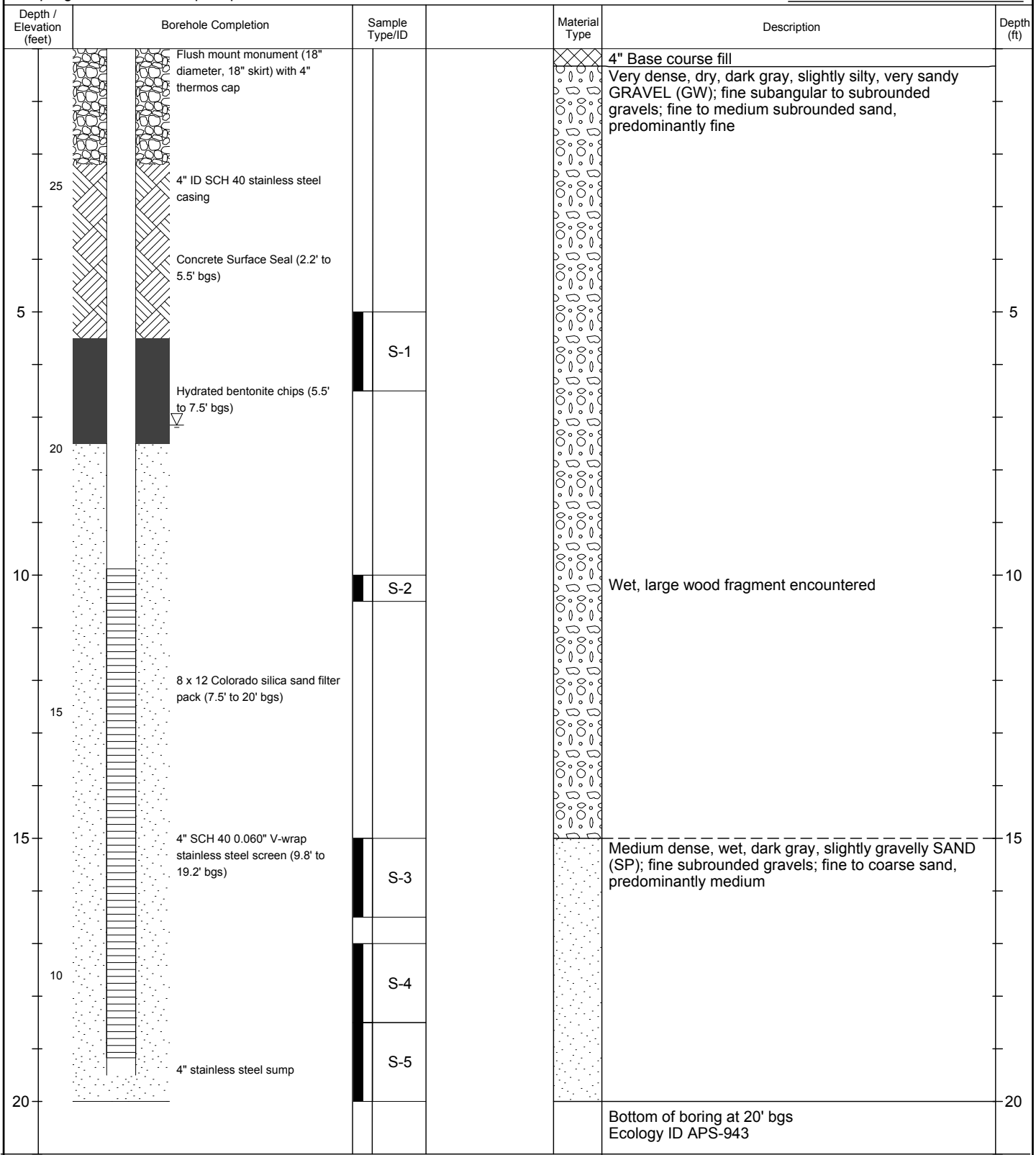
_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 22, 2007

Aspect consulting
IN-DEPTH PERSPECTIVE

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-3	1 of 1

Project Name	Barbee Mill	Ground Surface Elev	27.60
Location	Renton, WA	Top of Casing Elev.	27.00
Driller/Method	Cascade / Hollow Stem Auger	Depth to Water (ft BGS)	
Sampling Method	D&M Split-Spoon	Start/Finish Date	5/15/2006



Sampler Type:
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- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: DFR

Approved by: DAH

Figure No. A- 4

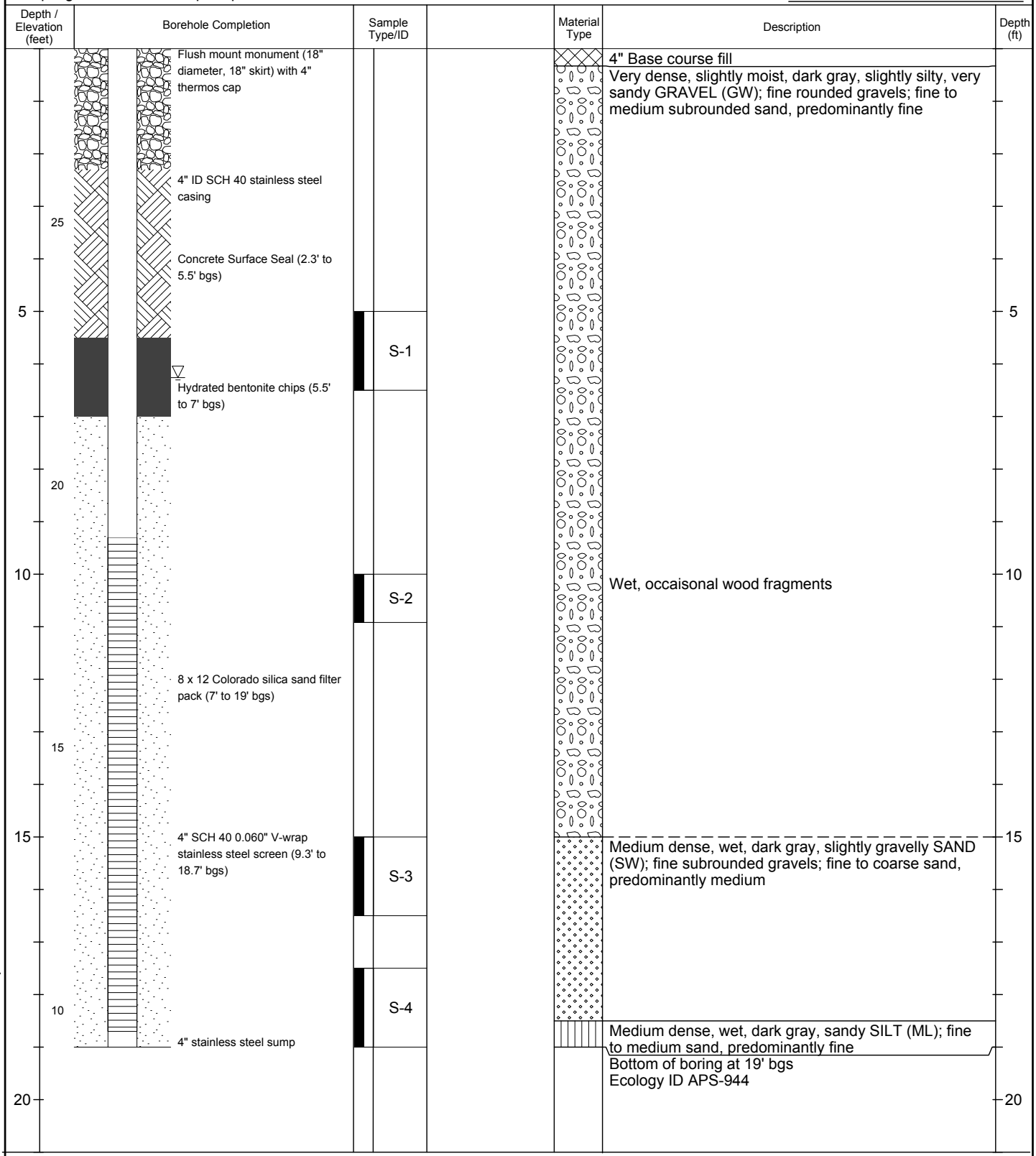
_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 22, 2007

Aspect consulting
IN-DEPTH PERSPECTIVE

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-4	1 of 1

Project Name	Barbee Mill	Ground Surface Elev	28.30
Location	Renton, WA	Top of Casing Elev.	27.30
Driller/Method	Cascade / Hollow Stem Auger	Depth to Water (ft BGS)	
Sampling Method	D&M Split-Spoon	Start/Finish Date	5/15/2006



Sampler Type:
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- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: DFR

Approved by: DAH

Figure No. A- 5

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 22, 2007

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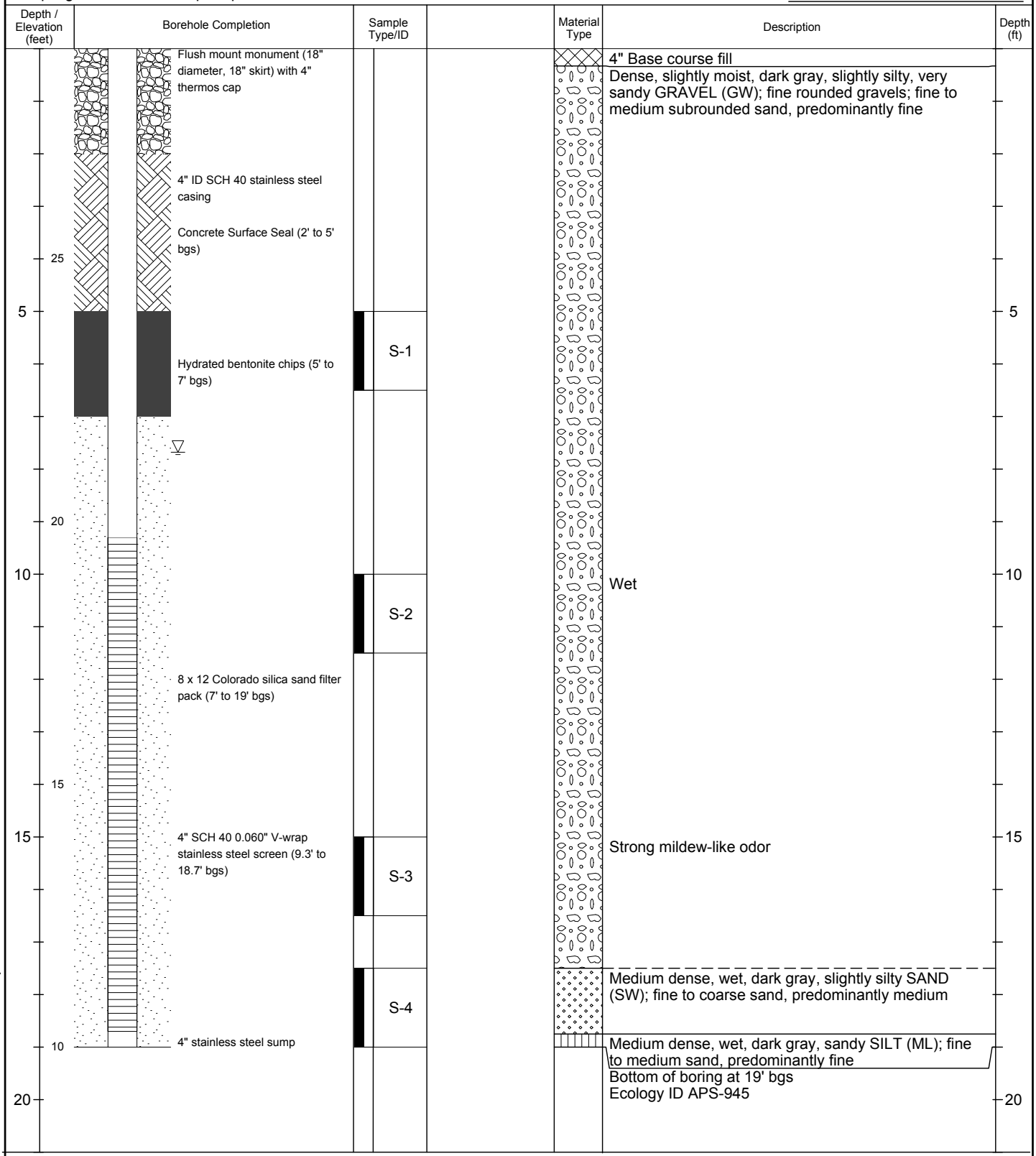
Well Construction Log

Project Number	Well Number	Sheet
050004	EW-5	1 of 1

Project Name	Barbee Mill	Ground Surface Elev	28.99
Location	Renton, WA	Top of Casing Elev.	28.32
Driller/Method	Cascade / Hollow Stem Auger	Depth to Water (ft BGS)	
Sampling Method	D&M Split-Spoon	Start/Finish Date	5/15/2006



Sampler Type:
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- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: DFR

Approved by: DAH

Figure No. A- 6

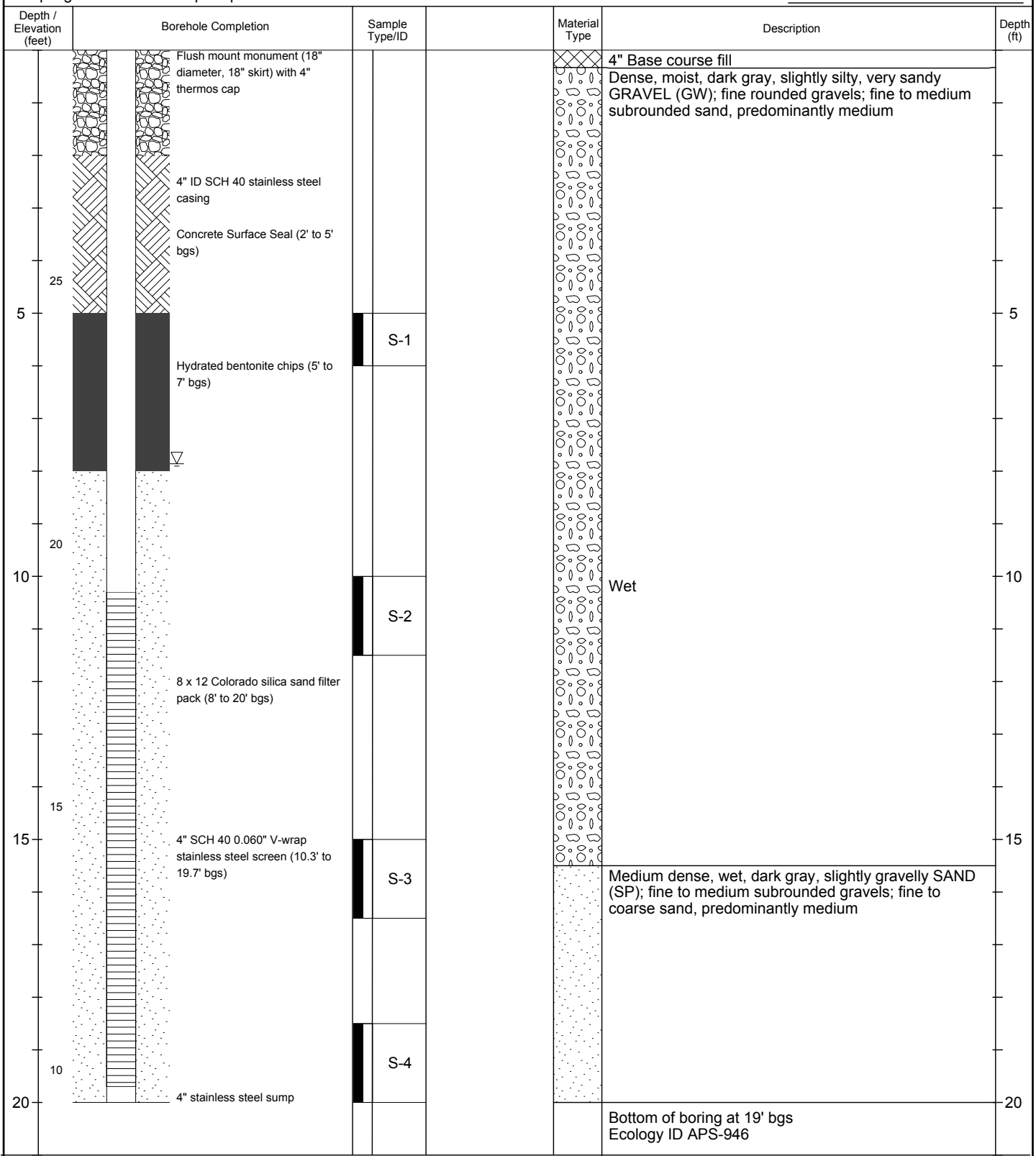
_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 22, 2007

Aspect consulting
IN-DEPTH PERSPECTIVE

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-6	1 of 1

Project Name	Barbee Mill	Ground Surface Elev	29.38
Location	Renton, WA	Top of Casing Elev.	28.75
Driller/Method	Cascade / Hollow Stem Auger	Depth to Water (ft BGS)	
Sampling Method	D&M Split-Spoon	Start/Finish Date	5/16/2006



Sampler Type:
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- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: DFR

Approved by: DAH

Figure No. A- 7

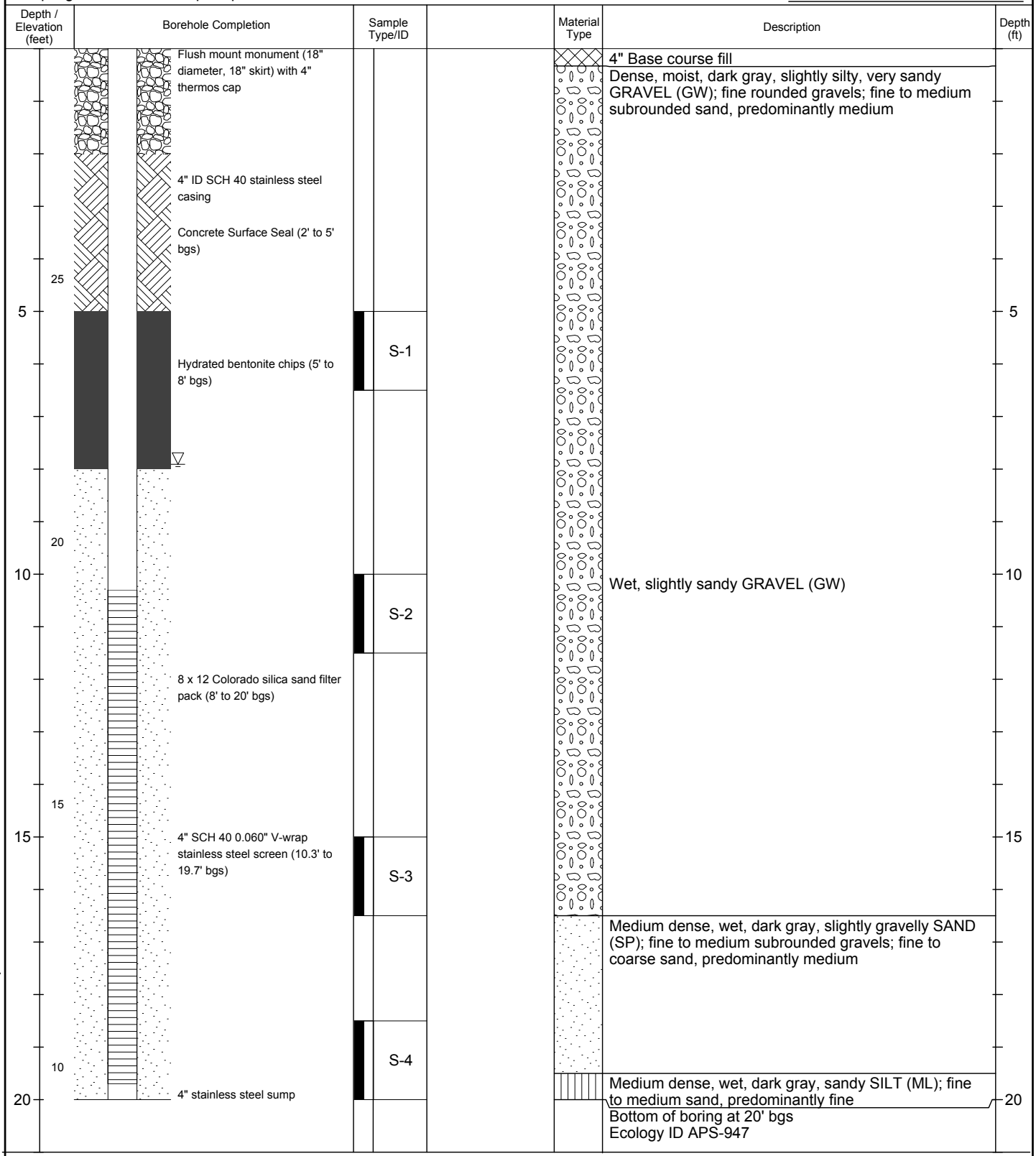
_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 22, 2007

Aspect consulting
IN-DEPTH PERSPECTIVE

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-7	1 of 1

Project Name	Barbee Mill	Ground Surface Elev	29.38
Location	Renton, WA	Top of Casing Elev.	28.50
Driller/Method	Cascade / Hollow Stem Auger	Depth to Water (ft BGS)	
Sampling Method	D&M Split-Spoon	Start/Finish Date	5/16/2006



Sampler Type:
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- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: DFR

Approved by: DAH

Figure No. A- 8

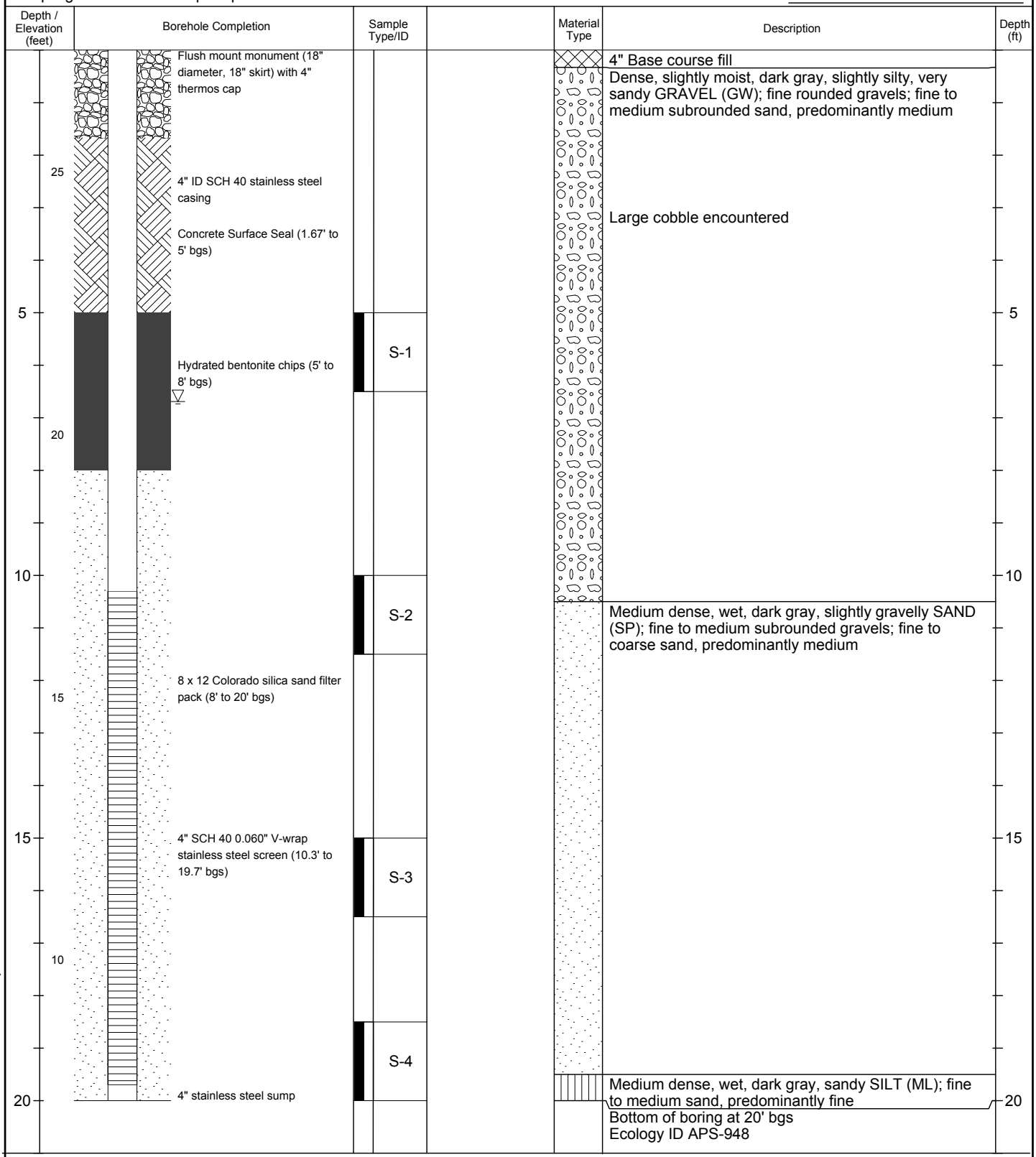
_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 22, 2007

Aspect consulting
IN-DEPTH PERSPECTIVE

Well Construction Log

Project Number	Well Number	Sheet
050004	EW-8	1 of 1

Project Name	Barbee Mill	Ground Surface Elev	27.32
Location	Renton, WA	Top of Casing Elev.	27.00
Driller/Method	Cascade / Hollow Stem Auger	Depth to Water (ft BGS)	
Sampling Method	D&M Split-Spoon	Start/Finish Date	5/16/2006



Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: DFR

Approved by: DAH

Figure No. A- 9

_WELL CONSTRUCTION BARBEE MILLS AZ.GPJ May 22, 2007

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

June 12, 2007

Jeremy Porter
Aspect Consulting
811 First Avenue, Suite 480
Seattle, WA 98104

Re: Analytical Data for Project 050004
Laboratory Reference No. 0706-022

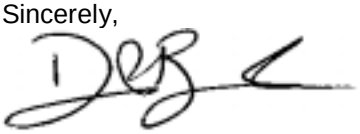
Dear Jeremy:

Enclosed are the analytical results and associated quality control data for samples submitted on June 4, 2007.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,



David Baumeister
Project Manager

Enclosures

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: June 12, 2007
Samples Submitted: June 4, 2007
Laboratory Reference: 0706-022
Project: 050004

Case Narrative

Samples were collected on May 30 and June 1, 2007 and received by the laboratory on June 4, 2007. They were maintained at the laboratory at a temperature of 2°C to 6°C except as noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: June 12, 2007
Samples Submitted: June 4, 2007
Laboratory Reference: 0706-022
Project: 050004

TOTAL ARSENIC
EPA 6020

Date Extracted:	6-11-07
Date Analyzed:	6-12-07
Matrix:	Water
Units:	ug/L (ppb)

Client ID	Lab ID	Result	PQL
EW2-053007-1	06-022-01	**210**	2.5
EW2-053007-2	06-022-02	**210**	2.5
EW2-053007-3	06-022-03	**210**	2.5
EW6-060107-1	06-022-04	**250**	2.5
EW6-060107-2	06-022-05	**240**	2.5
EW6-060107-3	06-022-06	**240**	2.5
BT1-060107	06-022-07	**230**	2.5

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: June 12, 2007
Samples Submitted: June 4, 2007
Laboratory Reference: 0706-022
Project: 050004

TOTAL ARSENIC
EPA 6020
METHOD BLANK QUALITY CONTROL

Date Extracted:	6-11-07
Date Analyzed:	6-12-07
Matrix:	Water
Units:	ug/L (ppb)
Lab ID:	MB0611W2

Analyte	Method	Result	PQL
Arsenic	6020	**ND**	1.0

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: June 12, 2007
Samples Submitted: June 4, 2007
Laboratory Reference: 0706-022
Project: 050004

TOTAL ARSENIC
EPA 6020
DUPLICATE QUALITY CONTROL

Date Extracted: 6-11-07
Date Analyzed: 6-12-07

Matrix: Water
Units: ug/L (ppb)

Lab ID: 06-019-01

Analyte	Sample Result	Duplicate Result	RPD	PQL	Flags
Arsenic	**7.01**	**6.72**	4	1.0	

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: June 12, 2007
Samples Submitted: June 4, 2007
Laboratory Reference: 0706-022
Project: 050004

TOTAL ARSENIC
EPA 6020
MS/MSD QUALITY CONTROL

Date Extracted: 6-11-07
Date Analyzed: 6-12-07

Matrix: Water
Units: ug/L (ppb)

Lab ID: 06-019-01

Analyte	Spike Level	MS	Percent Recovery	MSD	Percent Recovery	RPD	Flags
Arsenic	110	**118**	101	**121**	103	2	

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: June 12, 2007
Samples Submitted: June 4, 2007
Laboratory Reference: 0706-022
Project: 050004

TOTAL ARSENIC
EPA 6020
SPIKE BLANK QUALITY CONTROL

Date Extracted: 6-11-07
Date Analyzed: 6-12-07

Matrix: Water
Units: ug/L (ppb)

Lab ID: SB0611W2

Analyte	Method	Spike Level	Result	Percent Recovery
Arsenic	6020	110	**112**	102

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

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

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

Y - Sample extract treated with an acid/silica gel cleanup procedure.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Chain of Custody

Page 1 of 1

OnSite Environmental Inc.
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • Fax: (425) 885-4603

Company: ASPECT CONSULTING
Project Number: 050004
Project Name: Barbee Mill
Project Manager: Jeremy Porter
Sampled by: DAVID RUGH & David Heffner

Turnaround Request (in working days)

(Check One)

- ☐ Same Day
- ☐ 1 Day
- ☐ 2 Day
- ☐ 3 Day
- ☒ Standard (7 working days) (TPH analysis 5 working days)
- ☐ _____ (other)

Laboratory Number: 06-022

Requested Analysis

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx	Volatiles by 8260B	Halogenated Volatiles by 8260B	Semivolatiles by 8270C	PAHs by 8270C / SIM	PCBs by 8082	Pesticides by 8081A	Herbicides by 8151A	Total RCRA Metals (8)	TCLP Metals	HEM by 1664	VPH	EPH	Total Arsenic by 6420				% Moisture
1	EW2-053007-1	5/30/07	1515	W	1																X				
2	EW2-053007-2		1715																		X				
3	EW2-053007-3		1915																		X				
4	EW6-060107-1	6/1/07	1615																		X				
5	EW6-060107-2	6/1/07	1815																		X				
6	EW6-060107-3	6/1/07	2015																		X				
7	BT1-060107	6/1/07	2020																		X				

	Signature	Company	Date	Time
Relinquished by	Dan Rugh	Aspect	6/4/07	730
Received by	M. Van	OSE	6/4/07	1145
Relinquished by				
Received by				
Relinquished by				
Received by				
Reviewed by/Date		Reviewed by/Date		

Comments/Special Instructions:
Samples in 2 small coolers.

Chromatograms with final report ☐

DISTRIBUTION LEGEND: White - OnSite Copy Yellow - Report Copy Pink - Client Copy

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Charlene Morrow, M.S.
Yelena Aravkina, M.S.
Bradley T. Benson, B.S.
Kurt Johnson, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
TEL: (206) 285-8282
FAX: (206) 283-5044
e-mail: fbi@isomedia.com

May 22, 2007

Jeremy Porter, Project Manager
Aspect Consulting
811 1st Ave., Suite 480
Seattle, WA 98104

Dear Mr. Porter:

Included are the results from the testing of material submitted on May 16, 2007 from the Barbee Mill Pump+Treat, F&BI 705209 project. There are 3 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
ASP0522R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	EW-567-051607	Client:	Aspect Consulting
Date Received:	05/16/07	Project:	Barbee Mill Pump+Treat, F&BI 705209
Date Extracted:	05/18/07	Lab ID:	705209-01
Date Analyzed:	05/18/07	Data File:	705209-01.030
Matrix:	Soil	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	HR

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Indium	83	60	125

Analyte:	Concentration mg/kg (ppm)
Arsenic	33.2

Analysis For Total Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Aspect Consulting
Date Received:	Not Applicable	Project:	Barbee Mill Pump+Treat, F&BI 705209
Date Extracted:	05/18/07	Lab ID:	I7-183 mb
Date Analyzed:	05/18/07	Data File:	I7-183 mb.010
Matrix:	Soil	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	HR

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Indium	86	60	125

Analyte:	Concentration mg/kg (ppm)
Arsenic	<1

Date of Report: 05/22/07
Date Received: 05/16/07
Project: Barbee Mill Pump+Treat, F&BI 705209

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 705223-05 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	Relative Percent Difference	Acceptance Criteria
Arsenic	mg/kg (ppm)	<1	<1	nm	0-20

Laboratory Code: 705223-05 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Arsenic	mg/kg (ppm)	10	<1	103	50-150

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/kg (ppm)	10	98	70-130

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

705209

CHAIN OF CUSTODY ME 05-16-07

AI1

Aspect Consulting, LLC
811 First Avenue, Suite 480
Seattle, Washington 98104
(206) 328-7443
(206) 838-5853 FAX

Project # 050004

Project Name: BARBEE MILL PUMP + TREAT

WSG = Composition Water; Soil; or Gas

G/C = Grab or Composite

NUM = Number of Containers

Requested Laboratory Analysis

Bill To: Jeremy Porter, Aspect

Sampled By: DFR

Sample #	Date	Time	WSG	G/C	Location	NUM	Arsenic EPA 200.8									Remarks
EW-567-051607	5/16/07	1330	S	G	EW567	1	X									

Relinquished By: Dan Fleh	Received By: Mayflaw		8 Hour Rush
Date: 5/16/2007 Time: 1430	Date: 5/16/07 Time: 17:05		24 Hour Rush
Relinquished By:	Received By;		2 - 3 Day Rush
Date: Time:	Date: Time:		5 Day Rush
Relinquished By:	Received By:		10 Day Standard
Date: Time:	Date: Time:		

Document2

Samples received at 14 °C

ATTACHMENT C2

Independent Remedial Action Plan, Upland Areas, Hart Crowser, 2000

- Table 2 – Measured Hydraulic Conductivities at Barbee Mill

Table 2 - Measured Hydraulic Conductivities at Barbee Mill

Well ID	Soil Description	Conductivity in cm/sec
HC-MW1S	m-f SAND	6.9E-03
HC-MW1D	m-f SAND	3.9E-03
HC-MW2	gravelly SAND	8.5E-03
HC-MW3	gravelly SAND	3.5E-03
HC-MW4	slightly gravelly SAND	2.8E-03
HC-MW5S	silty SAND	3.0E-03
HC-MW5D	m-f SAND	2.0E-03
RMW-1	silty SAND	1.6E-03
RMW-3	silty SAND and SILT	2.5E-04
RMW-4	silty SAND	8.1E-03
RMW-5	silty SAND	6.8E-03

494610/IRAP.xls - Table2

ATTACHMENT C3

Interim Action Design and Implementation Report, Aspect, 2010

- Table 1 – Well Construction Summary

Table 1 - Well Construction Information

Barbee Mill 050004
Renton, WA

Well Number	Completion Date	Northing	Easting	Top of Casing Elevation	Well Casing Diameter (inches)	Well Casing Material	Drilled Depth (feet)	Screened Depth (feet)		
CMW-1	8/23/2007	196384	1301554	22.75	2	PVC	12.8	7.7	to	12.5
CMW-2S	8/23/2007	196558	1301556	22.27	2	PVC	12.6	7.7	to	12.3
CMW-2D	8/22/2007	196559	1301555	22.20	2	PVC	21.6	16.6	to	21.4
CMW-3	8/22/2007	196713	1301564	22.41	2	PVC	12.5	7.7	to	12.3
CMW-4S	8/22/2007	196784	1301631	27.44	2	PVC	16.6	11.6	to	16.4
CMW-4D	8/22/2007	196783	1301632	27.92	2	PVC	26.0	21.0	to	25.8
CMW-5	8/22/2007	196778	1301751	31.07	2	PVC	16.6	11.6	to	16.4
CMW-6	8/22/2007	196774	1301893	31.03	2	PVC	18.8	12.5	to	18.8
EW-1	5/14/2007	196483	1301713	26.81	4	Steel	20.0	9.3	to	18.7
EW-2	5/15/2007	196535	1301707	26.67	4	Steel	19.0	8.9	to	18.2
EW-3	5/15/2007	196588	1301713	26.77	4	Steel	20.0	9.9	to	19.2
EW-4	5/15/2007	196628	1301751	27.65	4	Steel	19.0	9.3	to	18.6
EW-5	5/15/2007	196645	1301804	28.34	4	Steel	19.0	9.3	to	18.6
EW-6	5/16/2007	196644	1301863	28.61	4	Steel	19.0	10.3	to	19.6
EW-7	5/16/2007	196642	1301947	28.66	4	Steel	19.0	10.3	to	19.6
EW-8	5/16/2007	196734	1301728	28.88	4	Steel	20.0	10.3	to	19.6
PZ-1	11/6/2007	196258	1301881	27.78	0.75	PVC	20.0	15.0	to	20.0
PZ-2	11/6/2007	196630	1302251	27.87	0.75	PVC	20.0	15.0	to	20.0
WP-1A	1/6/2009	196818	1301594	19.45	1.5	Steel	3.5	1.5	to	3.5
WP-8	1/6/2009	196899	1301627	19.48	1.5	Steel	3.5	1.5	to	3.5

APPENDIX D

Sediment Data Tables

Geosyntec consultants

engineers | scientists | innovators

REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT

APPENDIX D: SEDIMENT DATA TABLES

Prepared for

Barbee Mill Co., Inc.
P.O. Box 359
Renton, Washington 98057

Prepared by

Geosyntec Consultants, Inc.
520 Pike Street, Suite 2600
Seattle, Washington 98101

Project Number: PNG0869

December 2023

Table D-1 Analytical Results for Historical Surface Sediment Samples (0 to 10 cm)

Location ID		AN-BM-1	AN-BM-2	AN-BM-3	AN-BM-4	AN-BM-5	AN-BM-6	AN-BM-7	AN-BM-8	AN-BM-9	AN-BM-10	AN-BM-11
Sample ID		AN-BM-1_37558	AN-BM-2_37558	AN-BM-3_37558	AN-BM-4_37558	AN-BM-5_37558	AN-BM-6_37558	AN-BM-7_37558	AN-BM-8_37558	AN-BM-9_37558	AN-BM-10_37558	AN-BM-11_37558
Collection Date		10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002
Sampled Depth		0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 cm	0 - 10 cm	0 - 10 cm	0 cm	0 - 5 cm	0 - 10 cm
Analyte	**Unit**											
Conventionals in %												
Total Solids	%	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	%	**20.9**	12.6	15.3	16.8	10.1	-	18.1	13.8	-	46	18.8
Wood Waste	%	30	80	60	60	20	80	70	35	80	90	10
Metals in mg/kg												
Arsenic	mg/kg	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	123	55.3	158	166	145	-	194	155	-	81.7	150
Polycyclic Aromatic Hydrocarbons in ug/kg												
Naphthalene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Acenaphthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Fluorene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Benz(a)anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Chrysene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Total HPAHs	mg/kg	-	-	-	-	-	-	-	-	-	-	-
Total LPAHs	mg/kg	-	-	-	-	-	-	-	-	-	-	-
Total PAHs	mg/kg	-	-	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 0)	mg/kg	-	-	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 0)	mg/kg-OC	-	-	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 1/2 RDL)	mg/kg	-	-	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 1/2)	mg/kg-OC	-	-	-	-	-	-	-	-	-	-	-
Total PAHs	ug/kg	-	-	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 0)	ug/kg	-	-	-	-	-	-	-	-	-	-	-

Table D-1 Analytical Results for Historical Surface Sediment Samples (0 to 10 cm)

Analyte	Unit	AN-BM-12 AN-BM-12_37558 10/29/2002 0 cm	AN-BM-13 AN-BM-13_37558 10/29/2002 0 cm	AN-BM-14 AN-BM-14_37558 10/29/2002 0 - 10 cm	AN-BM-15 AN-BM-15_37489 08/21/2002 0 cm	AN-BM-16 AN-BM-16_37489 08/21/2002 0 cm	AN-BM-17 AN-BM-17_37489 08/21/2002 0 cm	AN-BM-18 AN-BM-18_37489 08/21/2002 0 - 10 cm	AN-BM-19 AN-BM-19_37489 08/21/2002 0 cm	AN-BM-20 AN-BM-20_37489 08/21/2002 0 - 10 cm	AN-BM-21 AN-BM-21_37489 08/21/2002 0 - 10 cm	BA-1 BA-1 08/25/1999 -	BA-2 BA-2 08/30/1999 -
Conventionals in %													
Total Solids	%	-	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	%	-	-	18.7	-	-	-	12.4	-	21.3	**20**	**9.6**	-
Wood Waste	%	80	90	60	**80**	**80**	80	25	80	50	**30**	-	-
Metals in mg/kg													
Arsenic	mg/kg	-	-	-	-	-	-	-	-	-	-	4.4	< 10 U
Lead	mg/kg	-	-	-	-	-	-	-	-	-	-	**15**	**26**
Selenium	mg/kg	-	-	-	-	-	-	-	-	-	-	< 1.0 U	< 10 U
Zinc	mg/kg	-	-	201	-	-	-	88.1	-	104	93.4	-	-
Polycyclic Aromatic Hydrocarbons in ug/kg													
Naphthalene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Acenaphthene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Acenaphthylene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Fluorene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Phenanthrene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Benz(a)anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Chrysene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Benzo(b)fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Benzo(k)fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Benzo(a)pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Indeno(1,2,3-cd)pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Dibenzo(a,h)anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Benzo(g,h,i)perylene	ug/kg	-	-	-	-	-	-	-	-	-	-	< 4000 U	< 530 U
Total HPAHs	mg/kg	-	-	-	-	-	-	-	-	-	-	< 4.0 U	< 0.53 U
Total LPAHs	mg/kg	-	-	-	-	-	-	-	-	-	-	< 4.0 U	< 0.53 U
Total PAHs	mg/kg	-	-	-	-	-	-	-	-	-	-	< 4.0 U	< 0.53 U
Total cPAHs TEQ (ND = 0)	mg/kg	-	-	-	-	-	-	-	-	-	-	**< 4.0 U**	< 0.53 U
Total cPAHs TEQ (ND = 0)	mg/kg-OC	-	-	-	-	-	-	-	-	-	-	< 41.7 U	-
Total cPAHs TEQ (ND = 1/2 RDL)	mg/kg	-	-	-	-	-	-	-	-	-	-	< 3.02 U	< 0.40 U
Total cPAHs TEQ (ND = 1/2)	mg/kg-OC	-	-	-	-	-	-	-	-	-	-	**< 3.02 U**	-
Total PAHs	ug/kg	-	-	-	-	-	-	-	-	-	-	**< 4000 U**	< 530 U
Total cPAHs TEQ (ND = 0)	ug/kg	-	-	-	-	-	-	-	-	-	-	**< 4000 U**	< 530 U

Table D-1 Analytical Results for Historical Surface Sediment Samples (0 to 10 cm)

Location ID		BA-3	BA-4	BA-5	BA-6	BA-7	BA-8	BA-9	BA-10	BA-11	BA-12	BA-13	BA-SED-01	BA-SED-02	BA-SED-03
Sample ID		BA-3	BA-4	BA-5	BA-6	BA-7	BA-8	BA-9	BA-10	BA-11	BA-12	BA-13	BA-SED-01_36404	BA-SED-02_36404	BA-SED-03_36404
Collection Date		08/31/1999	08/31/1999	09/01/1999	09/01/1999	09/03/1999	09/03/1999	09/08/1999	09/10/1999	10/24/1999	11/01/1999	11/02/1999	09/01/1999	09/01/1999	09/01/1999
Sampled Depth		-	-	-	-	-	-	-	-	-	-	-	0 - 10 cm	0 - 10 cm	0 - 10 cm
Analyte	**Unit**														
Conventionals in %															
Total Solids	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wood Waste	%	**-**	-	-	-	-	-	-	-	-	-	**-**	**5**	-	-
Metals in mg/kg															
Arsenic	mg/kg	< 20 U	< 10 U	< 10 U	< 7.0 U	< 8.0 U	< 10 U	< 8.0 U	< 9.0 U	< 9.0 U	< 8.0 U	20	< 10 U	< 10 U	< 10 U
Lead	mg/kg	**15**	**8**	**15**	**11**	17	21	5	10	13	9	47	40	37	50
Selenium	mg/kg	< 20 U	< 10 U	< 10 U	< 7.0 U	< 8.0 U	< 10 U	< 8.0 U	< 9.0 U	< 9.0 U	< 8.0 U	< 10 U	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons in ug/kg															
Naphthalene	ug/kg	< 410 U	< 280 U	270	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	120 J	75 J	< 1400 U	-	-	-
Acenaphthene	ug/kg	< 410 U	< 280 U	< 160 U	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	< 230 U	< 110 U	< 1400 U	-	-	-
Acenaphthylene	ug/kg	< 410 U	< 280 U	< 160 U	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	< 230 U	< 110 U	< 1400 U	-	-	-
Fluorene	ug/kg	< 410 U	< 280 U	250	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	130 J	440	< 1400 U	-	-	-
Phenanthrene	ug/kg	< 410 U	< 280 U	< 160 U	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	< 230 U	< 110 U	< 1400 U	-	-	-
Anthracene	ug/kg	< 410 U	< 280 U	< 160 U	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	< 230 U	39 J	< 1400 U	-	-	-
Fluoranthene	ug/kg	< 410 U	< 280 U	< 160 U	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	120 J	110 J	< 1400 U	-	-	-
Pyrene	ug/kg	< 410 U	< 280 U	< 160 U	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	< 230 U	< 110 U	< 1400 U	-	-	-
Benz(a)anthracene	ug/kg	< 410 U	< 280 U	< 160 U	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	< 230 U	76 J	< 1400 U	-	-	-
Chrysene	ug/kg	< 410 U	< 280 U	630	< 100 U	150	380	< 260 U	130	130 J	88 J	< 1400 U	-	-	-
Benzo(b)fluoranthene	ug/kg	< 410 U	< 280 U	< 160 U	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	< 230 U	< 110 U	< 1400 U	-	-	-
Benzo(k)fluoranthene	ug/kg	< 410 U	< 280 U	570	< 100 U	< 120 U	< 130 U	< 260 U	120 J	< 230 U	140	1500	-	-	-
Benzo(a)pyrene	ug/kg	< 410 U	290	1300	< 100 U	< 120 U	< 130 U	< 260 U	150	140 J	270	1700	-	-	-
Indeno(1,2,3-cd)pyrene	ug/kg	< 410 U	< 280 U	< 160 U	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	93 J	390	< 1400 U	-	-	-
Dibenzo(a,h)anthracene	ug/kg	< 410 U	< 280 U	220	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	84 J	80 J	< 1400 U	-	-	-
Benzo(g,h,i)perylene	ug/kg	< 410 U	< 280 U	< 160 U	< 100 U	< 120 U	< 130 U	< 260 U	< 120 U	< 230 U	69 J	< 1400 U	-	-	-
Total HPAHs	mg/kg	< 0.41 U	1.55	3.07	< 0.10 U	0.69	0.965	< 0.26 U	0.76	1.16 J	1.64 J	8	0.9	3.3	3.6
Total LPAHs	mg/kg	< 0.41 U	< 0.28 U	0.97	< 0.10 U	< 0.12 U	< 0.13 U	< 0.26 U	0.42 J	< 0.23 U	0.413 J	5	0.3	0.3	< 0.10 U
Total PAHs	mg/kg	< 0.41 U	2.53	4.12	< 0.10 U	1.11	1.42	< 0.26 U	1.24 J	1.97 J	2.11 J	13.7	1.2	3.5	**3.6**
Total cPAHs TEQ (ND = 0)	mg/kg	**< 0.41 U**	**< 0.28 U**	**0.0497**	< 0.10 U	< 0.12 U	< 0.13 U	< 0.26 U	< 0.12 U	0.152 J	0.202 J	< 1.4 U	-	-	**-**
Total cPAHs TEQ (ND = 0)	mg/kg-OC	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 1/2 RDL)	mg/kg	< 0.31 U	< 0.211 U	0.154	< 0.0755 U	< 0.0906 U	< 0.0982 U	< 0.196 U	< 0.0906 U	0.175 J	0.213 J	< 1.06 U	-	-	-
Total cPAHs TEQ (ND = 1/2)	mg/kg-OC	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-	-	**-**
Total PAHs	ug/kg	**< 410 U**	**2530**	**4120**	< 100 U	1110	1420	< 260 U	1240 J	1970 J	2110 J	13700	1200	3500	**3600**
Total cPAHs TEQ (ND = 0)	ug/kg	**< 410 U**	**< 280 U**	**49.7**	< 100 U	< 120 U	< 130 U	< 260 U	< 0.12 U	152 J	202 J	< 1400 U	-	-	**-**

Table D-1 Analytical Results for Historical Surface Sediment Samples (0 to 10 cm)

Location ID		BA-SED-04	BA-SED-05	BA-SED-06	BMPD-1	BMPD-2	BMPD-6	BMPD-7	BMPD-9	BMPD-10	BMPD-11	BMPD-12	BMPD-13
Sample ID		BA-SED-04_36404	BA-SED-05_36404	BA-SED-06_36404	BMPD-1_37558	BMPD-2_37558	BMPD-6_37558	BMPD-7_37558	BMPD-9_37558	BMPD-10_37558	BMPD-11_37558	BMPD-12_37558	BMPD-13_37558
Collection Date		09/01/1999	09/01/1999	09/01/1999	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002	10/29/2002
Sampled Depth		0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Analyte	**Unit**												
Conventionals in %													
Total Solids	%	-	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	%	-	-	-	6.3	13	5.8	4.9	5.7	6.4	3.5	5	7.3
Wood Waste	%	-	100	-	< 5.0 U	35	< 5.0 U	10	10	10	5	25	25
Metals in mg/kg													
Arsenic	mg/kg	**< 10 U**	< 10 U	< 10 U	-	-	-	-	-	-	-	-	-
Lead	mg/kg	24	34	37	-	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons in ug/kg													
Naphthalene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Benz(a)anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-
Total HPAHs	mg/kg	1.8	0.6	0.5	-	-	-	-	-	-	-	-	-
Total LPAHs	mg/kg	< 0.10 U	< 0.10 U	< 0.10 U	-	-	-	-	-	-	-	-	-
Total PAHs	mg/kg	1.8	0.6	0.5	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 0)	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 0)	mg/kg-OC	-	-	-	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 1/2 RDL)	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 1/2)	mg/kg-OC	-	-	-	-	-	-	-	-	-	-	-	-
Total PAHs	ug/kg	1800	600	500	-	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 0)	ug/kg	-	-	-	-	-	-	-	-	-	-	-	-

Table D-1 Analytical Results for Historical Surface Sediment Samples (0 to 10 cm)

Location ID		BMPD-14	BMPD-15	BMPD-16	BMPD-19	BMPD-20	BMPD-21	BMPD-22	BMPD-23	M. OUTFALL	N. OUTFALL	S. OUTFALL	VB-1
Sample ID		BMPD-14_37558	BMPD-15_37489	BMPD-16_37489	BMPD-19_37489	BMPD-20_37489	BMPD-21_37489	BMPD-22_37558	BMPD-23_37558	M. OUTFALL_36404	N. OUTFALL_36404	S. OUTFALL_36404	VB-1_35454
Collection Date		10/29/2002	08/21/2002	08/21/2002	08/21/2002	08/21/2002	08/21/2002	10/29/2002	10/29/2002	09/01/1999	09/01/1999	09/01/1999	01/24/1997
Sampled Depth		0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 35 cm
Analyte	**Unit**												
Conventionals in %													
Total Solids	%	-	-	-	-	-	-	-	-	-	-	-	32.2
Total Organic Carbon	%	6	5.5	2.3	6.2	7.7	4.1	7.3	5.6	-	-	-	7.4
Wood Waste	%	10	< 5.0 U	< 5.0 U	< 5.0 U	15	< 5.0 U	25	< 5.0 U	-	-	-	-
Metals in mg/kg													
Arsenic	mg/kg	-	-	-	-	-	-	-	-	< 10 U	30	< 10 U	< 20 U
Lead	mg/kg	-	-	-	-	-	-	-	-	13	18	16	27
Selenium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	< 20 U
Zinc	mg/kg	-	-	-	-	-	-	-	-	-	-	-	75
Polycyclic Aromatic Hydrocarbons in ug/kg													
Naphthalene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Acenaphthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Acenaphthylene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Fluorene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Phenanthrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Benz(a)anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Chrysene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Benzo(b)fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Benzo(k)fluoranthene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Benzo(a)pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Indeno(1,2,3-cd)pyrene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Dibenzo(a,h)anthracene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Benzo(g,h,i)perylene	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U
Total HPAHs	mg/kg	-	-	-	-	-	-	-	-	-	-	-	< 1.1 U
Total LPAHs	mg/kg	-	-	-	-	-	-	-	-	-	-	-	< 0.66 U
Total PAHs	mg/kg	-	-	-	-	-	-	-	-	0.8	2.8	< 0.10 U	< 1.9 U
Total cPAHs TEQ (ND = 0)	mg/kg	-	-	-	-	-	-	-	-	-	-	-	< 0.22 U
Total cPAHs TEQ (ND = 0)	mg/kg-OC	-	-	-	-	-	-	-	-	-	-	-	< 3.0 U
Total cPAHs TEQ (ND = 1/2 RDL)	mg/kg	-	-	-	-	-	-	-	-	-	-	-	< 0.166 U
Total cPAHs TEQ (ND = 1/2)	mg/kg-OC	-	-	-	-	-	-	-	-	-	-	-	< 2.24 U
Total PAHs	ug/kg	-	-	-	-	-	-	-	-	800	2800	< 100 U	< 1900 U
Total cPAHs TEQ (ND = 0)	ug/kg	-	-	-	-	-	-	-	-	-	-	-	< 220 U

Table D-1 Analytical Results for Historical Surface Sediment Samples (0 to 10 cm)

Analyte	Unit	VB-2	VB-3	VB-4	VB-5	VB-8	VS-35	S-103	S-112	EXP_S9
Location ID		VB-2	VB-3	VB-4	VB-5	VB-8	VS-35	S-103	S-112	EXP_S9
Sample ID		VB-2-0-10	VB-3-0-9	VB-4_35454	VB-5_35454	VB-8_35454	VS-35-0-22.5	S-103-0-10SD	S-112-0-10SD	EXP_S9
Collection Date		01/24/1997	01/24/1997	01/24/1997	01/24/1997	01/24/1997	2/3/1997	11/13/1996	11/14/1996	6/1/2000
Sampled Depth		0 - 10 cm	0 - 9 cm	0 - 10 cm	0 - 10 cm	0 - 45 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Conventionals in %										
Total Solids	%	26.5	28.2	26.4	68.9	35.1	29.4	33.2	21.7	-
Total Organic Carbon	%	5	24	5.1	2.7	14	22	14	9.1	17.7
Wood Waste	%	-	-	-	-	-	-	-	-	-
Metals in mg/kg										
Arsenic	mg/kg	< 20 U	< 20 U	< 20 U	< 7.0 U	< 10 U	-	-	-	-
Lead	mg/kg	46	13	43	10	13	-	-	-	-
Selenium	mg/kg	< 20 U	< 20 U	< 20 U	< 7.0 U	< 10 U	-	-	-	-
Zinc	mg/kg	142	55	1580	34	75	-	-	-	-
Polycyclic Aromatic Hydrocarbons in ug/kg										
Naphthalene	ug/kg	< 240 U	< 220 U	< 250 U	< 99 U	260	390	150 U	53	-
Acenaphthene	ug/kg	< 240 U	< 220 U	< 250 U	< 99 U	< 200 U	260 U	150 U	46	-
Acenaphthylene	ug/kg	< 240 U	< 220 U	< 250 U	< 99 U	< 200 U	260 U	150 U	110	-
Fluorene	ug/kg	< 240 U	< 220 U	< 250 U	< 99 U	< 200 U	340	160	92	-
Phenanthrene	ug/kg	< 240 U	< 220 U	< 250 U	< 99 U	1400	1900	1200	740	-
Anthracene	ug/kg	< 240 U	< 220 U	< 250 U	< 99 U	470	1400	640	680	-
Fluoranthene	ug/kg	< 240 U	< 220 U	< 250 U	< 99 U	780	1900	2100	1800	-
Pyrene	ug/kg	< 240 U	< 220 U	530	< 99 U	2400	2000	3100	2000	-
Benz(a)anthracene	ug/kg	< 240 U	< 220 U	280	< 99 U	850	-	-	-	-
Chrysene	ug/kg	< 240 U	< 220 U	510	130	760	4000	1100	2600	-
Benzo(b)fluoranthene	ug/kg	< 240 U	< 220 U	700	160	470	2300	760	790	-
Benzo(k)fluoranthene	ug/kg	< 240 U	< 220 U	410	120	560	1700	1100	760	-
Benzo(a)pyrene	ug/kg	< 240 U	< 220 U	730	210	900	1600	1100	1200	-
Indeno(1,2,3-cd)pyrene	ug/kg	< 240 U	< 220 U	500	140	480	-	-	-	-
Dibenzo(a,h)anthracene	ug/kg	< 240 U	< 220 U	< 250 U	< 99 U	< 200 U	490	330	180	-
Benzo(g,h,i)perylene	ug/kg	< 240 U	< 220 U	690	190	560	630	470	750	-
Total HPAHs	mg/kg	< 1.2 U	< 1.1 U	4.6	1.148	7.86	-	-	-	-
Total LPAHs	mg/kg	< 0.72 U	< 0.66 U	< 0.75 U	< 0.297 U	2.43	-	-	-	-
Total PAHs	mg/kg	< 2.0 U	< 1.9 U	5.5	1.5	10.4	-	-	-	-
Total cPAHs TEQ (ND = 0)	mg/kg	< 0.24 U	< 0.22 U	0.924	0.253	1.14	-	-	-	-
Total cPAHs TEQ (ND = 0)	mg/kg-OC	< 5.0 U	< 1.0 U	18.1	9.38	8.17	-	-	-	-
Total cPAHs TEQ (ND = 1/2 RDL)	mg/kg	< 0.181 U	< 0.166 U	0.937	0.263	1.15	-	-	-	-
Total cPAHs TEQ (ND = 1/2)	mg/kg-OC	< 3.62 U	< 0.692 U	18.4	9.74	8.21	-	-	-	-
Total PAHs	ug/kg	< 2000 U	< 1900 U	5500	1500	10400	-	-	-	-
Total cPAHs TEQ (ND = 0)	ug/kg	< 240 U	< 220 U	824	253	1140	-	-	-	-

Table D-1 Analytical Results for Historical Surface Sediment Samples (0 to 10 cm)

Notes

1. Includes all applicable data that represents the most current surface sediment conditions post-2002 interim actions.
2. Results not detected above Reporting Limits are shown as < RL and U flagged.

Acronyms

- = Not available or not analyzed
cm = centimeters
cPAH = Carcinogenic polycyclic aromatic hydrocarbons
J = Analyte detected below reporting limit, reported value is an estimate
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
OC = organic carbon
PAHs = polycyclic aromatic hydrocarbons
TEQ = Toxic Equivalent
U = non detected values reported as the method detection limits

Table D-2 Analytical Results for RI Surface Sediment Samples (0 to 10 cm)

Analyte	SL	Basis for SL	Location ID	BM-SED-01	BM-SED-02	BM-SED-03	BM-SED-03-DUP	BM-SED-04	BM-SED-05	BM-SED-06	BM-SED-07	BM-SED-08	BM-SED-09	BM-SED-10
			Group	On-site	On-site	On-site	QA/QC	On-site	On-site	On-site	On-site	On-site	On-site	On-site
			Collection Date	8/26/2021	8/26/2021	8/26/2021	8/26/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021
			Sampled Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Grain Size in %														
Total Gravel	-	-		1.4	2.3	3.6	4.8	3.2	3.8	2.5	0.9	1.7	1.6	0.8
Total Sand	-	-		56.3	21.6	58.1	45.2	60.2	71.2	85.9	82.6	77.1	38	38.4
Total Silt	-	-		41.8	75.4	28.3	49.6	29.1	25	11.6	16.4	21	59.9	60.2
Total Clay	-	-		0.4	0.8	10	0.3	7.3	0.1	0.2	0.2	0.2	0.4	0.7
Total Fines	-	-		42.2	76.2	38.3	49.9	36.4	25.1	11.8	16.6	21.2	60.3	60.9
Conventionals in %														
Total Solids	-	-		22.9	13.96	29.04	27.46	43.44	33.38	54.54	48.98	49.2	23.21	25.1
Total Organic Carbon	13.5	Site Specific[b]		14.4	8.55	5.86	5.59	3.8	5.85	2.29	3.07	2.38	5.09	4.9
Wood Debris [dry][a]	50	Site Specific[b]		7.5 U	5 U	16	8	26	8	10	12	19	5	4
Wood Debris [wet][a]	50	Site Specific[b]		25	5 U	18	11	28	13	10	10	18	8	5
Metals in mg/kg														
Arsenic	11/24	Bioaccumulative SCO/CSL[c]		6.02	6.41	5.82	5.98	4.49	4.4	2.69	2.61	2.65	4.01	5.37
Lead	21	Bioaccumulative SCO[c]		20.1	18.7	19.2	18.8	14.7	15	6.49	6.55	8.75	12.5	14.6
Manganese	-	-		207	216	183 J	204	152	177	181	138	170	253	280
Selenium	2	90th % Lake WA Dataset[d]		1.41 J	1.2 U	0.87 J	0.83 J	0.41 U	0.56 J	0.32 U	0.35 U	0.35 U	0.72 U	0.69 U
Zinc	3200	Benthic SCO[e]		116	143	127 J	98.9	50.8	77.7	48.4	42.5	51.1	110	126
Polycyclic Aromatic Hydrocarbons in ug/kg														
Naphthalene	13,000,000	HH Tribal Clamming[f]		32.2	47.1	21.2	19.6	22.2	38.4	11.8	9.74	8.09	16.8 J	5.73
Acenaphthene	39,000,000	HH Tribal Clamming[f]		27.3	26.2 J	13.9	14.9	7.42	14.5	4.39 J	6.21	2.43 J	9.11 J	3.64 J
Acenaphthylene	-	-		19.3	24.2 J	6.6	8.08	10.1	13.4	4.16 J	3.9 J	3.9 J	7.95 J	3.33 J
Fluorene	26,000,000	HH Tribal Clamming[f]		24.1	29.3	10.5	14.5	8.99	18.5	5.23	6.69	3.71 J	14.3 J	4.64 J
Phenanthrene	-	-		164	135	64.6	71.8	53.6	90.6	24	33.2	21.9	60	33.3
Anthracene	200,000,000	HH Tribal Clamming[f]		72.8	64.3	13.7	14.4	21.2	25.1	7.95	6.64	6.3	22.6	7.96
Fluoranthene	26,000,000	HH Tribal Clamming[f]		279	211	77.4	80.8	108	148	50.4	52.3	41.9	146	88.9
Pyrene	20,000,000	HH Tribal Clamming[f]		398	298	97.4	77.5	102	125	39.6	44.1	52.6	124	78.1
Benz(a)anthracene	-	-		160	181	43.8	50.1	76.1	84.7	25.4	22.3	20.4	80.1	42.2
Chrysene	-	-		309	493	89.2	105	155	170	47.6	42.9	39.4	146	74
Benzo(b)fluoranthene	-	-		343	583	121	135	203	187	58	42.5	44.1	160	70.4
Benzo(k)fluoranthene	-	-		165	306	64.7	73.5	96.5	97.1	27.6	22	22.7	72.3	36.9
Benzo(j)fluoranthene	-	-		118	180	34.4	41	61.6	59.9	17.6	14.1	14.8	51.8	23.9
Total Benzofluoranthenes	-	-		559	932	194	218	351	331	102	77.5	80.5	287	125
Benzo(a)pyrene	200,000	HH Tribal Clamming[f]		291	485	108	121	208	195	62	44.3	46.1	143	69.1
Indeno(1,2,3-cd)pyrene	-	-		220	433	86.6	94.3	139	134	43.3	38.4	38.6	124	57.2
Dibenzo(a,h)anthracene	-	-		74.9	154	31.8	32.6	46.1	45.4	11.8	12	12.6	35.3	17
Benzo(g,h,i)perylene	-	-		279	543	112	117	200	195	64.6	58.5	58.3	177	88.6
Total cPAHs TEQ (ND = 1/2 RDL)[g]	-	-		402	674	147	165	272	258	81	60	62	197	95
Total cPAHs TEQ (ND = 0)[g]	21/210	Bioaccumulative SCO/CSL[c]		402	674	147	165	272	258	81	60	62	197	95
Total PAHs (ND=1/2 RDL)[h]	-	-		2977	3664	997	1071	1519	1642	505	460	438	1390	705
Total PAHs (ND=0)[n]	17,000	Benthic SCO[e]		2977	3650	997	1071	1519	1642	505	460	438	1390	705

Blue shaded bold text indicates exceedance of SCO
Red shaded bold text indicates exceedance of CSL

Table D-2 Analytical Results for RI Surface Sediment Samples (0 to 10 cm)

Analyte	SL	Basis for SL	Location ID	BM-SED-11	BM-SED-12	BM-SED-13	BM-SED-14	BM-SED-15	BM-SED-16	BM-SED-16	BM-SED-17	PER-SED-18	PER-SED-19	PER-SED-20	PER-SED-21
			Group	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	Perimeter	Perimeter	Perimeter	Perimeter
			Collection Date	8/26/2021	8/26/2021	8/26/2021	8/26/2021	8/26/2021	8/27/2021	21/7/2022	8/27/2021	8/24/2021	8/24/2021	8/24/2021	8/24/2021
			Sampled Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Grain Size in %															
Total Gravel	-	-		1.6	4.5	3.5	28.1	47.1	3.7	18.1	76.6	7.8	5.7	23.7	16
Total Sand	-	-		28.6	34.2	94.5	53.1	42.8	81.1	69.7	20	20.3	78.6	55.6	42.5
Total Silt	-	-		69.4	57.8	1.9	18.5	10.1	15.3	6	3.4	71	15	20	38.7
Total Clay	-	-		0.5	3.3	0.1	0.4	0.1	0.1	6.1	0.1	1.2	0.7	0.7	2.7
Total Fines	-	-		69.9	61.1	2	18.9	10.2	15.4	12.1	3.5	72.2	15.7	20.7	41.4
Conventionals in %															
Total Solids	-	-		19.61	23.12	60.3	19.08	25.49	55.52	49.59	88.29	16.14	25.1	25.45	26.6
Total Organic Carbon	13.5	Site Specific[b]		7.56	9.34	3.21 J	35.4	47.5	2.82	6.36	1.35	8.35	19.5	15.1	10.1
Wood Debris [dry][a]	50	Site Specific[b]		1	7	11	72.5	95	10	25	15	11	69	48	21
Wood Debris [wet][a]	50	Site Specific[b]		9	8	25	62.5	95	28	40	10	8	55	58	43
Metals in mg/kg															
Arsenic	11/24	Bioaccumulative SCO/CSL[c]		6.99	6.46	4.94 J	12	8.82	20.1	34.4 J+	4.63	9.21	9.09	6.96	8.77
Lead	21	Bioaccumulative SCO[c]		20.7	27.4	5.75	24.2	10.7	6.93	17.2	3.87	22.6	22.2	26	51.3
Manganese	-	-		247	237	165	299	165	179	231	174	296	324	216	281
Selenium	2	90th % Lake WA Dataset[d]		0.86 U	1.2 J	0.34 J	0.89 U	0.67 U	0.32 U	0.36 U	0.2 U	1.86 J	1.02 J	1.05 J	1.04 J
Zinc	3200	Benthic SCO[e]		139	129	71.1 J	117	93.2	61.5	134	36.6	192	119	122	111
Polycyclic Aromatic Hydrocarbons in ug/kg															
Naphthalene	13,000,000	HH Tribal Clamming[f]		21 J	23.8	11.3	32.4	43	-	120 J	-	50 J	46.3 J	36.9	10.3 J
Acenaphthene	39,000,000	HH Tribal Clamming[f]		11.3 J	11.5	14.2	16.1 J	66	-	192	-	28.2 J	32.5 J	24.3	5.12 J
Acenaphthylene	-	-		13.5 J	17.7	5.82	17.4 J	41.4	-	26.5 J	-	24.6 J	23.5 J	27.7	7.56 J
Fluorene	26,000,000	HH Tribal Clamming[f]		13 J	10.7	11.5	21.2 J	100	-	222	-	80.4 U	55 U	19.6	7.3 J
Phenanthrene	-	-		75.9	76.5	79	139	580	-	913 J	-	170	317	150	53.2 J
Anthracene	200,000,000	HH Tribal Clamming[f]		34.6	39.8	26.2	97.2	188	-	442 J	-	69.1 J	110	68.4	18 J
Fluoranthene	26,000,000	HH Tribal Clamming[f]		151	199	104 J	269	686	-	1140	-	323	338	321	96 J
Pyrene	20,000,000	HH Tribal Clamming[f]		227	223 J	103	263	527	-	939	-	488	587	520	145 J
Benz(a)anthracene	-	-		92.1	88	61	147	227	-	361	-	194	220	173	56.9 J
Chrysene	-	-		207	307	92.3	279	312	-	847 J	-	448	397	309	116 J
Benzo(b)fluoranthene	-	-		186	227	93.4	238	297	-	354	-	445	442	351	146 J
Benzo(k)fluoranthene	-	-		100	120	47.7	129	152	-	187	-	223	217	182	74.7 J
Benzo(j)fluoranthene	-	-		65.9	75.9	36.1	94	117	-	186	-	142	154	125	45.6 J
Total Benzofluoranthenes	-	-		314	373	156	414	501	-	721	-	715	723	582	233 J
Benzo(a)pyrene	200,000	HH Tribal Clamming[f]		145	213	97.2	224	245	-	318	-	357	450	317	133 J
Indeno(1,2,3-cd)pyrene	-	-		185	168	68.5 J	247	130	-	228	-	309	319	232	106 J
Dibenzo(a,h)anthracene	-	-		64.9	57.2	20.7	78.8	48.1	-	59.9	-	103	106	80.4	35.5 J
Benzo(g,h,i)perylene	-	-		242	201	81.7 J	305	144	-	282	-	373	386	285	139 J
Total cPAHs TEQ (ND = 1/2 RDL)[g]	-	-		216	290	131	320	345	-	445.5	-	503	600	434	181
Total cPAHs TEQ (ND = 0)[g]	21/210	Bioaccumulative SCO/CSL[c]		216	290	131	320	345	-	445.5	-	503	600	434	181
Total PAHs (ND=1/2 RDL)[h]	-	-		1605	2059	954	2293	3770	-	6,817	-	3787	4173	3222	1195
Total PAHs (ND=0)[n]	17,000	Benthic SCO[e]		1593	2059	954	2271	3760	-	6,817	-	3747	4145	3222	1195

Blue shaded bold text indicates exceedance of SCO
Red shaded bold text indicates exceedance of CSL

Table D-2 Analytical Results for RI Surface Sediment Samples (0 to 10 cm)

Analyte	SL	Basis for SL	Location ID	PER-SED-21-DUP	PER-SED-22	PER-SED-23	PER-SED-24	PER-SED-25	PER-SED-26	PER-SED-27	PER-SED-28	PER-SED-29	PER-SED-30	PER-SED-31	PER-SED-32
			Group	QA/QC	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter	Perimeter
			Collection Date	8/24/2021	8/24/2021	8/23/2021	8/23/2021	8/23/2021	8/23/2021	8/23/2021	8/23/2021	8/23/2021	8/24/2021	8/24/2021	8/24/2021
			Sampled Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Grain Size in %															
Total Gravel	-	-		16.5	4.7	23	0.2	0.8	0.5	--	--	--	--	--	--
Total Sand	-	-		39.4	29.5	17.9	25	29.6	38.1	--	--	--	--	--	--
Total Silt	-	-		43.4	62.6	53.6	70.5	65.7	59.3	--	--	--	--	--	--
Total Clay	-	-		0.7	3.2	5.6	4.3	4.1	2.1	--	--	--	--	--	--
Total Fines	-	-		44.1	65.8	59.2	74.8	69.8	61.4	--	--	--	--	--	--
Conventionals in %															
Total Solids	-	-		27.95	22.55	22.72	29.39	31.38	37.51	--	--	--	--	--	--
Total Organic Carbon	13.5	Site Specific[b]		8.79	11.1	9.89	4.3	4.88	4.17	--	--	--	--	--	--
Wood Debris [dry][a]	50	Site Specific[b]		53	8	21	6	7	4	4	28	25	7	64	64
Wood Debris [wet][a]	50	Site Specific[b]		33	15	35	13	15	5	5	23	48	25	--	65
Metals in mg/kg															
Arsenic	11/24	Bioaccumulative SCO/CSL[c]		8.57	7	6.52	5.82	5.59	4.17	--	--	--	--	--	--
Lead	21	Bioaccumulative SCO[c]		48.5	30.5	31.3	22.4	16.6	11.9	--	--	--	--	--	--
Manganese	-	-		265	377	289	383	339	308	--	--	--	--	--	--
Selenium	2	90th % Lake WA Dataset[d]		0.64 UJ	1.09 J	0.78 U	1.12 J	1.12 J	0.99 J	--	--	--	--	--	--
Zinc	3200	Benthic SCO[e]		109	111	129	120	101	103	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons in ug/kg															
Naphthalene	13,000,000	HH Tribal Clamming[f]		35.5 J	24.9	14.3 J	3.82 U	3.82 U	3.83 U	--	--	--	--	--	--
Acenaphthene	39,000,000	HH Tribal Clamming[f]		17.7 J	11.5 J	9.5 J	1.71 U	1.71 U	2.13 J	--	--	--	--	--	--
Acenaphthylene	-	-		18.6 J	21.9	14.3 J	3.25 U	3.25 U	3.25 U	--	--	--	--	--	--
Fluorene	26,000,000	HH Tribal Clamming[f]		17.2 UJ	20.5 U	18.8 U	15 U	15 U	15 U	--	--	--	--	--	--
Phenanthrene	-	-		108 J	80.5	59.4	25	20.3	39.6	--	--	--	--	--	--
Anthracene	200,000,000	HH Tribal Clamming[f]		44.8 J	43.4	30.1	5.31 J	5.3 J	7.55 J	--	--	--	--	--	--
Fluoranthene	26,000,000	HH Tribal Clamming[f]		182 J	208	134	55.4	34.6	67.1	--	--	--	--	--	--
Pyrene	20,000,000	HH Tribal Clamming[f]		262 J	335	251	108	62.8	106	--	--	--	--	--	--
Benz(a)anthracene	-	-		120 J	121	89	29.2	24.3	31.5	--	--	--	--	--	--
Chrysene	-	-		219 J	230	179	54	47.1	54.3	--	--	--	--	--	--
Benzo(b)fluoranthene	-	-		267 J	287	169	53.1	49.3	57.6	--	--	--	--	--	--
Benzo(k)fluoranthene	-	-		136 J	156	90.7	32.4	28.6	28.6	--	--	--	--	--	--
Benzo(j)fluoranthene	-	-		86.6 J	100	65.2	19.8	18.4	22	--	--	--	--	--	--
Total Benzofluoranthenes	-	-		425 J	479	299	93.6	85.6	96.4	--	--	--	--	--	--
Benzo(a)pyrene	200,000	HH Tribal Clamming[f]		234 J	256	154	42.5	45	44.4	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	-	-		200 J	213	142	44.8	45	39.6	--	--	--	--	--	--
Dibenzo(a,h)anthracene	-	-		68 J	74.7	53.8	13.8 J	15.9	13.2 J	--	--	--	--	--	--
Benzo(g,h,i)perylene	-	-		247 J	271	145	47.8	50.4	46.5	--	--	--	--	--	--
Total cPAHs TEQ (ND = 1/2 RDL)[g]	-	-		324	353	217	62	64	64	--	--	--	--	--	--
Total cPAHs TEQ (ND = 0)[g]	21/210	Bioaccumulative SCO/CSL[c]		324	353	217	62	64	64	--	--	--	--	--	--
Total PAHs (ND=1/2 RDL)[h]	-	-		2255	2444	1610	561	477	583	--	--	--	--	--	--
Total PAHs (ND=0)[n]	17,000	Benthic SCO[e]		2246	2434	1600	531	447	560	--	--	--	--	--	--

Blue shaded bold text indicates exceedance of SCO
Red shaded bold text indicates exceedance of CSL

Table D-2 Analytical Results for RI Surface Sediment Samples (0 to 10 cm)

Analyte	SL	Basis for SL	Location ID	PER-SED-33	NS-SED-34	NS-SED-35	NS-SED-36	NS01-C1	NS-01-SS	WD-01-SS	WD-02	AN-BM-3	AN-BM-4	AN-BM-5	AN-BM-8
			Group	Perimeter	Nearshore	Nearshore	Nearshore	Historical	Historical	Historical	Historical	Historical	Historical	Historical	Historical
			Collection Date	8/24/2021	8/27/2021	8/27/2021	8/27/2021	09/01/2009	09/01/2009	09/01/2009	09/01/2009	10/29/2002	10/29/2002	10/29/2002	10/29/2002
			Sampled Depth	0 - 10 cm	0-45	0-45	0-45	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Grain Size in %															
Total Gravel	-	-		--	88.6	85.7	96.6	-	-	-	-	-	-	-	-
Total Sand	-	-		--	8.1	11.9	1.4	-	-	-	-	-	-	-	-
Total Silt	-	-		--	2.7	1.9	1.7	-	-	-	-	-	-	-	-
Total Clay	-	-		--	0.5	0.6	0.5	-	-	-	-	-	-	-	-
Total Fines	-	-		--	3.2	2.5	2.2	-	-	-	-	-	-	-	-
Conventionals in %															
Total Solids	-	-		--	85	80.7	80.48	-	-	-	-	-	-	-	-
Total Organic Carbon	13.5	Site Specific[b]		--	0.39 J	0.16	0.14	-	-	-	-	15.3	16.8	10.1	13.8
Wood Debris [dry][a]	50	Site Specific[b]		19	-	-	-	-	-	15	-	60	60	20	35
Wood Debris [wet][a]	50	Site Specific[b]		14	-	-	-	-	-	-	-	-	-	-	-
Metals in mg/kg															
Arsenic	11/24	Bioaccumulative SCO/CSL[c]		--	4.3 J	6.6	3.21	7.4	< 20 U	< 8 U	3.2	-	-	-	-
Lead	21	Bioaccumulative SCO[c]		--	3	3.93	2.61	-	-	-	-	-	-	-	-
Manganese	-	-		--	313	370	170	-	-	-	-	-	-	-	-
Selenium	2	90th % Lake WA Dataset[d]		--	1.42 J	0.27 J	0.41 J	-	-	-	-	-	-	-	-
Zinc	3200	Benthic SCO[e]		--	67 J	223	25.5	-	-	-	-	158	166	145	155
Polycyclic Aromatic Hydrocarbons in ug/kg															
Naphthalene	13,000,000	HH Tribal Clamming[f]		--	122 J	1.46 J	1.64 J	-	-	-	-	-	-	-	-
Acenaphthene	39,000,000	HH Tribal Clamming[f]		--	37.9	0.57 U	0.79 J	-	-	-	-	-	-	-	-
Acenaphthylene	-	-		--	1.99 J	1.08 U	1.08 U	-	-	-	-	-	-	-	-
Fluorene	26,000,000	HH Tribal Clamming[f]		--	46.3	0.63 U	1.38 J	-	-	-	-	-	-	-	-
Phenanthrene	-	-		--	241 J	3.01 J	3.91 J	-	-	-	-	-	-	-	-
Anthracene	200,000,000	HH Tribal Clamming[f]		--	66.2	1 J	0.92 J	-	-	-	-	-	-	-	-
Fluoranthene	26,000,000	HH Tribal Clamming[f]		--	112 J	2.85 J	5.51	-	-	-	-	-	-	-	-
Pyrene	20,000,000	HH Tribal Clamming[f]		--	188 J	2.73 J	4.97 J	-	-	-	-	-	-	-	-
Benz(a)anthracene	-	-		--	103	1.84 J	2.61 J	-	-	-	-	-	-	-	-
Chrysene	-	-		--	164 J	4.12 J	5.37	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	-	-		--	54.8	3.62 J	6.47	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	-	-		--	29.4	1.87 J	3.02 J	-	-	-	-	-	-	-	-
Benzo(j)fluoranthene	-	-		--	30.3	1.26 J	2.11 J	-	-	-	-	-	-	-	-
Total Benzofluoranthenes	-	-		--	113	7.09 J	12.2	-	-	-	-	-	-	-	-
Benzo(a)pyrene	200,000	HH Tribal Clamming[f]		--	125	2.83 J	4.89 J	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	-	-		--	50.6	3.08 J	4.81 J	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	-	-		--	19.6	1.61 J	1.48 J	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	-	-		--	76.5	4.45 J	7.48	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 1/2 RDL)[g]	-	-		--	155	4	7	-	-	-	-	-	-	-	-
Total cPAHs TEQ (ND = 0)[g]	21/210	Bioaccumulative SCO/CSL[c]		--	155	4	7	-	-	-	-	-	-	-	-
Total PAHs (ND=1/2 RDL)[h]	-	-		--	1469	43	60	-	-	-	-	-	-	-	-
Total PAHs (ND=0)[n]	17,000	Benthic SCO[e]		--	1469	36	57	-	-	-	-	-	-	-	-

Blue shaded bold text indicates exceedance of SCO
Red shaded bold text indicates exceedance of CSL

Table D-2 Analytical Results for RI Surface Sediment Samples (0 to 10 cm)

Analyte	SL	Basis for SL	Location ID: AN-BM-18 Group: Historical Collection Date: 10/29/2002 Sampled Depth: 0 - 10 cm	BA-4 Historical 8/31/1999 0 - 10 cm	WD-04-SS Historical 6/17/2009 0 - 10 cm	VS-35 Historical 2/3/1997 0 - 10 cm	s-103 Historical 11/13/1996 0 - 10 cm	s-112 Historical 11/14/1996 0 - 10 cm	EXP_S9 Historical 0 - 10 cm
Grain Size in %									
Total Gravel	-	-	-	-	-	-	-	-	-
Total Sand	-	-	-	-	-	-	-	-	-
Total Silt	-	-	-	-	-	-	-	-	-
Total Clay	-	-	-	-	-	-	-	-	-
Total Fines	-	-	-	-	-	-	-	-	-
Conventionals in %									
Total Solids	-	-	-	-	-	-	-	-	-
Total Organic Carbon	13.5	Site Specific[b]	12.4	-	15.6	22	14	9.1	17.7
Wood Debris [dry][a]	50	Site Specific[b]	25	-	75	-	-	-	-
Wood Debris [wet][a]	50	Site Specific[b]	-	-	-	-	-	-	-
Metals in mg/kg									
Arsenic	11/24	Bioaccumulative SCO/CSL[c]	-	< 10 U	-	-	-	-	-
Lead	21	Bioaccumulative SCO[c]	-	8	-	-	-	-	-
Manganese	-	-	-	< 10 U	-	-	-	-	-
Selenium	2	90th % Lake WA Dataset[d]	-	-	-	-	-	-	-
Zinc	3200	Benthic SCO[e]	88.1	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons in ug/kg									
Naphthalene	13,000,000	HH Tribal Clamming[f]	-	< 280 U	-	390	150	51	-
Acenaphthene	39,000,000	HH Tribal Clamming[f]	-	< 280 U	-	260	150	70	-
Acenaphthylene	-	-	-	< 280 U	-	260	150	140	-
Fluorene	26,000,000	HH Tribal Clamming[f]	-	< 280 U	-	340	160	80	-
Phenanthrene	-	-	-	< 280 U	-	1900	1200	800	-
Anthracene	200,000,000	HH Tribal Clamming[f]	-	< 280 U	-	1400	640	500	-
Fluoranthene	26,000,000	HH Tribal Clamming[f]	-	< 280 U	-	1900	2100	2300	-
Pyrene	20,000,000	HH Tribal Clamming[f]	-	< 280 U	-	2000	3100	2200	-
Benz(a)anthracene	-	-	-	< 280 U	-	-	-	-	-
Chrysene	-	-	-	< 280 U	-	4000	1100	1400	-
Benzo(b)fluoranthene	-	-	-	< 280 U	-	2300	760	650	-
Benzo(k)fluoranthene	-	-	-	290	-	1700	1100	270	-
Benzo(j)fluoranthene	-	-	-	< 280 U	-	-	-	-	-
Total Benzofluoranthenes	-	-	-	< 280 U	-	-	-	-	-
Benzo(a)pyrene	200,000	HH Tribal Clamming[f]	-	< 280 U	-	1600	1100	1000	-
Indeno(1,2,3-cd)pyrene	-	-	-	2.53	-	-	-	-	-
Dibenzo(a,h)anthracene	-	-	-	< 0.28 U	-	490	330	130	-
Benzo(g,h,i)perylene	-	-	-	< 0.211 U	-	630	470	600	-
Total cPAHs TEQ (ND = 1/2 RDL)[g]	-	-	-		-	-	-	-	-
Total cPAHs TEQ (ND = 0)[g]	21/210	Bioaccumulative SCO/CSL[c]	-	-	-	-	-	-	-
Total PAHs (ND=1/2 RDL)[h]	-	-	-	-	-	-	-	-	-
Total PAHs (ND=0)[n]	17,000	Benthic SCO[e]	-	-	-	-	-	-	-

Blue shaded bold text indicates exceedance of SCO
Red shaded bold text indicates exceedance of CSL

Table D-2 Analytical Results for RI Surface Sediment Samples (0 to 10 cm)

Footnotes

a. Dry wood debris represents field visual estimate obtained evaluating sediment samples as collected. Wet estimates obtained by adding 8 fluid ounces of water.
b. Site Specific SLs are the 2002 cleanup levels as confirmed by Ecology via email on April 17, 2020.
c. Bioaccumulative SCO are based on Natural Background from Table 10-1 of SCUM (Ecology, 2021). Bioaccumulative CSL are based on regional background of 24 mg/kg for arsenic adn 210 ug/kg for cPAH TEQ.
d. Value reported for Selenium represents the 90th percentile for the lake Washington dataset as described in Appendix I.
e. Benthic SCO from Table 8-1 SCUM (Ecology, 2019).
f. Human Health values are from Table 9-3 of SCUM (Ecology, 2019) or estimated using the Appendix K Workbook (Ecology, 2020).
g. cPAHs include: Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor (Ecology, 2019) by the detected concentration.
h. Total PAHs include: Naphthalene, Acenaphthene, Acenaphthylene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perilene.
i. Screening levels applicable to nearshore surface sediment samples includes human health beach play values which are 4.8mg/kg for arsenic adn 21 ug/kg for cPAH TEQ.

Acronyms

- = Not available or not analyzed
-- = Archived
BM = Barbee Mill
cm = centimeters
cPAH = Carcinogenic polycyclic aromatic hydrocarbons
HH = Human Health
J = Analyte detected below reporting limit, reported value is an estimate
ug/L = micrograms per liter
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
NS = nearshore
PAHs = polycyclic aromatic hydrocarbons
PER = perimeter
PQL = Practical Quantification Limit
PW = porewater
SCO = Sediment Cleanup Objectives
SED = Sediment
SL = Screening Level
TEQ = Toxic Equivalent
U = non detected values reported as the method detection limits

Table D-3 Analytical Results for Historical Subsurface Sediment Samples

Analyte	Unit	Location ID	B-01	B-01	B-01	B-02	B-02	B-03	B-03	B-03	B-04	B-04	B-04	B-05	B-05
		Sample ID	B01-12.0-13.0	B01-19.0-20.0	B01-23.0-24.0	B02-21.0-22.0	B02-26.0-27.0	B03-8.0-9.0	B03-21.0-23.0	B03-25.0-26.0	B04-18.0-19.0	B04-20.0-21.0	B04-24.0-25.0	B05-16.0-17.0	B05-21.0-22.0
		Collection Date	09/14/2018	09/14/2018	09/14/2018	09/13/2018	09/13/2018	09/13/2018	09/13/2018	09/13/2018	09/12/2018	09/12/2018	09/12/2018	09/12/2018	09/12/2018
		Sampled Depth	12 - 13 ft	19 - 20 ft	23 - 24 ft	21 - 22 ft	26 - 27 ft	8 - 9 ft	21 - 23 ft	25 - 26 ft	18 - 19 ft	20 - 21 ft	24 - 25 ft	16 - 17 ft	21 - 22 ft
Conventionals in %															
Total Solids	%		--	--	--	--	--	--	--	--	--	--	--	--	--
Total Organic Carbon	%		--	--	--	--	--	--	--	--	--	--	--	--	--
Wood Waste	%		--	--	--	--	--	--	--	--	--	--	--	--	--
Metals in mg/kg															
Arsenic	mg/kg		3.9	2.7	1.3	1.8	1.2	2.3	1.8	1.6	3.2	5.1	1.7	4.3	1.5
Lead	mg/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	mg/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons in ug/kg															
Naphthalene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Total HPAHs	mg/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Total LPAHs	mg/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Total PAHs	mg/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Total cPAHs TEQ (ND = 0)	mg/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Total cPAHs TEQ (ND = 0)	mg/kg-OC		--	--	--	--	--	--	--	--	--	--	--	--	--
Total cPAHs TEQ (ND = 1/2 RDL)	mg/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Total cPAHs TEQ (ND = 1/2)	mg/kg-OC		--	--	--	--	--	--	--	--	--	--	--	--	--
Total PAHs	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--
Total cPAHs TEQ (ND = 0)	ug/kg		--	--	--	--	--	--	--	--	--	--	--	--	--

Table D-3 Analytical Results for Historical Subsurface Sediment Samples

Analyte	Unit	Location ID: B-05 Sample ID: B05-26.0-26.5 Collection Date: 09/12/2018 Sampled Depth: 26 - 26.5 ft	VB-1 VB-1-35-65 01/24/1997 35 - 65 cm	VB-2 VB-2_35454 01/24/1997 10 - 19 cm	VB-3 VB-3_35454 01/24/1997 9 - 39 cm	VB-4 VB-4-10-20 01/24/1997 10 - 20 cm
Conventionals in %						
Total Solids	%	--	49.6	43.3	55.1	69.2
Total Organic Carbon	%	--	3.4	3.7	5	1.3
Wood Waste	%	--	--	--	--	--
Metals in mg/kg						
Arsenic	mg/kg	1	< 10 U	< 10 U	< 10 U	< 8.0 U
Lead	mg/kg	--	16	23	12	8
Selenium	mg/kg	--	< 10 U	< 10 U	< 10 U	< 8.0 U
Zinc	mg/kg	--	57.4	70.2	52	111
Polycyclic Aromatic Hydrocarbons in ug/kg						
Naphthalene	ug/kg	--	< 140 U	< 160 U	< 160 U	< 97 U
Acenaphthene	ug/kg	--	< 140 U	< 160 U	< 160 U	< 97 U
Acenaphthylene	ug/kg	--	< 140 U	< 160 U	< 160 U	< 97 U
Fluorene	ug/kg	--	< 140 U	< 160 U	< 160 U	< 97 U
Phenanthrene	ug/kg	--	600	< 160 U	200	< 97 U
Anthracene	ug/kg	--	< 140 U	< 160 U	< 160 U	< 97 U
Fluoranthene	ug/kg	--	290	< 160 U	160	< 97 U
Pyrene	ug/kg	--	440	230	510	120
Benz(a)anthracene	ug/kg	--	< 140 U	< 160 U	< 160 U	< 97 U
Chrysene	ug/kg	--	< 140 U	160	< 160 U	< 97 U
Benzo(b)fluoranthene	ug/kg	--	< 140 U	170	< 160 U	< 97 U
Benzo(k)fluoranthene	ug/kg	--	< 140 U	< 160 U	< 160 U	< 97 U
Benzo(a)pyrene	ug/kg	--	< 140 U	230	< 160 U	130
Indeno(1,2,3-cd)pyrene	ug/kg	--	< 140 U	180	< 160 U	< 97 U
Dibenzo(a,h)anthracene	ug/kg	--	< 140 U	< 160 U	< 160 U	< 97 U
Benzo(g,h,i)perylene	ug/kg	--	< 140 U	220	< 160 U	110
Total HPAHs	mg/kg	--	1.29	1.51	1.31	0.6995
Total LPAHs	mg/kg	--	0.95	< 0.48 U	0.6	< 0.291 U
Total PAHs	mg/kg	--	2	2	2	1
Total cPAHs TEQ (ND = 0)	mg/kg	--	< 0.14 U	0	< 0.16 U	0.13
Total cPAHs TEQ (ND = 0)	mg/kg-OC	--	< 4.0 U	7	< 3.0 U	10
Total cPAHs TEQ (ND = 1/2 RDL)	mg/kg	--	< 0.106 U	0	< 0.121 U	0.155
Total cPAHs TEQ (ND = 1/2)	mg/kg-OC	--	< 3.12 U	8	< 2.42 U	11.9
Total PAHs	ug/kg	--				
Total cPAHs TEQ (ND = 0)	ug/kg	--				

Table D-3 Analytical Results for Historical Subsurface Sediment Samples

Notes
1. Includes all applicable data that represents the most current surface sediment conditions post-2002 interim actions.
2. Results not detected above Reporting Limits are shown as < RL and U flagged.

Acronyms
- = Not available or not analyzed
cm = centimeters
cPAH = Carcinogenic polycyclic aromatic hydrocarbons
ft = feet
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = Non Detected
OC = organic carbon
PAHs = polycyclic aromatic hydrocarbons
TEQ = Toxic Equivalent
U = non detected values reported as the method detection limits

Table D-4 Analytical Results for RI Porewater Samples (0 to 10 cm)

Sample ID	BM-PW-16	BM-PW-17
Group	Porewater	Porewater
Depth Interval (cm)	0-10	0-10
Northing	1301602	1301484
Easting	196900	196423
Collection Date	8/27/2021	8/27/2021
Analyte		
Metals in µg/L		
Arsenic	4	2
Iron	--	--
Manganese	65	12

Acronyms

-- = Not available or no analyzed

BM = Barbee Mill

bss = below sediment surface

cm = centimeters

ug/L = micrograms per liter

PW = porewater

SL = Screening Level

APPENDIX E

Terrestrial Ecological Evaluation

Barbee Mill Terrestrial Ecological Evaluation

The purpose of a Terrestrial Ecological Evaluation (TEE) is to assess the potential risk to terrestrial plants and/or animals that live entirely or primarily on affected land. Sites may qualify for an exclusion from the TEE process under WAC 173-340-7491(1) if any of the following conditions are met:

1. All soil contaminated with hazardous substances is, or will be located below the standard point of compliance (15 feet bgs); or
2. All soil contaminated with hazardous substances is,or will be located below an approved conditional point of compliance (6 feet bgs, or alternative depth if approved by Ecology). Note: for this to be acceptable, an institutional control needs to be written in as a deed restriction on the property preventing excavation of soils below 6 feet (bgs). The purpose of this institutional control is to prevent contaminated soils from reaching the surface; or
3. All soil contaminated with hazardous substances is, or will be covered by buildings, paved roads, or other physical barriers that will prevent plants or wildlife from being exposed to the soil contamination. Note: for this to be acceptable, an institutional control shall be required by the department under WACC 173-340-440. An exclusion based on planned future land use shall include a completion date for such future development that is acceptable to the department; or
4. For sites contaminated with any of the hazardous substances listed in WAC 173-340-7491(1)(c)(ii), there is less than ¼ acre of contiguous undeveloped area on or within 500 feet of the site; or
5. For sites with hazardous substances (other than those listed in WAC 173-340-7491(1)(c)(ii), there is less than 1.5 acres of contiguous undeveloped land on or within 500 feet of the site.

The Barbee Mill site qualifies for a TEE exclusion because conditions for #2 and #3 are met, as described below:

- All contaminated soil associated with the Site is present on the Barbee Mill property.[1]
- Much of the Barbee Mill property, including the area in and around the soil interim action actions, was covered with approximately 4 to 8 feet of clean fill during redevelopment in 2007. All contaminated soil at the site is greater than 6 feet below the current grade.
- An environmental covenant was placed on the property. Because the interim action removed soil exceeding direct contact-based screening levels (adjusted for background) above 15 feet in depth, the covenant includes conditions preventing subsurface disturbances of: 1) the passive attenuation zone; 2) soil beneath the vertical extent of the 2005 arsenic excavation (approximately 18 feet or more below current grade); and 3) Site soil located below the historical high groundwater elevation of 19 to 23 feet NAVD88.
- In addition to the 4 to 8 feet of clean fill, the 2007 site redevelopment covered the area of contaminated soil with roads, sidewalks, utilities, buildings, and limited areas of landscaping and plantings that prevent wildlife or plants from being exposed to contaminated soil.

Therefore, no further evaluation of the terrestrial ecological pathway is required.

[1] Arsenic-contaminated groundwater is located on the adjacent Quendall Terminals Property; however, arsenic concentrations in soil within the footprint of the arsenic plume on Quendall Terminals do not exceed the MTCA Method A cleanup level for unrestricted use of 20 mg/kg.

APPENDIX F

Preliminary Cleanup Levels (PCUL) Workbook for Freshwater Sites (Ecology, 2022)

PCUL Workbook - Soil Summary for Freshwater Sites

Sort Order	Chemical (all concentrations are in mg/kg)	Most Stringent Soil PCUL Vadose Zone Potable GW SL #s 1-4, 8-10	Most Stringent Soil PCUL Saturated Zone Potable GW SL #s 1, 5-10	Most Stringent Soil PCUL Vadose Zone Nonpotable GW SL #s 1, 3, 4, 8-10	Most Stringent Soil PCUL Saturated Zone Nonpotable GW SL #s 1, 6-10	User-Defined Soil PCUL Specify SL #s	SL-1 Direct Contact SL-Det	SL-2 Protect Drinking Water Vadose Zone LeachFW	SL-3 Protect Surface Water via Ground Water Vadose Zone LeachFW	SL-4 Protect Sediment via Ground Water Vadose Zone LeachFW	SL-5 Protect Drinking Water Saturated Zone LeachFW	SL-6 Protect Surface Water via Ground Water Saturated Zone LeachFW	SL-7 Protect Sediment via Ground Water Saturated Zone LeachFW	SL-8 Protect Sediment via Erosion SMS Lower Tier SedFW	SL-9 Site-Specific TEE Unrest. Land Use SL-Det	SL-10 Natural Background Ecology (1994)
1	***PCBs***															
2	Total PCB Aroclors	1.1E-05	5.5E-07	1.1E-05	5.5E-07		1.0E+00	3.4E-01	1.1E-05	4.8E-02	1.7E-02	5.5E-07	2.4E-03	1.2E-02	6.5E-01	na
3	Total PCB congeners	1.1E-05	5.5E-07	1.1E-05	5.5E-07		1.0E+00	3.4E-01	1.1E-05	1.4E-02	1.7E-02	5.5E-07	7.0E-04	3.5E-03	6.5E-01	na
4	Total PCB TEQ	6.9E-09	3.5E-10	6.9E-09	3.5E-10		1.3E-05	5.3E-07	6.9E-09	2.8E-06	2.6E-08	3.5E-10	1.4E-07	7.0E-07	na	na
5	***Dioxins/Furans***															
6	Total dioxin/furan TEQ	5.2E-06	5.2E-06	5.2E-06	5.2E-06		1.3E-05	1.7E-06	1.4E-08	2.0E-05	8.4E-08	6.9E-10	1.0E-06	5.0E-06	na	5.2E-06
7	2,3,7,8-TCDD	5.2E-06	5.2E-06	5.2E-06	5.2E-06		1.3E-05	1.7E-05	2.5E-08	TBD	8.4E-07	1.2E-09	TBD	PQL	na	5.2E-06
8	Total chlorinated dioxins	na	na	2.0E-06	2.0E-06		na	na	na	TBD	na	na	TBD	PQL	2.0E-06	na
9	Total chlorinated furans	na	na	2.0E-06	2.0E-06		na	na	na	TBD	na	na	TBD	PQL	2.0E-06	na
10	***Inorganics***															
11	Cyanide, free	5.0E+01	5.0E+01	5.0E+01	5.0E+01		5.0E+01	na	na	na	na	na	na	4.2E+02	na	na
12	Nitrate	1.3E+05	1.3E+05	1.3E+05	1.3E+05		1.3E+05	na	na	na	na	na	na	1.1E+06	na	na
13	Nitrite	8.0E+03	8.0E+03	8.0E+03	8.0E+03		8.0E+03	na	na	na	na	na	na	6.7E+04	na	na
14	Sulfate	na	na	na	na		na	na	na	na	na	na	na	na	na	na
15	Sulfide	na	na	3.9E+01	3.9E+01		na	na	na	na	na	na	na	3.9E+01	na	na
16	***Metals***															
17	Aluminum	3.3E+04	3.3E+04	3.3E+04	3.3E+04		8.0E+04	4.8E+05	2.6E+03	1.3E+07	2.4E+04	1.3E+02	6.7E+05	6.7E+05	5.0E+01	3.3E+04
18	Antimony	5.1E+00	2.5E-01	5.0E+00	2.5E-01		3.2E+01	5.4E+00	5.1E+00	5.3E+03	2.7E-01	2.5E-01	2.7E+02	2.7E+02	5.0E+00	na
19	Arsenic	7.3E+00	7.3E+00	7.3E+00	7.3E+00		6.7E-01	3.4E-01	1.1E-02	2.2E+02	1.7E-02	5.3E-04	1.1E+01	1.1E+01	7.0E+00	7.3E+00
20	Barium	8.2E+02	4.1E+01	1.0E+02	4.1E+01		1.6E+04	1.6E+03	8.2E+02	2.7E+06	8.3E+01	4.1E+01	1.3E+05	1.3E+05	1.0E+02	na
21	Beryllium	6.3E+01	3.2E+00	1.0E+01	1.0E+01		1.6E+02	6.3E+01	1.2E+03	2.7E+04	3.2E+00	6.0E+01	1.3E+03	1.3E+03	1.0E+01	6.1E-01
22	Cadmium	7.7E-01	7.7E-01	7.7E-01	7.7E-01		8.0E+01	6.9E-01	9.9E-02	1.6E+01	3.5E-02	5.0E-03	8.0E-01	8.0E-01	4.0E+00	7.7E-01
23	Chromium, total	na	na	4.8E+01	4.8E+01		na	na	na	na	na	na	na	7.2E+01	4.2E+01	4.8E+01
24	Chromium, trivalent	1.5E+03	7.4E+01	1.5E+03	7.4E+01		1.2E+05	4.8E+05	1.5E+03	2.0E+07	2.4E+04	7.4E+01	1.0E+06	1.0E+06	na	na
25	Chromium, hexavalent	1.8E-02	8.9E-04	1.4E-01	6.9E-03		3.8E-01	1.8E-02	1.4E-01	TBD	8.9E-04	6.9E-03	TBD	PQL	na	na
26	Cobalt	4.3E+00	2.2E-01	2.0E+01	2.0E+01		2.4E+01	4.3E+00	na	4.0E+03	2.2E-01	na	2.0E+02	2.0E+02	2.0E+01	na
27	Copper	3.6E+01	3.6E+01	3.6E+01	3.6E+01		3.2E+03	2.8E+02	5.0E+00	8.0E+03	1.4E+01	2.5E-01	4.0E+02	4.0E+02	5.0E+01	3.6E+01
28	Iron	3.6E+04	3.6E+04	3.6E+04	3.6E+04		5.6E+04	1.5E+02	5.0E+02	9.3E+06	7.6E+00	2.5E+01	4.7E+05	4.7E+05	na	3.6E+04
29	Lead	2.5E+02	2.1E+01	2.1E+01	2.1E+01		2.5E+02	3.0E+03	5.0E+02	4.2E+02	1.5E+02	2.5E+01	2.1E+01	2.1E+01	5.0E+01	1.7E+01
30	Manganese	1.1E+03	1.1E+03	1.1E+03	1.1E+03		3.7E+03	6.5E+01	6.5E+01	6.1E+05	3.3E+00	3.3E+00	3.1E+04	3.1E+04	1.1E+03	1.1E+03
31	Mercury, inorganic	7.0E-02	7.0E-02	7.0E-02	7.0E-02		na	2.1E+00	1.3E-02	4.0E+00	1.0E-01	6.3E-04	2.0E-01	2.0E-01	1.0E-01	7.0E-02
32	Methylmercury	8.0E+00	5.4E+00	4.0E-01	4.0E-01		8.0E+00	2.2E+02	1.1E+02	TBD	1.1E+01	5.4E+00	TBD	PQL	4.0E-01	na
33	Molybdenum	3.2E+01	1.6E+00	2.0E+00	2.0E+00		4.0E+02	3.2E+01	na	6.6E+04	1.6E+00	na	3.3E+03	3.3E+03	2.0E+00	na
34	Nickel	6.8E+01	3.8E+01	3.8E+01	3.8E+01		1.6E+03	1.3E+02	6.8E+01	1.0E+03	6.5E+00	3.4E+00	5.0E+01	5.0E+01	3.0E+01	3.8E+01
35	Selenium	5.2E-01	2.6E-02	1.0E-01	2.6E-02		4.0E+02	5.2E+00	5.2E-01	2.0E+00	2.6E-01	2.6E-02	1.0E-01	1.0E-01	3.0E-01	na
36	Silver	5.5E-01	2.8E-02	5.5E-01	2.8E-02		4.0E+02	1.4E+01	5.5E-01	1.1E+01	6.9E-01	2.8E-02	5.7E-01	5.7E-01	2.0E+00	na
37	Thallium	8.8E-02	4.4E-03	8.8E-02	4.4E-03		8.0E-01	2.3E-01	8.8E-02	1.3E+02	1.1E-02	4.4E-03	6.7E+00	6.7E+00	1.0E+00	na
38	Tin	4.8E+04	2.4E+03	5.0E+01	5.0E+01		4.8E+04	4.8E+04	na	8.0E+06	2.4E+03	na	4.0E+05	4.0E+05	5.0E+01	na
39	Vanadium	7.2E+02	1.4E+02	2.0E+00	2.0E+00		7.2E+02	2.9E+03	na	1.2E+05	1.4E+02	na	6.0E+03	6.0E+03	2.0E+00	na
40	Zinc	1.3E+02	8.5E+01	8.6E+01	8.5E+01		2.4E+04	6.0E+03	1.3E+02	6.4E+04	3.0E+02	6.5E+00	3.2E+03	3.2E+03	8.6E+01	8.5E+01
41	***Metals - Butyltins***															
42	Monobutyltin	na	na	5.4E-01	5.4E-01		na	na	na	na	na	na	na	5.4E-01	na	na
43	Dibutyltin	na	na	9.1E-01	9.1E-01		na	na	na	na	na	na	na	9.1E-01	na	na
44	Tributyltin oxide	8.4E-03	4.2E-04	2.1E-03	4.2E-04		2.4E+01	2.5E+03	3.7E+01	8.4E-03	1.2E+02	1.9E+00	4.2E-04	2.1E-03	na	na
45	Tetrabutyltin	na	na	9.7E-02	9.7E-02		na	na	na	na	na	na	na	9.7E-02	na	na
46	***SVOCs - PAHs***															
47	Acenaphthene	3.1E+00	1.6E-01	3.1E+00	1.6E-01		4.8E+03	4.9E+01	3.1E+00	2.2E+04	2.5E+00	1.6E-01	1.1E+03	5.4E+03	2.0E+01	na
48	Acenaphthylene	na	na	na	na		na	na	na	na	na	na	na	na	na	na
49	Anthracene	4.7E+01	2.4E+00	4.7E+01	2.4E+00		2.4E+04	1.1E+03	4.7E+01	1.1E+05	5.7E+01	2.4E+00	5.4E+03	2.7E+04	na	na
50	Benzo(a)anthracene	na	na	na	na		na	na	na	na	na	na	na	na	na	na
51	Benzo(b)fluoranthene	na	na	na	na		na	na	na	na	na	na	na	na	na	na
52	Benzo(k)fluoranthene	na	na	na	na		na	na	na	na	na	na	na	na	na	na
53	Total benzofluoranthenes	na	na	1.2E-02	1.2E-02		na	na	na	na	na	na	na	1.2E-02	na	na
54	Benzo(g,h,i)perylene	na	na	5.0E-03	5.0E-03		na	na	na	na	na	na	na	5.0E-03	na	na
55	Benzo(a)pyrene	3.1E-04	1.6E-05	3.1E-04	1.6E-05		1.9E-01	3.9E+00	3.1E-04	3.6E-02	1.9E-01	1.6E-05	1.8E-03	9.0E-03	1.2E+01	na
56	Chrysene	na	na	na	na		na	na	na	na	na	na	na	na	na	na
57	Dibenz(a,h)anthracene	na	na	na	na		na	na	na	na	na	na	na	na	na	na
58	Dibenzofuran	8.1E-01	4.1E-02	2.0E-01	4.1E-02		8.0E+01	1.5E+00	na	8.1E-01	7.6E-02	na	4.1E-02	2.0E-01	na	na
59	Fluoranthene	2.0E-02	1.0E-03	5.0E-03	1.0E-03		3.2E+03	6.3E+02	5.9E+00	2.0E-02	3.2E+01	3.0E-01	1.0E-03	5.0E-03	na	na
60	Fluorene	1.6E+00	8.0E-02	1.6E+00	8.0E-02		3.2E+03	5.1E+01	1.6E+00	1.5E+04	2.6E+00	8.0E-02	7.4E+02	3.6E+03	3.0E+01	na
61	Indeno(1,2,3-cd)pyrene	na	na	na	na		na	na	na	na	na	na	na	na	na	na
62	Methyl isopropyl phenanthrene	na	na	na	na		na	na	na	na	na	na	na	na	na	na
63	1-Methylnaphthalene	8.2E-02	4.2E-03	1.7E+01	3.7E+00		3.4E+01	8.2E-02	na	7.1E+01	4.2E-03	na	3.7E+00	1.7E+01	na	na
64	2-Methylnaphthalene	1.7E+00	8.9E-02	3.2E+02	7.8E+01		3.2E+02	1.7E+00	na	1.5E+03	8.9E-02	na	7.8E+01	3.6E+02	na	na
65	Naphthalene	4.5E+00	2.4E-01	3.8E+01	2.0E+00		1.6E+03	4.5E+00	3.8E+01	8.0E+03	2.4E-01	2.0E+00	4.2E+02	1.8E+03	na	na
66	Phenanthrene	na	na	na	na		na	na	na	na	na	na	na	na	na	na
67	Pyrene	2.0E-02	1.0E-03	5.0E-03	1.0E-03		2.4E+03	3.3E+02	1.1E+01	2.0E-02	1.6E+01	5.5E-01	1.0E-03	5.0E-03	na	na
68	Total LPAHs	na	na	na	na		na	na	na	na	na	na	na	na	na	na
69	Total HPAHs	na	na	na	na		na	na	na	na	na	na	na	na	na	na
70	Total PAHs	na	na	1.7E+01	1.7E+01		na	na	na	na	na	na	na	1.7E+01	na	na
71	Total cPAH TEQ	8.4E-02	4.2E-03	2.1E-02	4.2E-03		1.9E-01	4.5E-01	1.9E-01	8.4E-02	2.2E-02	9.4E-03	4.2E-03	2.1E-02	na	na
72	***Other SVOCs***															
73	Aniline	8.3E-02	5.5E-03	1.0E+02	5.8E+01		1.8E+02	8.3E-02	na	8.8E+02	5.5E-03	na	5.8E+01	1.0E+02	na	na
74	Azobenzene	9.1E+00	9.1E+00	5.4E+00	5.4E+00		9.1E+00	na	na	na	na	na	na	5.4E+00	na	na
75	Benzidine	5.6E-07	3.0E-08	5.6E-07	3.0E-08		8.2E-04	2.8E-06	5.6E-07	2.8E-03	1.5E-07	3.0E-08	1.5E-04	6.4E-04	na	na
76	Benzoic acid	4.0E+01	2.9E+00	2.9E+00	2.9E+00		3.2E+05	2.6E+02	na	4.0E+01	1.8E+01	na	2.9E+00	2.9E+00	na	na
77	Benzyl alcohol	7.1E+00	4.9E-01	8.0E+03	8.0E+03		8.0E+03	7.1E+00	na	1.3E+05	4.9E-01	na	8.7E+03	1.1E+04	na	na
78	Bis(2-chloroethoxy)methane	2.1E-01	1.4E-02	2.4E+02	2.4E+02		2.4E+02	2.1E-01	na	4.0E+03	1.4E-02	na	2.8E+02	3.3E+02	na	na
79	Bis(2-chloroethyl)ether	1.1E-04	7.3E-06	1.1E-04	7.3E-06		9.1E-01	2.2E-04	1.1E-04	1.7E+01	1.4E-05	7.3E-06	1.1E+00	2.1E+00	na	na
80	Bis(chloromethyl)ether	4.5E-03	4.5E-03	2.7E-03	2.7E-03		4.5E-03	na	na	na	na	na	na	2.7E-03	na	na
81	Bis(2-chloro-1-methylethyl)ether	3.5E-03	2.3E-04	5.9E-01	3.8E-02		1.4E+01	3.5E-03	5.9E-01	6.9E+01	2.3E-04	3.8E-02	4.5E+00	8.5E+00	na	na
82	2,6-Bis(1,1-dimethylethyl) phenol	na	na	na	na		na	na	na	na	na	na	na	na	na	na
83	Bis(2-ethylhexyl) phthalate	1.0E-01	5.0E-03	1.0E-01	5.0E-03		7.1E+01	1.3E+01	1.0E-01	2.0E+00	6.7E-01	5.0E-03	1.0E-01	5.0E-01	na	na
84	4-Bromophenyl phenyl ether	na	na	na	na		na	na	na	na	na	na	na	na	na	na
85	Butyl benzyl phthalate	3.6E-03	1.8E-04	3.6E-03	1.8E-04		5.3E+02	1.3E+01	3.6E-03	1.3E+03	6.4E-01	1.8E-04	6.4E+01	3.1E+02	na	na
86	Butyl diphenyl phosphate	na	na	na	na		na	na	na	na	na	na	na	na	na	na
87	Carbazole	na	na	9.0E-01	9.0E-01		na	na	na	na	na	na	na	9.0E-01	na	na
88	4-Chloroaniline	2.7E-03	1.7E-04	3.0E+00	1.4E+00		5.0E+00	2.7E-03	na	2.2E+01	1.7E-04	na	1.4E+00	3.0E+00	na	na
89	4-Chloro-3-methylphenol	5.0E-01	2.8E-02	5.0E-01	2.8E-02		8.0E+03	2.2E+01	5.0E-01	5.6E+04	1.2E+00	2.8E-02	3.2E+03	1.1E+04	na	na
90	2-Chloronaphthalene	5.4E+00	2.8E-01	5.4E+00	2.8E-01		6.4E+03	3.4E+01	5.4E+00	3.8E+04	1.8E+00	2.8E-01	1.9E+03	8.9E+03	na	na

Basis - Vadose, Potable GW						
Direct Contact	Drinking Water	Surface Water via GW	Sediment via GW	Bank Erosion	TEE	Nat. Background
PCBs						
		X				
		X				
		X				
Dioxins/Furans						
						X
						X
Inorganics						
X						
X						
X						
Metals						
						X
		X				
						X
		X				
	X					
						X
						X
		X				
	X					
						X
						X
						X
						X
						X
Metals - Butyltins						
SVOCs - PAHs						
		X				
		X				
		X				
		X				
		X				
Other SVOCs						
		X				

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PCUL Workbook - Groundwater Summary for Freshwater Sites

Sort Order	Chemical (all concentrations are in ug/L)	Most Stringent PCUL Potable Water GW #s 1-5	Most Stringent PCUL Nonpotable Water GW #s 2-5	User-Defined PCUL Site-Specific Natural Background	GW-1 Protect Drinking Water PW	GW-2 Protect Surface Water SW-FW	GW-3 Protect Sediment PartitFW	GW-4 Screening Level Protect Indoor Air VI	GW-5 Natural Background	Basis - Potable GW: Drinking Water	Basis - Potable GW: Surface Water	Basis - Potable GW: Sediment	Basis - Potable GW: Indoor Air	Basis - Potable GW: Nat. Background	Basis - Nonpotable GW: Surface Water	Basis - Nonpotable GW: Sediment	Basis - Nonpotable GW: Indoor Air	Basis - Nonpotable GW: Nat. Background	Select Use an 'X' to identify chemicals of interest for filtering
1	***PCBs***									***PCBs***									
2	Total PCB Aroclors	7.0E-06	7.0E-06		2.2E-01	7.0E-06	3.1E-02	na	na		X				X				
3	Total PCB congeners	7.0E-06	7.0E-06		2.2E-01	7.0E-06	9.0E-03	na	na		X				X				
4	Total PCB TEQ	4.4E-09	4.4E-09		3.4E-07	4.4E-09	1.8E-06	na	na		X				X				
5	***Dioxins/Furans***									***Dioxins/Furans***									
6	Total dioxin/furan TEQ	2.8E-09	2.8E-09		3.4E-07	2.8E-09	4.0E-06	na	na		X				X				
7	2,3,7,8-TCDD	5.0E-09	5.0E-09		3.4E-06	5.0E-09	TBD	na	na		X				X				
8	Total chlorinated dioxins	0.0E+00	0.0E+00		na	na	TBD	na	na										
9	Total chlorinated furans	0.0E+00	0.0E+00		na	na	TBD	na	na										
10	***Inorganics***									***Inorganics***									
11	Cyanide, free	5.0E+00	5.2E+00		5.0E+00	5.2E+00	4.1E+04	na	na	X					X				
12	Nitrate	1.0E+04	na		1.0E+04	na	na	na	na	X									
13	Nitrite	1.0E+03	na		1.0E+03	na	na	na	na	X									
14	Sulfate	2.5E+05	na		2.5E+05	na	na	na	na	X									
15	Sulfide	2.0E+00	2.0E+00		na	2.0E+00	na	na	na		X				X				
16	***Metals***									***Metals***									
17	Aluminum	8.7E+01	8.7E+01		1.6E+04	8.7E+01	4.5E+05	na	na		X				X				
18	Antimony	5.6E+00	5.6E+00		6.0E+00	5.6E+00	5.9E+03	na	na		X				X				
19	Arsenic	1.6E+01	8.0E+00	1.6E+01	5.8E-01	1.8E-02	3.8E+02	na	8.0E+00										X
20	Barium	1.0E+03	1.0E+03		2.0E+03	1.0E+03	3.2E+06	na	na		X				X				
21	Beryllium	4.0E+00	7.6E+01		4.0E+00	7.6E+01	1.7E+03	na	na	X					X				
22	Cadmium	7.2E-01	7.2E-01		5.0E+00	7.2E-01	1.1E+02	na	na		X				X				
23	Chromium, total	1.0E+02	na		1.0E+02	na	na	na	na	X									
24	Chromium, trivalent	7.4E+01	7.4E+01		2.4E+04	7.4E+01	1.0E+06	na	na		X				X				
25	Chromium, hexavalent	4.6E-02	3.6E-01		4.6E-02	3.6E-01	TBD	na	na	X					X				
26	Cobalt	4.8E+00	4.4E+03		4.8E+00	na	4.4E+03	na	na	X						X			
27	Copper	1.1E+01	1.1E+01		6.4E+02	1.1E+01	1.8E+04	na	na		X				X				
28	Iron	1.4E+05	1.0E+03	1.4E+05	3.0E+02	1.0E+03	1.8E+07	na	na						X				
29	Lead	2.1E+00	2.1E+00		1.5E+01	2.5E+00	2.1E+00	na	na			X				X			
30	Manganese	6.5E+03	5.0E+01	6.5E+03	5.0E+01	5.0E+01	4.7E+05	na	na						X				
31	Mercury, inorganic	1.2E-02	1.2E-02		2.0E+00	1.2E-02	3.8E+00	1.1E+00	na		X				X				
32	Methylmercury	7.7E-01	7.7E-01		1.6E+00	7.7E-01	TBD	na	na		X				X				
33	Molybdenum	8.0E+01	1.6E+05		8.0E+01	na	1.6E+05	na	na	X						X			
34	Nickel	5.2E+01	5.2E+01		1.0E+02	5.2E+01	7.7E+02	na	na		X				X				
35	Selenium	5.0E+00	5.0E+00		5.0E+01	5.0E+00	1.9E+01	na	na		X				X				
36	Silver	3.2E+00	3.2E+00		8.0E+01	3.2E+00	6.6E+01	na	na		X				X				
37	Thallium	6.2E-02	6.2E-02		1.6E-01	6.2E-02	9.4E+01	na	na		X				X				
38	Tin	9.6E+03	1.6E+06		9.6E+03	na	1.6E+06	na	na	X						X			
39	Vanadium	1.4E+02	6.0E+03		1.4E+02	na	6.0E+03	na	na	X						X			
40	Zinc	1.0E+02	1.0E+02		4.8E+03	1.0E+02	5.1E+04	na	na		X				X				

41	***Metals - Butyltins***									***Metals - Butyltins***										
42	Monobutyltin	na	na		na	na	na	na	na											
43	Dibutyltin	na	na		na	na	na	na	na											
44	Tributyltin oxide	1.6E-05	1.6E-05		4.8E+00	7.2E-02	1.6E-05	na	na			X					X			
45	Tetrabutyltin	na	na		na	na	na	na	na											
46	***SVOCs - PAHs***									***SVOCs - PAHs***										
47	Acenaphthene	3.0E+01	3.0E+01		4.8E+02	3.0E+01	2.2E+05	na	na		X				X					
48	Acenaphthylene	na	na		na	na	na	na	na											
49	Anthracene	1.0E+02	1.0E+02		2.4E+03	1.0E+02	2.3E+05	na	na		X				X					
50	Benzo(a)anthracene	1.6E-04	1.6E-04		na	1.6E-04	5.0E-03	na	na		X				X					
51	Benzo(b)fluoranthene	1.6E-04	1.6E-04		na	1.6E-04	3.0E-03	na	na		X				X					
52	Benzo(k)fluoranthene	1.6E-03	1.6E-03		na	1.6E-03	3.1E-03	na	na		X				X					
53	Total benzofluoranthenes	na	na		na	na	na	na	na											
54	Benzo(g,h,i)perylene	na	na		na	na	na	na	na											
55	Benzo(a)pyrene	1.6E-05	1.6E-05		2.0E-01	1.6E-05	1.9E-03	na	na		X				X					
56	Chrysene	9.8E-03	9.8E-03		na	1.6E-02	9.8E-03	na	na			X					X			
57	Dibenz(a,h)anthracene	1.6E-05	1.6E-05		na	1.6E-05	1.0E-03	na	na		X				X					
58	Dibenzofuran	4.3E+00	4.3E+00		8.0E+00	na	4.3E+00	na	na			X					X			
59	Fluoranthene	2.0E-02	2.0E-02		6.4E+02	6.0E+00	2.0E-02	na	na			X					X			
60	Fluorene	1.0E+01	1.0E+01		3.2E+02	1.0E+01	9.2E+04	na	na		X				X					
61	Indeno(1,2,3-cd)pyrene	1.6E-04	1.6E-04		na	1.6E-04	9.2E-04	na	na		X				X					
62	Methyl isopropyl phenanthrene	na	na		na	na	na	na	na											
63	1-Methylnaphthalene	1.5E+00	1.3E+03		1.5E+00	na	1.3E+03	na	na	X							X			
64	2-Methylnaphthalene	3.2E+01	2.8E+04		3.2E+01	na	2.8E+04	na	na	X							X			
65	Naphthalene	8.9E+00	8.9E+00		1.6E+02	1.4E+03	2.9E+05	8.9E+00	na				X					X		
66	Phenanthrene	na	na		na	na	na	na	na											
67	Pyrene	1.5E-02	1.5E-02		2.4E+02	8.0E+00	1.5E-02	na	na			X					X			
68	Total LPAHs	na	na		na	na	na	na	na											
69	Total HPAHs	na	na		na	na	na	na	na											
70	Total PAHs	na	na		na	na	na	na	na											
71	Total cPAH TEQ	4.3E-03	4.3E-03		2.3E-02	9.7E-03	4.3E-03	na	na			X					X			
72	***Other SVOCs***									***Other SVOCs***										
73	Aniline	1.5E+01	1.6E+05		1.5E+01	na	1.6E+05	na	na	X							X			
74	Azobenzene	4.0E-01	na		4.0E-01	na	na	na	na	X										
75	Benzidine	2.0E-05	2.0E-05		1.0E-04	2.0E-05	1.0E-01	na	na		X				X					
76	Benzoic acid	1.0E+04	1.0E+04		6.4E+04	na	1.0E+04	na	na			X					X			
77	Benzyl alcohol	1.6E+03	2.8E+07		1.6E+03	na	2.8E+07	na	na	X							X			
78	Bis(2-chloroethoxy)methane	4.8E+01	9.3E+05		4.8E+01	na	9.3E+05	na	na	X							X			
79	Bis(2-chloroethyl)ether	2.0E-02	2.0E-02		4.0E-02	2.0E-02	3.1E+03	na	na		X				X					
80	Bis(chloromethyl)ether	2.0E-04	8.1E+00		2.0E-04	1.0E+02	8.1E+00	na	na	X							X			
81	Bis(2-chloro-1-methylethyl)ether	6.3E-01	1.0E+02		6.3E-01	1.0E+02	1.2E+04	na	na	X							X			
82	2,6-Bis(1,1-dimethylethyl) phenol	na	na		na	na	na	na	na											
83	Bis(2-ethylhexyl) phthalate	4.5E-02	4.5E-02		6.0E+00	4.5E-02	9.0E-01	na	na		X				X					
84	4-Bromophenyl phenyl ether	na	na		na	na	na	na	na											
85	Butyl benzyl phthalate	1.3E-02	1.3E-02		4.6E+01	1.3E-02	4.6E+03	na	na		X				X					
86	Butyl diphenyl phosphate	na	na		na	na	na	na	na											
87	Carbazole	na	na		na	na	na	na	na											
88	4-Chloroaniline	4.4E-01	3.5E+03		4.4E-01	na	3.5E+03	na	na	X							X			
89	4-Chloro-3-methylphenol	3.6E+01	3.6E+01		1.6E+03	3.6E+01	4.1E+06	na	na		X				X					

90	2-Chloronaphthalene	1.0E+02	1.0E+02		6.4E+02	1.0E+02	7.0E+05	na	na		X				X				
91	2-Chlorophenol	1.5E+01	1.5E+01		4.0E+01	1.5E+01	1.5E+06	na	na		X				X				
92	4-Chlorophenyl phenyl ether	na	na		na	na	na	na	na										
93	Dibutyl phthalate	8.0E+00	8.0E+00		1.6E+03	8.0E+00	4.7E+01	na	na		X				X				
94	Dibutyl phenyl phosphate	na	na		na	na	na	na	na										
95	1,2-Dichlorobenzene	6.0E+02	7.0E+02		6.0E+02	7.0E+02	4.6E+06	2.5E+03	na	X					X				
96	1,3-Dichlorobenzene	2.0E+00	2.0E+00		na	2.0E+00	na	na	na		X				X				
97	1,4-Dichlorobenzene	5.0E+00	5.0E+00		7.5E+01	6.0E+01	3.3E+04	5.0E+00	na				X					X	
98	3,3'-Dichlorobenzidine	3.1E-03	3.1E-03		1.9E-01	3.1E-03	7.0E+02	na	na		X				X				
99	2,4-Dichlorophenol	1.0E+01	1.0E+01		4.8E+01	1.0E+01	3.3E+05	na	na		X				X				
100	Di(2-ethylhexyl)adipate	4.0E+02	2.7E+03		4.0E+02	na	2.7E+03	na	na	X						X			
101	Diethyl phthalate	2.0E+02	2.0E+02		1.3E+04	2.0E+02	1.3E+08	na	na		X				X				
102	Dimethyl phthalate	6.0E+02	6.0E+02		na	6.0E+02	na	na	na		X				X				
103	2,4-Dimethylphenol	8.5E+01	8.5E+01		3.2E+02	8.5E+01	8.1E+05	na	na		X				X				
104	1,2-Dinitrobenzene	1.6E+00	5.4E+03		1.6E+00	na	5.4E+03	na	na	X						X			
105	1,3-Dinitrobenzene	1.6E+00	na		1.6E+00	na	na	na	na	X									
106	1,4-Dinitrobenzene	1.6E+00	5.5E+03		1.6E+00	na	5.5E+03	na	na	X						X			
107	4,6-Dinitro-2-methylphenol (DNOC)	1.3E+00	2.0E+00		1.3E+00	2.0E+00	2.2E+03	na	na	X					X				
108	2,4-Dinitrophenol	1.0E+01	1.0E+01		3.2E+01	1.0E+01	7.8E+05	na	na		X				X				
109	2,4-Dinitrotoluene	3.9E-02	3.9E-02		2.8E-01	3.9E-02	6.1E+02	na	na		X				X				
110	2,6-Dinitrotoluene	5.8E-02	1.2E+02		5.8E-02	na	1.2E+02	na	na	X						X			
111	Di-n-octyl phthalate	1.9E-01	1.9E-01		1.6E+02	na	1.9E-01	na	na			X				X			
112	1,4-Dioxane	4.4E-01	4.7E+03		4.4E-01	na	2.0E+04	4.7E+03	na	X								X	
113	1,2-Diphenylhydrazine	1.0E-02	1.0E-02		1.1E-01	1.0E-02	9.5E+01	na	na		X				X				
114	Hexachlorobenzene	5.0E-06	5.0E-06		2.7E-01	5.0E-06	2.5E-03	2.4E-01	na		X				X				
115	Hexachlorobutadiene	1.0E-02	1.0E-02		5.6E-01	1.0E-02	6.6E-02	6.4E-01	na		X				X				
116	Hexachlorocyclopentadiene	1.0E+00	1.0E+00		4.8E+01	1.0E+00	5.5E+05	4.2E+00	na		X				X				
117	Hexachloroethane	2.0E-02	2.0E-02		1.1E+00	2.0E-02	1.2E+04	3.8E+00	na		X				X				
118	Isophorone	2.7E+01	2.7E+01		9.2E+01	2.7E+01	1.0E+06	na	na		X				X				
119	2-Methoxynaphthalene	na	na		na	na	na	na	na										
120	2-Methylphenol (o-cresol)	8.0E+02	3.1E+06		8.0E+02	na	3.1E+06	na	na	X						X			
121	3-Methylphenol (m-cresol)	8.0E+02	3.1E+06		8.0E+02	na	3.1E+06	na	na	X						X			
122	4-Methylphenol (p-cresol)	1.5E+02	1.5E+02		1.6E+03	na	1.5E+02	na	na			X				X			
123	2-Nitroaniline	1.6E+02	1.3E+06		1.6E+02	na	1.3E+06	na	na	X						X			
124	3-Nitroaniline	na	na		na	na	na	na	na										
125	4-Nitroaniline	4.4E+00	1.0E+05		4.4E+00	na	1.0E+05	na	na	X						X			
126	Nitrobenzene	1.0E+01	1.0E+01		1.6E+01	1.0E+01	2.5E+05	na	na		X				X				
127	2-Nitrophenol	na	na		na	na	na	na	na										
128	4-Nitrophenol	na	na		na	na	na	na	na										
129	n-Nitrosodimethylamine	2.3E-04	6.5E-04		2.3E-04	6.5E-04	3.3E+01	na	na	X					X				
130	n-Nitrosodiphenylamine	6.2E-01	6.2E-01		1.8E+01	6.2E-01	9.0E+03	na	na		X				X				
131	n-Nitrosodi-n-propylamine	4.4E-03	4.4E-03		1.3E-02	4.4E-03	5.1E+01	na	na		X				X				
132	Pentachlorophenol	2.0E-03	2.0E-03		1.0E+00	2.0E-03	4.0E+02	na	na		X				X				
133	Phenol	9.8E+01	9.8E+01		4.8E+03	4.0E+03	9.8E+01	na	na			X				X			
134	Pyridine	8.0E+00	1.7E+05		8.0E+00	na	1.7E+05	na	na	X						X			
135	2,3,4,5-Tetrachlorophenol	na	na		na	na	na	na	na										
136	2,3,4,6-Tetrachlorophenol	4.8E+02	2.0E+06		4.8E+02	na	2.0E+06	na	na	X						X			
137	1,2,4-Trichlorobenzene	3.6E-02	3.6E-02		1.5E+01	3.6E-02	2.4E+03	3.9E+01	na		X				X				
138	2,4,5-Trichlorophenol	3.0E+02	3.0E+02		1.6E+03	3.0E+02	1.3E+06	na	na		X				X				
139	2,4,6-Trichlorophenol	2.5E-01	2.5E-01		8.0E+00	2.5E-01	2.5E+04	na	na		X				X				

140	***Volatile Organic Compounds***									***Volatile Organic Compounds***										
141	Acetone	7.2E+03	2.0E+09		7.2E+03	na	2.0E+09	na	na	X						X				
142	Acrolein	1.0E+00	1.0E+00		4.0E+00	1.0E+00	1.1E+06	2.9E+00	na		X				X					
143	Acrylonitrile	1.9E-02	1.9E-02		8.1E-02	1.9E-02	1.3E+04	1.2E+01	na		X				X					
144	Benzaldehyde	1.1E+01	1.7E+06		1.1E+01	na	1.7E+06	na	na	X						X				
145	Benzene	4.4E-01	4.4E-01		5.0E+00	4.4E-01	7.0E+04	2.4E+00	na		X				X					
146	Bromobenzene	6.4E+01	6.3E+02		6.4E+01	na	3.7E+06	6.3E+02	na	X								X		
147	Bromochloromethane	na	na		na	na	na	na	na											
148	Bromoethane	na	na		na	na	na	na	na											
149	Bromoform	4.6E+00	4.6E+00		5.5E+01	4.6E+00	3.2E+05	2.2E+02	na		X				X					
150	Bromomethane	1.1E+01	1.1E+01		1.1E+01	1.0E+02	2.8E+06	1.1E+01	na				X					X		
151	2-Butoxyethanol (EGBE)	8.0E+02	2.2E+08		8.0E+02	na	2.2E+08	na	na	X						X				
152	n-Butylbenzene	4.0E+02	4.3E+06		4.0E+02	na	4.3E+06	na	na	X						X				
153	sec-Butylbenzene	8.0E+02	9.6E+06		8.0E+02	na	9.6E+06	na	na	X						X				
154	tert-Butylbenzene	8.0E+02	1.3E+07		8.0E+02	na	1.3E+07	na	na	X						X				
155	Carbon disulfide	8.0E+02	8.4E+02		8.0E+02	na	1.7E+08	8.4E+02	na	X								X		
156	Carbon tetrachloride	2.0E-01	2.0E-01		5.0E+00	2.0E-01	3.1E+04	6.2E-01	na		X				X					
157	Chlorobenzene	1.0E+02	1.0E+02		1.0E+02	1.0E+02	9.5E+06	3.4E+02	na	X	X				X					
158	Chloroethane	1.5E+04	1.5E+04		na	na	na	1.5E+04	na				X					X		
159	2-Chloroethyl vinyl ether	na	na		na	na	na	na	na											
160	Chloroform	1.2E+00	1.2E+00		1.4E+01	6.0E+01	1.3E+05	1.2E+00	na				X					X		
161	Chloromethane	1.5E+02	1.5E+02		na	na	na	1.5E+02	na				X					X		
162	3-Chloro-1-propene (allyl chloride)	2.1E+00	2.2E+05		2.1E+00	na	2.2E+05	na	na	X						X				
163	2-Chlorotoluene	1.6E+02	6.1E+06		1.6E+02	na	6.1E+06	na	na	X						X				
164	4-Chlorotoluene	1.6E+02	6.2E+06		1.6E+02	na	6.2E+06	na	na	X						X				
165	Dibromochloromethane	6.0E-01	6.0E-01		5.2E+00	6.0E-01	6.1E+04	na	na		X				X					
166	1,2-Dibromo-3-chloropropane	4.2E-02	4.2E-02		1.4E-01	na	9.6E+02	4.2E-02	na				X					X		
167	Dibromomethane	8.0E+01	8.7E+01		8.0E+01	na	1.1E+07	8.7E+01	na	X								X		
168	Dichlorobromomethane	7.3E-01	7.3E-01		7.1E+00	7.3E-01	8.3E+04	1.4E+00	na		X				X					
169	trans-1,4-Dichloro-2-butene	na	na		na	na	na	na	na											
170	Dichlorodifluoromethane	4.2E+00	4.2E+00		1.6E+03	na	2.6E+08	4.2E+00	na				X					X		
171	1,1-Dichloroethane	7.7E+00	1.1E+01		7.7E+00	na	7.3E+05	1.1E+01	na	X								X		
172	1,2-Dichloroethane (EDC)	3.5E+00	3.5E+00		4.8E+00	8.9E+00	5.3E+04	3.5E+00	na				X					X		
173	1,1-Dichloroethylene	7.0E+00	1.3E+02		7.0E+00	3.0E+02	5.5E+07	1.3E+02	na	X								X		
174	cis-1,2-Dichloroethylene	1.6E+01	2.8E+06		1.6E+01	na	2.8E+06	na	na	X						X				
175	trans-1,2-Dichloroethylene	7.7E+01	7.7E+01		1.0E+02	1.0E+02	2.8E+07	7.7E+01	na				X					X		
176	1,2-Dichloroethylene (mixed isomers)	na	na		na	na	na	na	na											
177	1,2-Dichloropropane	7.1E-01	7.1E-01		5.0E+00	7.1E-01	1.2E+05	1.0E+01	na		X				X					
178	1,3-Dichloropropane	1.6E+02	2.1E+07		1.6E+02	na	2.1E+07	na	na	X						X				
179	2,2-Dichloropropane	na	na		na	na	na	na	na											
180	1,1-Dichloropropene	na	na		na	na	na	na	na											
181	cis-1,3-Dichloropropene	2.2E-01	2.2E-01		4.4E-01	2.2E-01	5.4E+04	1.6E+00	na		X				X					
182	trans-1,3-Dichloropropene	2.2E-01	2.2E-01		4.4E-01	2.2E-01	5.4E+04	1.6E+00	na		X				X					
183	Diisopropyl ether	na	na		na	na	na	na	na											
184	Ethane	na	na		na	na	na	na	na											
185	Ethylbenzene	1.2E+01	1.2E+01		7.0E+02	1.2E+01	5.1E+07	2.8E+03	na		X				X					
186	Ethylene oxide	3.7E-02	5.4E-02		3.7E-02	na	7.1E+03	5.4E-02	na	X								X		
187	Ethyl ether	1.6E+03	4.0E+08		1.6E+03	na	4.0E+08	na	na	X						X				
188	Ethylene dibromide (EDB)	5.0E-02	3.0E-01		5.0E-02	na	1.8E+03	3.0E-01	na	X								X		
189	Formaldehyde	2.1E+00	3.7E+05		2.1E+00	na	3.7E+05	na	na	X						X				
190	n-Hexane	4.1E+00	4.1E+00		4.8E+02	na	2.3E+06	4.1E+00	na				X					X		
191	2-Hexanone	4.0E+01	7.3E+03		4.0E+01	na	9.2E+06	7.3E+03	na	X								X		

192	Isopropylbenzene (cumene)	8.0E+02	9.1E+02		8.0E+02	na	1.8E+07	9.1E+02	na	X							X		
193	4-Isopropyltoluene	na	na		na	na	na	na	na										
194	Methane	na	na		na	na	na	na	na										
195	Methyl ethyl ketone (2-butanone)	4.8E+03	1.7E+06		4.8E+03	na	1.3E+09	1.7E+06	na	X							X		
196	Methyl iodide	na	na		na	na	na	na	na										
197	Methyl isobutyl ketone	6.4E+02	4.7E+05		6.4E+02	na	1.5E+08	4.7E+05	na	X							X		
198	Methyl tert-butyl ether (MTBE)	2.4E+01	8.0E+02		2.4E+01	na	3.7E+06	8.0E+02	na	X							X		
199	Methylene chloride	5.0E+00	1.0E+01		5.0E+00	1.0E+01	9.9E+05	7.8E+02	na	X					X				
200	2-Pentanone	na	na		na	na	na	na	na										
201	n-Propylbenzene	8.0E+02	2.3E+03		8.0E+02	na	1.5E+07	2.3E+03	na	X							X		
202	Styrene	1.0E+02	8.2E+03		1.0E+02	na	2.8E+07	8.2E+03	na	X							X		
203	1,1,1,2-Tetrachloroethane	1.7E+00	7.1E+00		1.7E+00	na	1.2E+05	7.1E+00	na	X							X		
204	1,1,2,2-Tetrachloroethane	1.0E-01	1.0E-01		2.2E-01	1.0E-01	1.7E+04	5.9E+00	na		X				X				
205	Tetrachloroethylene (PCE)	2.4E+00	2.4E+00		5.0E+00	2.4E+00	6.7E+05	2.5E+01	na		X				X				
206	Tetrahydrofuran	7.2E+03	1.3E+06		7.2E+03	na	1.6E+08	1.3E+06	na	X							X		
207	Toluene	5.3E+01	5.3E+01		6.4E+02	5.3E+01	5.4E+07	1.5E+04	na		X				X				
208	1,2,3-Trichlorobenzene	6.4E+00	7.4E+04		6.4E+00	na	7.4E+04	na	na	X						X			
209	1,1,1-Trichloroethane	2.0E+02	5.4E+03		2.0E+02	1.0E+04	1.4E+09	5.4E+03	na	X							X		
210	1,1,2-Trichloroethane	3.5E-01	3.5E-01		3.0E+00	3.5E-01	6.0E+04	5.1E+00	na		X				X				
211	Trichloroethylene (TCE)	3.0E-01	3.0E-01		4.0E+00	3.0E-01	1.9E+04	1.4E+00	na		X				X				
212	Trichlorofluoroethane	na	na		na	na	na	na	na										
213	Trichlorofluoromethane	1.2E+02	1.2E+02		2.4E+03	na	4.0E+08	1.2E+02	na				X				X		
214	1,2,3-Trichloropropane	3.8E-04	2.1E+01		3.8E-04	na	2.6E+01	2.1E+01	na	X							X		
215	Trichlorotrifluoroethane	1.7E+02	1.7E+02		2.4E+05	na	1.6E+10	1.7E+02	na				X				X		
216	1,2,3-Trimethylbenzene	8.0E+01	4.1E+02		8.0E+01	na	2.0E+06	4.1E+02	na	X							X		
217	1,2,4-Trimethylbenzene	8.0E+01	2.4E+02		8.0E+01	na	2.0E+06	2.4E+02	na	X							X		
218	1,3,5-Trimethylbenzene	8.0E+01	1.7E+02		8.0E+01	na	2.0E+06	1.7E+02	na	X							X		
219	Vinyl acetate	7.8E+03	7.8E+03		8.0E+03	na	2.1E+09	7.8E+03	na				X				X		
220	Vinyl chloride	2.0E-02	2.0E-02		2.9E-01	2.0E-02	3.8E+03	3.3E-01	na		X				X				
221	Total xylenes	5.7E+01	5.7E+01		1.6E+03	5.7E+01	9.2E+07	3.2E+02	na		X				X				
222	***PFAS***									***PFAS***									
223	GenX (HFPO-DA)	2.4E-02	5.8E+03		2.4E-02	na	5.8E+03	na	na	X						X			
224	Perfluorobutanesulfonic acid (PFBS)	3.5E-01	5.6E+04		3.5E-01	na	5.6E+04	na	na	X						X			
225	Perfluorohexanesulfonic acid (PFHxS)	6.5E-02	1.3E+03		6.5E-02	na	1.3E+03	na	na	X						X			
226	Perfluorononanoic acid (PFNA)	9.0E-03	1.8E+02		9.0E-03	na	1.8E+02	na	na	X						X			
227	Perfluorooctanesulfonic acid (PFOS)	1.5E-02	0.0E+00		1.5E-02	na	TBD	na	na	X									
228	Perfluorooctanoic acid (PFOA)	1.0E-02	3.9E+02		1.0E-02	na	3.9E+02	na	na	X						X			
229	***Petroleum Hydrocarbons***									***Petroleum Hydrocarbons***									
230	Gasoline range hydrocarbons, fresh	8.0E+02	8.0E+02		8.0E+02	8.0E+02	na	na	na	X	X				X				
231	Gasoline range hydrocarbons, weathered	1.0E+03	1.0E+03		1.0E+03	1.0E+03	na	na	na	X	X				X				
232	Diesel range hydrocarbons, fresh	1.5E+02	1.5E+02		5.0E+02	1.5E+02	na	na	na		X				X				
233	Diesel range hydrocarbons, weathered	5.0E+02	5.0E+02		5.0E+02	5.0E+02	na	na	na	X	X				X				
234	Oil range hydrocarbons	5.0E+02	5.0E+02		5.0E+02	5.0E+02	na	na	na	X	X				X				
235	Total diesel & oil range hydrocarbons	5.0E+02	5.0E+02		5.0E+02	5.0E+02	na	na	na	X	X				X				

236	***Pesticides***									***Pesticides***										
237	Aldrin	4.1E-08	4.1E-08		2.6E-03	4.1E-08	4.1E-04	na	na		X				X					
238	alpha-BHC	4.8E-05	4.8E-05		1.4E-02	4.8E-05	1.0E+01	na	na		X				X					
239	beta-BHC	1.3E-03	1.3E-03		4.9E-02	1.3E-03	6.6E-01	na	na		X				X					
240	delta-BHC	na	na		na	na	na	na	na											
241	gamma-BHC	8.0E-02	8.0E-02		2.0E-01	8.0E-02	7.7E+01	na	na		X				X					
242	cis-Chlordane	3.0E-04	3.0E-04		4.0E+00	na	3.0E-04	na	na			X				X				
243	trans-Chlordane	3.0E-04	3.0E-04		4.0E+00	na	3.0E-04	na	na			X				X				
244	Chlordane	2.2E-05	2.2E-05		1.3E+00	2.2E-05	TBD	na	na		X				X					
245	Chlorpyrifos	4.1E-02	4.1E-02		1.6E+01	4.1E-02	TBD	na	na		X				X					
246	4,4'-DDD	7.9E-06	7.9E-06		3.6E-01	7.9E-06	4.4E-04	na	na		X				X					
247	4,4'-DDE	8.8E-07	8.8E-07		1.3E-01	8.8E-07	2.3E-04	na	na		X				X					
248	4,4'-DDT	1.2E-06	1.2E-06		2.6E-01	1.2E-06	2.9E-05	na	na		X				X					
249	Total DDD	3.6E-01	0.0E+00		3.6E-01	na	TBD	na	na	X										
250	Total DDE	1.3E-01	0.0E+00		1.3E-01	na	TBD	na	na	X										
251	Total DDT	2.6E-01	0.0E+00		2.6E-01	na	TBD	na	na	X										
252	Diazinon	1.7E-01	1.7E-01		1.1E+01	1.7E-01	TBD	na	na		X				X					
253	Dieldrin	7.0E-08	7.0E-08		5.5E-03	7.0E-08	7.8E-04	na	na		X				X					
254	Endosulfan I	5.6E-02	5.6E-02		na	5.6E-02	TBD	na	na		X				X					
255	Endosulfan II	5.6E-02	5.6E-02		na	5.6E-02	TBD	na	na		X				X					
256	Endosulfan sulfate	9.0E+00	9.0E+00		9.6E+01	9.0E+00	1.4E+04	na	na		X				X					
257	Endrin	2.0E-03	2.0E-03		2.0E+00	2.0E-03	TBD	na	na		X				X					
258	Endrin aldehyde	3.4E-02	3.4E-02		na	3.4E-02	na	na	na		X				X					
259	Endrin ketone	na	na		na	na	na	na	na											
260	Heptachlor	3.4E-07	3.4E-07		9.7E-02	3.4E-07	2.1E-03	5.1E-01	na		X				X					
261	Heptachlor epoxide	2.4E-06	2.4E-06		4.8E-02	2.4E-06	TBD	na	na		X				X					
262	Lindane	8.0E-02	8.0E-02		2.0E-01	8.0E-02	1.4E+02	na	na		X				X					
263	Malathion	1.0E-01	1.0E-01		3.2E+02	1.0E-01	5.0E+06	na	na		X				X					
264	Methoxychlor	2.0E-02	2.0E-02		4.0E+01	2.0E-02	1.4E+03	na	na		X				X					
265	Mirex	1.0E-03	1.0E-03		2.4E-03	1.0E-03	TBD	1.5E-02	na		X				X					
266	Nonachlor	na	na		na	na	na	na	na											
267	Toxaphene	3.2E-05	3.2E-05		8.0E-01	3.2E-05	TBD	na	na		X				X					
268	***Herbicides***									***Herbicides***										
269	2,4-D	7.0E+01	1.3E+03		7.0E+01	1.3E+03	4.4E+06	na	na	X					X					
270	2,4-DB	na	na		na	na	na	na	na											
271	2,4,5-TP	5.0E+01	1.0E+02		5.0E+01	1.0E+02	7.7E+05	na	na	X					X					
272	2,4,5-T	1.6E+02	1.4E+06		1.6E+02	na	1.4E+06	na	na	X						X				
273	Dalapon	2.0E+02	1.1E+07		2.0E+02	na	1.1E+07	na	na	X						X				
274	Dicamba	4.8E+02	7.8E+06		4.8E+02	na	7.8E+06	na	na	X						X				
275	Dichloroprop	na	na		na	na	na	na	na											
276	Dinoseb	7.0E+00	5.1E+03		7.0E+00	na	5.1E+03	na	na	X						X				
277	MCPA	8.0E+00	1.3E+05		8.0E+00	na	1.3E+05	na	na	X						X				
278	MCPP	1.6E+01	2.1E+05		1.6E+01	na	2.1E+05	na	na	X						X				
										Number of Chemicals:	94	105	13	14	0	117	59	36	1	0

APPENDIX G

Background Concentrations of Arsenic, Iron, and Manganese

Attachments

Attachment G1 – Email Correspondence from Ecology Establishing Natural Background for Arsenic

Attachment G2 – Summary of Natural Background Evaluation for Iron and Manganese in Groundwater

- Table G-1 – Summary of Statistical Analyses for Iron and Manganese
- Table G-2 – ProUCL Data Input - Manganese in Groundwater
- Table G-3 – ProUCL Data Input - Iron in Groundwater
- Table G-4 – ProUCL Data Output - Manganese in Groundwater
- Table G-5 – ProUCL Data Output - Iron in Groundwater

ATTACHMENT G1

Email Correspondence from Ecology Establishing Natural Background for Arsenic

From:	Jeremy Porter
To:	Delia Massey
Subject:	FW: Barbee Mill Statistics
Date:	Monday, February 27, 2023 2:48:36 PM
Attachments:	image001.png image002.png image009.jpg Barbee Mill BG (ProUCL).xlsx

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From: McInerney, Lucy (ECY) <LPEB461@ECY.WA.GOV>
Sent: Tuesday, June 2, 2020 4:26 PM
To: Jeremy Porter <jporter@aspectconsulting.com>
Cc: Buchan, Arthur (ECY) <ABUC461@ECY.WA.GOV>; Kann, Jennifer (ECY) <jkan461@ECY.WA.GOV>
Subject: Barbee Mill Statistics

Hi Jeremy,

Ecology proposes a value of 16.28 ug/l as a natural background concentration for arsenic in groundwater. The basis for this is presented below.

Arthur conducted additional research and review, specifically of the ProUCL Technical Guide at: https://www.epa.gov/sites/production/files/2016-05/documents/proucl_5.1_tech-guide.pdf. Page 99 states:

It is implicitly assumed that the background data set used to estimate BTVs represents a single statistical population. However, since outliers (well-separated from the main dominant data) are inevitable in most environmental applications, some outliers such as the observations coming from populations other than the background population may also be present in a background data set. Outliers, when present, distort decision statistics of interest (e.g., upper prediction limits [UPLs], upper tolerance limits [UTLs]), which in turn may lead to incorrect remediation decisions that may not be cost-effective or protective of human health and the environment. The BTVs should be estimated by statistics representing the dominant background population represented by the majority of the data set. Upper limits computed by including a few low probability high outliers (e.g., coming from the far tails of data distribution) tend to represent locations with those elevated concentrations rather than representing the main dominant background population. It is suggested to compute all relevant statistics using data sets with outliers and without outliers, and compare the results. This extra step often helps the project team to see the potential influence of outlier(s) on the various decision making statistics (e.g., upper confidence limits [UCLs], UPLs, UTLs), and to make informative decisions about the disposition of outliers. That is, the project team and experts familiar with the site should decide which of the computed statistics (with outliers or without outliers) represent more accurate estimate(s) of the population parameters (e.g., mean, exposure point concentration [EPC], BTV) under consideration.

In summary, the dataset should be evaluated with and without outliers. And the decision about which dataset to be used should be made by deciding which dataset best represents the main dominant background population.

The ProUCL outlier test indicates that the 28 ug/L value is a potential outlier at the 10% significance

level.

This is the dataset with the outlier included, the resulting distribution and the natural background concentration:

Mean = 10.83 ug/L, SD = 8.122, CV = 0.75

Gamma Distribution, R^2 = 0.943

90^{th} % = 22.7 ug/L, 4 x 50^{th} % = 34.8 ug/L

Final result is 22.7 ug/L

This is the dataset with the outlier omitted, the resulting distribution and the natural background concentration:

Mean = 8.371 ug/L, SD = 4.557, CV = 0.544

Gamma Distribution, R^2 = 0.903

90^{th} % = 16.28 ug/L, 4 x 50^{th} % = 34.8 ug/L

Final result is 16.28 ug/L

Comparing the two datasets, the dataset with the outlier omitted represents the more accurate estimate of the population parameters to the majority of the dataset. The resulting mean (Mean) more accurately represents the majority of the dataset. In addition, the standard deviation (SD), and coefficient of variation (CV) indicate that there is less variability in the dataset with the outlier (28 ug/L) omitted.

As a result Ecology proposes a value of 16.28 ug/l as a natural background concentration for arsenic in groundwater.

Let us know your thoughts,

Lucy

Lucille T. McInerney, P.E. | Cleanup Project Manager
Washington State Department of Ecology
Northwest Regional Office | Toxics Cleanup Program
3190 160th Avenue SE, Bellevue, WA 98008-5452
425-649-7272 | lucy.mcinerney@ecy.wa.gov
TEMPORARY CELL PHONE: (425) 410-1400

ATTACHMENT G2

Summary of Natural Background Evaluation For Iron and Manganese in Groundwater

Barbee Mill: Natural Background Evaluation For Iron and Manganese in Groundwater

Criteria from MTCA Statistics Draft User's Manual (Ecology, 2022):

- Distributions of datasets:
  - Data shall be assumed to be lognormally distributed unless this assumption is rejected by a statistical test.
  - The W test, D'Agostino's test, or censored probability plots as appropriate for the data shall be the statistical methods used to determine whether the data is lognormally or normally distributed.
- Non-detect data:
  - Measurements below the MDL shall be assigned a value equal to one-half of the method detection limit; and
  - If more than 50% of the measurements are below the MDL, the largest value in the dataset is to be used in place of the upper confidence limit on the true mean.

Manganese Stats evaluation (no deep GW samples)

1) No non-detect data in this data set.
2) Compute Full Raw Stats **(see output)**
3) Complete GOF evaluation (full w/o NDs): data do not appear normal, data do not appear gamma, **data appear lognormal**
4) Calculate Upper Limits/BTVs (w/o ND observations use lognormal distribution)
   a. Data not lognormal at 10% significance level per ProUCL
   b. Based on MTCA Guidance if it fits lognormal distribution = use 90% UTL with 90% coverage
   c. Updated output, to 90% UTL with 90% coverage, and updated Table: 6522 ug/L

Pre-PAZ[1] Iron Stats Evaluation (w/o deep samples):

1) No non-detect values in this dataset.
2) Compute Full Raw Stats with/NDs **(see output)**
3) Complete GOF evaluation (w/o NDs): data do not appear normal, data do not appear gamma distributed, **data appear lognormal**
4) Calculate Upper Limits/BTVs (using both gamma and lognormal distribution; w/o NDs observations use Gamma and lognormal distribution)
   a. Detected data appear gamma distributed at 5% significance level per ProUCL
   b. Detected data appear lognormally distributed at 10% significance level
   c. Based on MTCA Guidance if it fits gamma distribution w/o NDs observations = use 90% Approx Gamma UTL with 90% coverage (WH)
   d. Based on MTCA Guidance if it fits lognormal distribution w/o NDs = 90 UTL with 90 coverage
   e. Updated output, to 90% UTL with 90% coverage, and updated Table F-1
   f. Gamma UTL: 73572 ug/L
   g. Lognormal UTL: 141804 ug/L

[1] Also excludes PAZ pilot test data collected prior to full scale PAZ installation.

Table G-1. Summary of Statistical Analyses for Iron and Manganese

Project No. 050004, Barbee Mill, Renton, Washington

Analyte	Manganese	Iron
Background Data Set Time Period	All Available Data (2005 - 2021)	Prior to PAZ Installation (2005 - 2006)
Background Data Set Location	Shallow Alluvium Groundwater	Shallow Alluvium Groundwater
90/90 Upper Tolerance Level (UTL) in ug/L	**6,522**	**141,804**
95% Upper Confidence Level (UCL) in ug/L	3,454	78,076
Confidence Level Method (Table A-9) in ug/L	H-UCL	H-UCL
Number of Wells	15	10
Number of Results	15	10
Minimum Value in ug/L	641	4400
Maximum Value in ug/L	9780	98700
Number of Detects	15	10
Number of Non-Detects (values less than reporting limit)	0	0
% Detect	100%	100%
% Non-Detect	0%	0%
2x UTL (Y/N)	N	N
# of results that exceed UTL	0	0
% Exceedance (<10%)	0%	0%
Distribution (Goodness of Fit)	Lognormal	Lognormal
Mean in ug/L	2301	32340
Median in ug/L	1400	25350
Standard Deviation in ug/L	2374	27270
Log transformed Standard Deviation	0.72	0.86
50th Percentile in ug/L	1400	25350
4x 50th Percentile in ug/L	5600	101400
90th Percentile in ug/L	4530	57840
95th Percentile in ug/L	6231	78270
Coefficient of Variation (CV)	1.0	0.8
Skewness	2.6	1.8

Notes

[a] Groundwater quality criteria are from Washington Administrative Code (WAC) 173-200, Table
Statistical analyses were performed based on distribution determined by including non-detect values (at half of the method detection limit), in accordance to the MTCA Statistics Draft User Manual (Ecology, 2022).

Table A-9 references Appendix I: ProUCL Guidelines for MTCA Site Managers, from the Ecolo

Table G-2. ProUCL Data Input - Manganese in Groundwater

Project No. 050004, Barbee Mill, Renton, Washington

Manganese Groundwater Data for ProUCL Input					ProUCL Input	
Sample Location	**Sample Date**	**Concentration**	**Units**	**Concentration (ug/L)**	**Detection (ug/L)**	**Detected (0/1)**
RMW-04	8/2/2005	0.641	mg/L	641	641	1
CMW-4S	3/18/2021	800	ug/L	800	800	1
EW-6	3/19/2021	940	ug/L	940	940	1
EW-2	3/19/2021	1200	ug/L	1200	1200	1
HCMW-03	8/2/2005	1.21	mg/L	1210	1210	1
HCMW-05S	8/2/2005	1.26	mg/L	1260	1260	1
CMW-2S	3/18/2021	1400	ug/L	1400	1400	1
EW-4	3/19/2021	1400	ug/L	1400	1400	1
HCMW-02	8/2/2005	1.61	mg/L	1610	1610	1
EW-8	3/19/2021	1700	ug/L	1700	1700	1
CMW-1	3/18/2021	1800	ug/L	1800	1800	1
CMW-6	3/19/2021	1800	ug/L	1800	1800	1
WP-1B	8/10/2005	4.26	mg/L	4260	4260	1
HCMW-01S	8/2/2005	4.71	mg/L	4710	4710	1
RMW-01	8/2/2005	9.78	mg/L	9780	9780	1

Notes

All concentrations were converted to ug/L prior to processing in ProUCL.

ug/L = micrograms per liter

Detected concentrations in ProUCL are coded with a 1, non-detects are coded as 0.

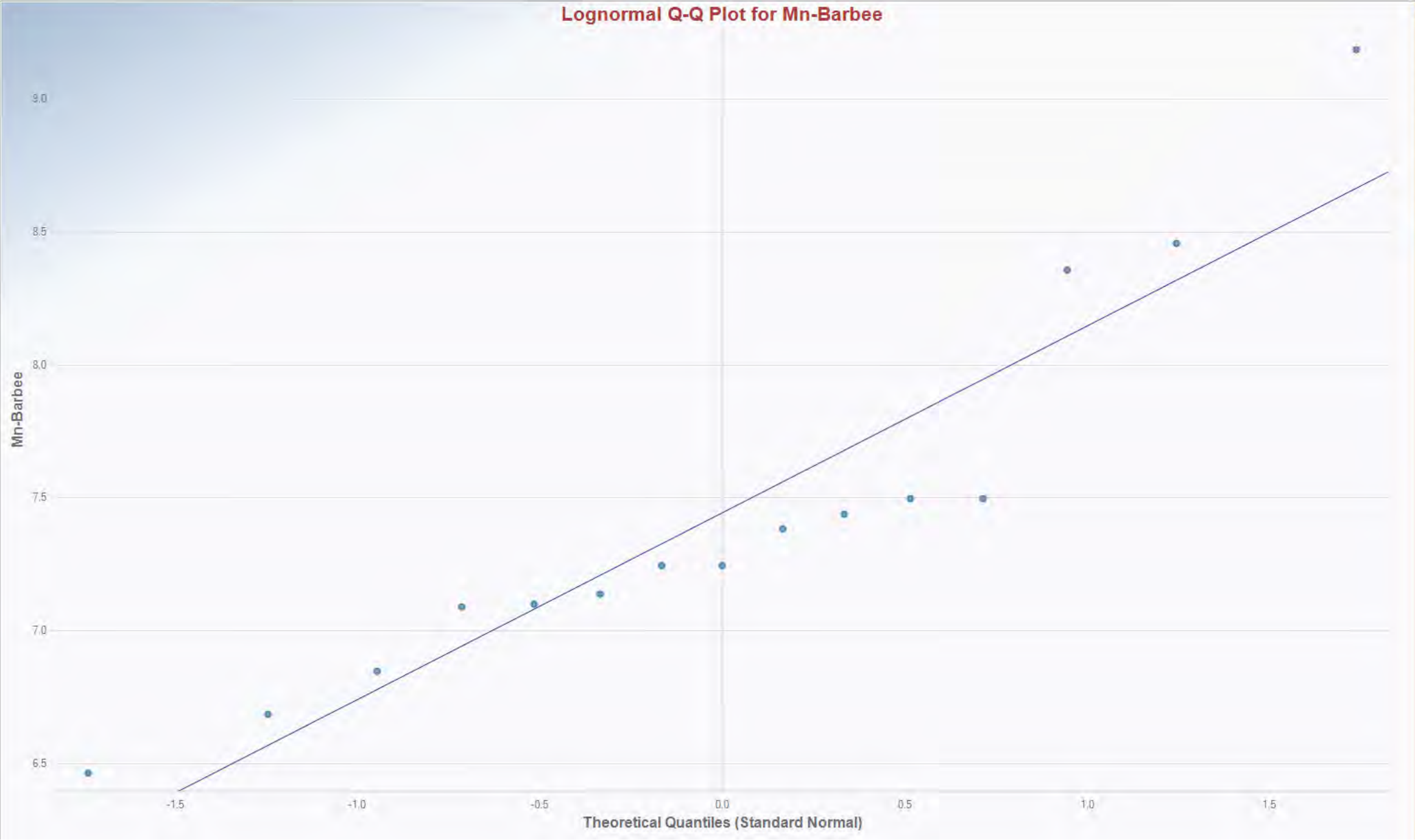
Table G-3. ProUCL Data Input - Iron in Groundwater

Project No. 050004, Barbee Mill, Renton, Washington

Iron Groundwater Data for ProUCL Input					ProUCL Input	
Sample Location	**Sample Date**	**Concentration**	**Units**	**Concentration (ug/L)**	**Detection (ug/L)**	**Detected (0/1)**
WP-07	10/6/2006	4400	ug/L	4400	4400	1
RMW-04	8/2/2005	10.4	mg/L	10400	10400	1
HCMW-05S	8/2/2005	16	mg/L	16000	16000	1
WP-08	7/1/2006	22000	ug/L	22000	22000	1
WP-06	9/29/2006	25000	ug/L	25000	25000	1
HCMW-02	8/2/2005	25.7	mg/L	25700	25700	1
HCMW-03	8/2/2005	26.5	mg/L	26500	26500	1
HCMW-01S	8/2/2005	41.4	mg/L	41400	41400	1
WP-1B	8/10/2005	53.3	mg/L	53300	53300	1
RMW-01	8/2/2005	98.7	mg/L	98700	98700	1

	A	B	C	D	E	F	G	H	I	J	K	L
1				**General Statistics on Uncensored Full Data**								
2		Date/Time of Computation		ProUCL 5.2 2/2/2023 15:55:51								
3		**User Selected Options**										
4		From File		WorkSheet.xls								
5		Full Precision		OFF								
6												
7	**From File: WorkSheet.xls**											
8												
9	**General Statistics for Uncensored Dataset**											
10												
11	**Variable**		**NumObs**	**# Missing**	**Minimum**	**Maximum**	**Mean**	**Geo-Mean**	**SD**	**SEM**	**MAD/0.675**	**Skewness**
12	Mn-Barbee		15	0	641	9780	2301	1706	2374	612.9	593	2.609
13												
14	**Percentiles for Uncensored Dataset**											
15												
16	**Variable**		**NumObs**	**# Missing**	**10%ile**	**20%ile**	**25%ile(Q1)**	**50%ile(Q2)**	**75%ile(Q3)**	**80%ile**	**90%ile**	**95%ile**
17	Mn-Barbee		15	0	856	1148	1205	1400	1800	2292	4530	6231

	M
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	**CV**
12	1.032
13	
14	
15	
16	**99%ile**
17	9070



Mn-Barbee

n = 15
Mean = 7.442
Sd = 0.718
Slope = 0.704
Intercept = 7.442
Correlation, R = 0.936
Shapiro-Wilk Test
Exact Test Statistic = 0.885
Critical Value(0.05) = 0.881
Data Appear Lognormal
Approx. Test Value = 0.882
p-Value = 0.0513
Best Fit Line

1				General Statistics on Uncensored Log-Transformed Data								
2			Date/Time of Computation	ProUCL 5.2 2/14/2023 12:15:29								
3			User Selected Options									
4			From File	WorkSheet_a.xls								
5			Full Precision	OFF								
6												
7	From File: WorkSheet_a.xls											
8												
9	General Statistics for Uncensored Log-Transformed Dataset											
10												
11	Variable		NumObs	# Missing	Minimum	Maximum	Mean	Variance	SD	MAD/0.675	Skewness	Kurtosis
12	Mn_nodeep		15	0	6.463	9.188	7.442	0.516	0.718	0.373	1.207	1.379
13												
14	Percentiles for Uncensored Log-Transformed Dataset											
15												
16	Variable		NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile
17	Mn_nodeep		15	0	6.749	7.041	7.094	7.244	7.496	7.668	8.417	8.677

	M
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	**CV**
12	0.0965
13	
14	
15	
16	**99%ile**
17	9.086

1				**Lognormal Background Statistics for Uncensored Full Data Sets**								
2			**User Selected Options**									
3			Date/Time of Computation	ProUCL 5.2 2/2/2023 15:59:28								
4			From File	WorkSheet.xls								
5			Full Precision	OFF								
6			Confidence Coefficient	90%								
7			Coverage	90%								
8			New or Future K Observations	1								
9			Number of Bootstrap Operations	2000								
10												
11	**Mn-Barbee**											
12												
13	**General Statistics**											
14						Total Number of Observations	15			Number of Distinct Observations	13	
15						Minimum	641			First Quartile	1205	
16						Second Largest	4710			Median	1400	
17						Maximum	9780			Third Quartile	1800	
18						Mean	2301			SD	2374	
19						Coefficient of Variation	1.032			Skewness	2.609	
20						Mean of logged Data	7.442			SD of logged Data	0.718	
21												
22						**Critical Values for Background Threshold Values (BTVs)**							
23						Tolerance Factor K (For UTL)	1.867			d2max (for USL)	2.248	
24												
25						**Lognormal GOF Test**						
26						Shapiro Wilk Test Statistic	0.885			**Shapiro Wilk Lognormal GOF Test**		
27						10% Shapiro Wilk Critical Value	0.901			Data Not Lognormal at 10% Significance Level		
28						Lilliefors Test Statistic	0.27			**Lilliefors Lognormal GOF Test**		
29						10% Lilliefors Critical Value	0.202			Data Not Lognormal at 10% Significance Level		
30						**Data Not Lognormal at 10% Significance Level**						
31												
32						**Background Statistics assuming Lognormal Distribution**						
33						90% UTL with 90% Coverage	6522			90% Percentile (z)	4283	
34						90% UPL (t)	4627			95% Percentile (z)	5560	
35						90% USL	8573			99% Percentile (z)	9072	
36												
37						Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.						
38						Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers						
39						and consists of observations collected from clean unimpacted locations.						
40						The use of USL tends to provide a balance between false positives and false negatives provided the data						
41						represents a background data set and when many onsite observations need to be compared with the BTV.						
42												

Lognormal UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	ProUCL 5.2 2/14/2023 12:16:14
From File	WorkSheet_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Mn_nodeep

General Statistics

Total Number of Observations	15	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	641	Mean	2301
Maximum	9780	Median	1400
SD	2374	Std. Error of Mean	612.9
Coefficient of Variation	1.032	Skewness	2.609

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk Lognormal GOF Test**
10% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.27	**Lilliefors Lognormal GOF Test**
10% Lilliefors Critical Value	0.202	Data Not Lognormal at 10% Significance Level

Data Not Lognormal at 10% Significance Level

Logged Statistics

Minimum of Logged Data	6.463	Mean of logged Data	7.442
Maximum of Logged Data	9.188	SD of logged Data	0.718

Lognormal Maximum likelihood Estimates (MLEs)

MLE Mean	2208	MLE Standard Deviation	1815
MLE Median	1706	MLE Skewness	3.021
MLE Coefficient of Variation	0.822	80% MLE Quantile	3122
90% MLE Quantile	4283	95% MLE Quantile	5560
99% MLE Quantile	9072		

Lognormal Minimum Variance Unbiased Estimates (MVUEs)

MVUE Mean	2163	MVUE SD	1658
MVUE Median	1677	MVUE SEM	423.7

Assuming Lognormal Distribution

95% H-UCL	3454	90% Chebyshev (MVUE) UCL	3434
95% Chebyshev (MVUE) UCL	4009	97.5% Chebyshev (MVUE) UCL	4809
99% Chebyshev (MVUE) UCL	6378		

Nonparametric Distribution Free UCLs

95% CLT UCL	3309	95% BCA Bootstrap UCL	3839
95% Standard Bootstrap UCL	3273	95% Bootstrap-t UCL	4576
95% Hall's Bootstrap UCL	5882	95% Percentile Bootstrap UCL	3366
90% Chebyshev(Mean, Sd) UCL	4139	95% Chebyshev(Mean, Sd) UCL	4972
97.5% Chebyshev(Mean, Sd) UCL	6128	99% Chebyshev(Mean, Sd) UCL	8399

	A	B	C	D	E	F	G	H	I	J	K	L
54												
55	**Suggested UCL to Use**											
56	**Data do not follow a Discernible Distribution, May want to try Nonparametric UCLs**											
57												
58	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
59	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.											
60	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
61												

1				General Statistics on Uncensored Full Data								
2			Date/Time of Computation	ProUCL 5.2 2/2/2023 18:36:22								
3			User Selected Options									
4			From File	WorkSheet_b.xls								
5			Full Precision	OFF								
6												
7	From File: WorkSheet_b.xls											
8												
9	General Statistics for Uncensored Dataset											
10												
11	Variable		NumObs	# Missing	Minimum	Maximum	Mean	Geo-Mean	SD	SEM	MAD/0.675	Skewness
12	Fe_nodeep		10	0	4400	98700	32340	23857	27270	8624	18013	1.804
13												
14	Percentiles for Uncensored Dataset											
15												
16	Variable		NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile
17	Fe_nodeep		10	0	9800	14880	17500	25350	37675	43780	57840	78270

	M
1	
2	
3	
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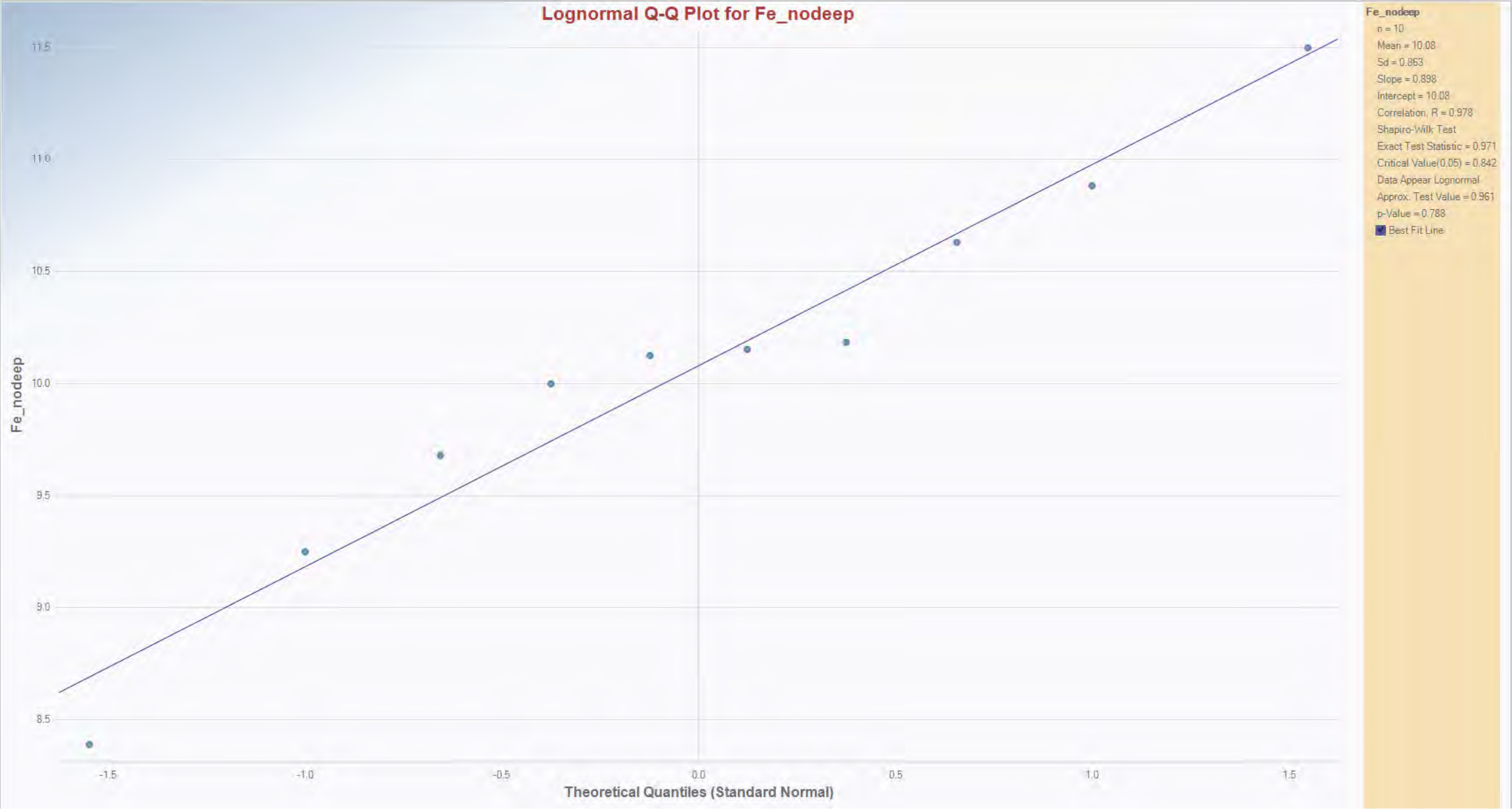
7	
8	
9	
10	
11	**CV**
12	0.843
13	
14	
15	
16	**99%ile**
17	94614


Lognormal Q-Q Plot for Fe_nodeep
Fe_nodeep
n = 10
Mean = 10.08
Sd = 0.863
Slope = 0.898
Intercept = 10.08
Correlation, R = 0.978
Shapiro-Wilk Test
Exact Test Statistic = 0.971
Critical Value(0.05) = 0.842
Data Appear Lognormal
Approx. Test Value = 0.961
p-Value = 0.788
Best Fit Line
11.5
11.0
10.5
10.0
9.5
9.0
8.5
Fe_nodeep
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)

1				General Statistics on Uncensored Log-Transformed Data								
2			Date/Time of Computation	ProUCL 5.2 2/14/2023 13:46:48								
3			User Selected Options									
4			From File	WorkSheet_d.xls								
5			Full Precision	OFF								
6												
7	From File: WorkSheet_d.xls											
8												
9	General Statistics for Uncensored Log-Transformed Dataset											
10												
11	Variable		NumObs	# Missing	Minimum	Maximum	Mean	Variance	SD	MAD/0.675	Skewness	Kurtosis
12	Fe_nodeep		10	0	8.389	11.5	10.08	0.744	0.863	0.705	-0.414	0.879
13												
14	Percentiles for Uncensored Log-Transformed Dataset											
15												
16	Variable		NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile
17	Fe_nodeep		10	0	9.164	9.594	9.76	10.14	10.52	10.68	10.95	11.22

	M
1	
2	
3	
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6	
7	
8	
9	
10	
11	**CV**
12	0.0856
13	
14	
15	
16	**99%ile**
17	11.44

1				**Lognormal Background Statistics for Uncensored Full Data Sets**								
2			**User Selected Options**									
3			Date/Time of Computation	ProUCL 5.2 2/2/2023 18:43:37								
4			From File	WorkSheet_b.xls								
5			Full Precision	OFF								
6			Confidence Coefficient	90%								
7			Coverage	90%								
8			New or Future K Observations	1								
9			Number of Bootstrap Operations	2000								
10												
11	**Fe_nodeep**											
12												
13	**General Statistics**											
14						Total Number of Observations	10			Number of Distinct Observations	10	
15						Minimum	4400			First Quartile	17500	
16						Second Largest	53300			Median	25350	
17						Maximum	98700			Third Quartile	37675	
18						Mean	32340			SD	27270	
19						Coefficient of Variation	0.843			Skewness	1.804	
20						Mean of logged Data	10.08			SD of logged Data	0.863	
21												
22						**Critical Values for Background Threshold Values (BTVs)**							
23						Tolerance Factor K (For UTL)	2.066			d2max (for USL)	2.036	
24												
25						**Lognormal GOF Test**						
26						Shapiro Wilk Test Statistic	0.971			**Shapiro Wilk Lognormal GOF Test**		
27						10% Shapiro Wilk Critical Value	0.869			Data appear Lognormal at 10% Significance Level		
28						Lilliefors Test Statistic	0.163			**Lilliefors Lognormal GOF Test**		
29						10% Lilliefors Critical Value	0.241			Data appear Lognormal at 10% Significance Level		
30						**Data appear Lognormal at 10% Significance Level**						
31												
32						**Background Statistics assuming Lognormal Distribution**						
33						90% UTL with 90% Coverage	141804			90% Percentile (z)	72074	
34						90% UPL (t)	83385			95% Percentile (z)	98604	
35						90% USL	138208			99% Percentile (z)	177514	
36												
37						Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.						
38						Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers						
39						and consists of observations collected from clean unimpacted locations.						
40						The use of USL tends to provide a balance between false positives and false negatives provided the data						
41						represents a background data set and when many onsite observations need to be compared with the BTV.						
42												

1	**Lognormal UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation	ProUCL 5.2 2/14/2023 13:47:40										
5	From File	WorkSheet_d.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	**Fe_nodeep**											
12												
13	**General Statistics**											
14	Total Number of Observations	10					Number of Distinct Observations	10				
15							Number of Missing Observations	0				
16	Minimum	4400					Mean	32340				
17	Maximum	98700					Median	25350				
18	SD	27270					Std. Error of Mean	8624				
19	Coefficient of Variation	0.843					Skewness	1.804				
20												
21	**Lognormal GOF Test**											
22	Shapiro Wilk Test Statistic	0.971					**Shapiro Wilk Lognormal GOF Test**					
23	10% Shapiro Wilk Critical Value	0.869					Data appear Lognormal at 10% Significance Level					
24	Lilliefors Test Statistic	0.163					**Lilliefors Lognormal GOF Test**					
25	10% Lilliefors Critical Value	0.241					Data appear Lognormal at 10% Significance Level					
26	**Data appear Lognormal at 10% Significance Level**											
27												
28	**Logged Statistics**											
29	Minimum of Logged Data	8.389					Mean of logged Data	10.08				
30	Maximum of Logged Data	11.5					SD of logged Data	0.863				
31												
32	**Lognormal Maximum likelihood Estimates (MLEs)**											
33	MLE Mean	34613					MLE Standard Deviation	36383				
34	MLE Median	23857					MLE Skewness	4.315				
35	MLE Coefficient of Variation	1.051					80% MLE Quantile	49312				
36	90% MLE Quantile	72074					95% MLE Quantile	98604				
37	99% MLE Quantile	177514										
38												
39	**Lognormal Minimum Variance Unbiased Estimates (MVUEs)**											
40	MVUE Mean	33031					MVUE SD	30096				
41	MVUE Median	22983					MVUE SEM	9383				
42												
43	**Assuming Lognormal Distribution**											
44	95% H-UCL	78076					90% Chebyshev (MVUE) UCL	61180				
45	95% Chebyshev (MVUE) UCL	73931					97.5% Chebyshev (MVUE) UCL	91628				
46	99% Chebyshev (MVUE) UCL	126390										
47												
48	**Nonparametric Distribution Free UCLs**											
49	95% CLT UCL	46525					95% BCA Bootstrap UCL	50710				
50	95% Standard Bootstrap UCL	45874					95% Bootstrap-t UCL	64002				
51	95% Hall's Bootstrap UCL	120165					95% Percentile Bootstrap UCL	46980				
52	90% Chebyshev(Mean, Sd) UCL	58211					95% Chebyshev(Mean, Sd) UCL	69930				
53	97.5% Chebyshev(Mean, Sd) UCL	86195					99% Chebyshev(Mean, Sd) UCL	118144				

	A	B	C	D	E	F	G	H	I	J	K	L
54												
55	**Suggested UCL to Use**											
56	**Data appear Normal, May want to try Normal Distribution**											
57												
58	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
59	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.											
60	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
61												

APPENDIX H

Ambient Selenium Concentrations in Lake Washington Surface Sediments

Geosyntec consultants

engineers | scientists | innovators

REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT

APPENDIX H: SELENIUM IN LAKE WASHINGTON SURFACE SEDIMENTS

Prepared for

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Prepared by

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Project Number: PNG0869

December 2023

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   1.2 Study Objectives 1
2. AVAILABLE DATASET 2
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Table H-1 Selenium Concentrations in Lake Washington Surface Sediments Summary of Analytical Results – Phase I Survey

Table H-2 Descriptive Statistics for Selenium in Lake Washington Surface Sediments

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Figure H-1 Selenium Concentrations in Lake Washington Surface Sediments Summary

LIST OF ATTACHMENTS

Attachment H-1 EIM Output

Attachment H-2 ProUCL Output

ACRONYMS AND ABBREVIATIONS

AO	Agreed Order
Aspect	Aspect Consulting, LLC
Barbee	Barbee Mill Co., Inc.
cm	centimeters
COPC	contaminant of potential concern
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management System
FS	Feasibility Study
Geosyntec	Geosyntec Consultants, Inc.
ID	identification number
mg/kg	milligrams per kilogram
PQL	Practical Quantification Limit
RI Data Report	*Remedial Investigation Data Report*
RI	Remedial Investigation
SCO	Sediment Cleanup Objective
SRI	Sediment Remedial Investigation
the Site	Barbee Mill Sediment Site

1. INTRODUCTION

This appendix is part of the Remedial Investigation and Feasibility Study (RI/FS) Report prepared by Aspect Consulting, LLC (Aspect) and Geosyntec Consultants, Inc. (Geosyntec) on behalf of the Barbee Mill Co., Inc. (Barbee). Barbee is conducting an RI/FS for the Barbee Mill site (the Site) under an Agreed Order (AO; No. DE 5396), including the first and second amendments, with the Washington State Department of Ecology (Ecology). This appendix presents an evaluation of selenium concentrations in Site surface sediment in comparison to current Lake Washington surface sediment to support the human health and ecological (bioaccumulative) risk evaluation performed in the RI/FS

1.1 Background

Selenium is not considered a Site-related contaminant of potential concern (COPC), as clarified in the Sediment Remedial Investigation (SRI) Work Plan, Appendix B of the Work Plan (Aspect, 2021). However, selenium is a bioaccumulative chemical co-located with Site-related contaminants. Past investigations at the Site showed high concentrations of selenium in surface sediments, but multiple samples were non-detect with maximum reporting limits (20 milligrams per kilogram [mg/kg]) exceeding the practical quantification limit (PQL) of 0.1 mg/kg and the benthic sediment cleanup objective (SCO) of 11 mg/kg (Ecology, 2021). Therefore, surface sediment samples collected during the SRI investigations were evaluated for selenium to assess current Site conditions.

In accordance with the *Sediment Cleanup User's Manual II* (SCUM II [Ecology, 2021]) and Washington Administrative Code 173-204-560[2][a][ii], site-specific factors need to be evaluated to assess the ability to achieve and maintain the SCO after cleanup (in this case, the interim action completed at Barbee Mill). Under the state Sediment Management Standards the SCO screening level for bioaccumulative chemicals is the higher of a risk-based value, natural background or the PQL. A risk-based value has not been calculated, Ecology has not yet established a natural background value for Lake Washington surface sediment, and the PQL is likely exceeded throughout Lake Washington.

1.2 Study Objectives

The purpose of this appendix is to (1) evaluate current selenium concentrations in Lake Washington surface sediment, (2) compare descriptive statistics of Site and ambient conditions, and (3) support evaluation of sediment conditions within the Site. Future sediment surface conditions are expected to reflect ambient concentrations within Lake Washington, but a regional background for selenium in Site sediment has not been established. Specific analyses performed included the following:

- Compilation of the available dataset of selenium concentrations in Lake Washington surface sediments from the Environmental Information Management System (EIM) database
- Comparison of descriptive statistics for selenium concentration in Lake Washington and Site surface sediment

- Recommendation of a selenium concentration representative of ambient selenium in Lake Washington surface sediments

Results of this analysis will assess if selenium levels in Site surface sediment are consistent with ambient concentrations and will ultimately support development of sediment cleanup levels in the RI/FS report.

2. AVAILABLE DATASET

The dataset was downloaded from the official website of the Environmental Information Management System[1] (EIM) by applying the following selection criteria:

1. Analyte: Selenium
2. Location: Lake Washington

The output of the EIM research (298 samples) is reported in Attachment H-1. The acquired dataset was screened by applying the following criteria:

1. Matrix: soil/sediment
2. Collection depth: 0 to 10 centimeters (cm)
3. Sampling method: grab
4. Result basis: dry
5. Analytical method: SW6020A

The resulting dataset (96 samples) includes results from three studies:

1. Kenmore Sediment and Water Investigation (samples collected by Anchor QEA in 2012), EIM study identification number (ID): "AQ_Kenmore2012"
2. Barbee Company Boathouse maintenance dredging DY17 (sample collected by the US Army Corps of Engineers in 2016), EIM study ID: "BARB16"
3. King County Lakes Sediment Monitoring Program (samples collected by the King County Natural Resources Department between 2008 and 2016), EIM study ID: "KingLakeSeds"

The dataset was compiled including data from the King County Lakes Sediment Monitoring Program and the Kenmore Sediment and Water Investigation. The Barbee maintenance dredging study was excluded as samples were collected within the boundary of the Site, and, therefore, are not representative of ambient conditions. The resulting dataset is reported in Table H-1 and shown on Figure H-1.

[1] https://ecology.wa.gov/Research-Data/Data-resources/Environmental-Information-Management-database

3. SUMMARY OF RELEVANT STATISTICS

Descriptive statistics for the dataset of selenium concentrations in Lake Washington and Barbee Mill surface sediments were obtained using ProUCL (USEPA, 2022). The dataset used included detected and non-detected results. The non-detects were reported as reporting limits, for consistency with the project data management guidelines. The output of the ProUCL analysis is reported in Attachment H-2. Table H-2 reports descriptive statistics for the Lake Washington sediment dataset compared to the RI current dataset for the Barbee Mill Site.

4. RECOMMENDATIONS

Results of this analysis can serve to compare selenium concentrations in surface sediment samples collected at the Site to ambient concentrations in Lake Washington sediment. The 90th percentile is often considered an appropriate estimator of upper-bound background values, and it could be useful to evaluate selenium concentrations in Barbee Mill surface sediment.

5. REFERENCES

Aspect Consulting, LLC (Aspect). 2021. *Final Remedial Investigation Work Plan*. Prepared for Barbee Mill Co. Inc. Prepared for submittal to Washington State Department of Ecology. 5 August.

GeoEngineers. 2022. *Draft Gas Work Park Site Remedial Investigation and Feasibility Study*. Prepared for Puget Sound Energy and the City of Seattle. Submitted to Ecology for review. October.

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Ecology. 2021. *Sediment Cleanup User's Manual II* (SCUM II) Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC. Revision 2. Washington State Department of Ecology, Toxics Cleanup Program, Olympia, Washington. Publication No. 12-09-057. First Issued 1991. Third Revision December 2021.

TABLES

Table H-1. Selenium Concentrations in Lake Washington Surface Sediments

Study ID	Location ID	Latitude	Longitude	Accuracy	Collection Date	Reference Point	Top Depth	Bottom Depth	Depth Units	Value	Units	RL	RL_Type	DL	DL Type	Qualifier	Selenium (ND=RL)	Detected Selenium (ND=RL)
KingLakeSeds	KCM-YRRWCRKMTH	47.64853	-122.2078	+/- 3 ft (1 m)	8/23/2010	Sediment Surface	0	10	cm	0.89172	mg/kg	3.94268	PQL	0.764331	MDL	JT	0.89172	1
KingLakeSeds	KCM-EYRRWCRKMTH	47.648964	-122.2068	+/- 3 ft (1 m)	8/23/2010	Sediment Surface	0	10	cm	0.486891	mg/kg	2.26966	PQL	0.449438	MDL	JT	0.486891	1
KingLakeSeds	KCM-0826	47.686762	-122.2353	Unknown	8/24/2010	Sediment Surface	0	10	cm	0.829268	mg/kg	3.18049	PQL	0.634146	MDL	JT	0.829268	1
KingLakeSeds	KCM-0890	47.575435	-122.2673	Unknown	8/24/2010	Sediment Surface	0	10	cm	0.861244	mg/kg	3.04785	PQL	0.62201	MDL	JT	0.861244	1
KingLakeSeds	KCM-0864A	47.571126	-122.2755	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	0.32	mg/kg	0.351	PQL	0.18	MDL	JT	0.32	1
KingLakeSeds	KCM-0804INGWET	47.750279	-122.2579	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	0.48	mg/kg	0.693	PQL	0.35	MDL	JT	0.48	1
KingLakeSeds	KCM-08UNBAYNW	47.65362	-122.2925	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	1	mg/kg	1.9	PQL	0.95	MDL	JT	1	1
KingLakeSeds	KCM-MERSLOU-S1	47.57681	-122.189	+/- 3 ft (1 m)	9/28/2009	Sediment Surface	0	10	cm	0.84507	mg/kg	4.23239	PQL	0.84507	MDL	JT	0.84507	1
KingLakeSeds	KCM-MERSLOUMTH	47.57821	-122.1888	+/- 3 ft (1 m)	9/28/2009	Sediment Surface	0	10	cm	1.02362	mg/kg	4.77953	PQL	0.944882	MDL	JT	1.02362	1
KingLakeSeds	KCM-0826	47.686762	-122.2353	Unknown	9/30/2009	Sediment Surface	0	10	cm	0.857143	mg/kg	2.99048	PQL	0.619048	MDL	JT	0.857143	1
KingLakeSeds	KCM-0890	47.575435	-122.2673	Unknown	9/30/2009	Sediment Surface	0	10	cm	0.780488	mg/kg	2.97561	PQL	0.585366	MDL	JT	0.780488	1
KingLakeSeds	KCM-KENNYBCHPK	47.52361	-122.2078	+/- 3 ft (1 m)	9/30/2009	Sediment Surface	0	10	cm	0.365854	mg/kg	1.83537	PQL	0.365854	MDL	JT	0.365854	1
KingLakeSeds	KCM-0890	47.575435	-122.2673	Unknown	9/16/2008	Sediment Surface	0	10	cm	0.699	mg/kg	0.674	PQL	0.674	MDL		0.699	1
AQ_Kenmore2012	KNMR-HT-01	-122.2658	47.757527	+/- 10 ft (3 m)	11/6/2012	sediment surface	0	10	cm	0.6	mg/kg	0.6	MRL	0.12	MDL	U	0.6	0
AQ_Kenmore2012	KNMR-HT-02	-122.2654	47.757502	+/- 10 ft (3 m)	11/6/2012	sediment surface	0	10	cm	0.6	mg/kg	0.6	MRL	0.12	MDL	U	0.6	0
AQ_Kenmore2012	KNMR-HT-03	-122.2643	47.757282	+/- 10 ft (3 m)	11/6/2012	sediment surface	0	10	cm	0.7	mg/kg	0.7	MRL	0.14	MDL	U	0.7	0
AQ_Kenmore2012	KNMR-HT-04	-122.2634	47.757065	+/- 10 ft (3 m)	11/6/2012	sediment surface	0	10	cm	1	mg/kg	1	MRL	0.19	MDL	U	1	0
AQ_Kenmore2012	KNMR-HT-05	-122.2633	47.756636	+/- 10 ft (3 m)	11/6/2012	sediment surface	0	10	cm	0.6	mg/kg	0.6	MRL	0.12	MDL	U	0.6	0
AQ_Kenmore2012	KNMR-HT-06	-122.2629	47.756574	+/- 10 ft (3 m)	11/6/2012	sediment surface	0	10	cm	0.6	mg/kg	0.6	MRL	0.13	MDL	U	0.6	0
AQ_Kenmore2012	KNMR-HT-11	-122.2741	47.752523	+/- 10 ft (3 m)	11/6/2012	sediment surface	0	10	cm	0.6	mg/kg	0.6	MRL	0.12	MDL	U	0.6	0
AQ_Kenmore2012	KNMR-HT-10	-122.2744	47.752731	+/- 10 ft (3 m)	11/6/2012	sediment surface	0	10	cm	0.6	mg/kg	0.6	MRL	0.11	MDL	U	0.6	0
AQ_Kenmore2012	KNMR-SG-10	-122.2628	47.756396	+/- 10 ft (3 m)	11/7/2012	sediment surface	0	10	cm	0.9	mg/kg	0.9	MRL	0.17	MDL	U	0.9	0
AQ_Kenmore2012	KNMR-SG-11	-122.2619	47.756363	+/- 10 ft (3 m)	11/7/2012	sediment surface	0	10	cm	3	mg/kg	3	MRL	0.58	MDL	U	3	0
AQ_Kenmore2012	KNMR-SG-12	-122.263	47.755842	+/- 10 ft (3 m)	11/7/2012	sediment surface	0	10	cm	2	mg/kg	2	MRL	0.34	MDL	U	2	0
AQ_Kenmore2012	KNMR-SG-13	-122.2608	47.75555	+/- 10 ft (3 m)	11/7/2012	sediment surface	0	10	cm	2	mg/kg	2	MRL	0.44	MDL	U	2	0
AQ_Kenmore2012	KNMR-SG-13	-122.2608	47.75555	+/- 10 ft (3 m)	11/7/2012	sediment surface	0	10	cm	2	mg/kg	2	MRL	0.43	MDL	U	2	0
AQ_Kenmore2012	KNMR-SG-15	-122.2577	47.755	+/- 10 ft (3 m)	11/7/2012	sediment surface	0	10	cm	0.7	mg/kg	0.7	MRL	0.13	MDL	U	0.7	0
AQ_Kenmore2012	KNMR-SG-01	-122.2603	47.753102	+/- 10 ft (3 m)	11/7/2012	sediment surface	0	10	cm	0.6	mg/kg	0.6	MRL	0.12	MDL	U	0.6	0
AQ_Kenmore2012	KNMR-SG-14	-122.2556	47.757146	+/- 10 ft (3 m)	11/7/2012	sediment surface	0	10	cm	1	mg/kg	1	MRL	0.23	MDL	U	1	0
AQ_Kenmore2012	KNMR-SG-02	-122.2599	47.756442	+/- 10 ft (3 m)	11/8/2012	sediment surface	0	22	cm	2	mg/kg	2	MRL	0.4	MDL	U	2	0
AQ_Kenmore2012	KNMR-SG-03	-122.2594	47.756435	+/- 10 ft (3 m)	11/8/2012	sediment surface	0	25	cm	2	mg/kg	2	MRL	0.41	MDL	U	2	0
AQ_Kenmore2012	KNMR-SG-04	-122.2569	47.756369	+/- 10 ft (3 m)	11/8/2012	sediment surface	0	15	cm	0.6	mg/kg	0.6	MRL	0.11	MDL	U	0.6	0
AQ_Kenmore2012	KNMR-SG-05	-122.2583	47.755718	+/- 10 ft (3 m)	11/8/2012	sediment surface	0	23	cm	1	mg/kg	1	MRL	0.29	MDL	U	1	0
AQ_Kenmore2012	KNMR-SG-06	-122.2598	47.755161	+/- 10 ft (3 m)	11/8/2012	sediment surface	0	25	cm	2	mg/kg	2	MRL	0.34	MDL	U	2	0
AQ_Kenmore2012	KNMR-SG-07	-122.2617	47.753883	+/- 10 ft (3 m)	11/8/2012	sediment surface	0	25	cm	1	mg/kg	1	MRL	0.27	MDL	U	1	0
AQ_Kenmore2012	KNMR-SG-07	-122.2617	47.753883	+/- 10 ft (3 m)	11/8/2012	sediment surface	0	25	cm	1	mg/kg	1	MRL	0.28	MDL	U	1	0
AQ_Kenmore2012	KNMR-SG-08	-122.2632	47.752521	+/- 10 ft (3 m)	11/8/2012	sediment surface	0	25	cm	1	mg/kg	1	MRL	0.24	MDL	U	1	0
AQ_Kenmore2012	KNMR-SG-09	-122.2642	47.7515	+/- 10 ft (3 m)	11/8/2012	sediment surface	0	25	cm	1	mg/kg	1	MRL	0.29	MDL	U	1	0
KingLakeSeds	KCM-CHSMCNTR	47.6002	-122.2121	+/- 3 ft (1 m)	8/23/2010	Sediment Surface	0	10	cm	0.211382	mg/kg	1.0374	PQL	0.211382	MDL	U	1.0374	0
KingLakeSeds	KCM-CHSMNORTH	47.600883	-122.213	+/- 3 ft (1 m)	8/23/2010	Sediment Surface	0	10	cm	0.16624	mg/kg	0.828645	PQL	0.16624	MDL	U	0.828645	0
KingLakeSeds	KCM-COZYCOVE	47.640609	-122.224	+/- 3 ft (1 m)	8/23/2010	Sediment Surface	0	10	cm	0.416667	mg/kg	2.10069	PQL	0.416667	MDL	U	2.10069	0
KingLakeSeds	KCM-SHOUTNBCH	47.659663	-122.207	+/- 3 ft (1 m)	8/23/2010	Sediment Surface	0	10	cm	0.150376	mg/kg	0.755639	PQL	0.150376	MDL	U	0.755639	0
KingLakeSeds	KCM-NHOUTNBCH	47.661212	-122.2073	+/- 3 ft (1 m)	8/23/2010	Sediment Surface	0	10	cm	0.144284	mg/kg	0.716981	PQL	0.144284	MDL	U	0.716981	0
KingLakeSeds	KCM-MRSHPKS	47.665598	-122.2078	+/- 3 ft (1 m)	8/23/2010	Sediment Surface	0	10	cm	0.160214	mg/kg	0.807744	PQL	0.160214	MDL	U	0.807744	0
KingLakeSeds	KCM-MRSHPKN	47.666221	-122.2075	+/- 3 ft (1 m)	8/23/2010	Sediment Surface	0	10	cm	0.169271	mg/kg	0.824219	PQL	0.169271	MDL	U	0.824219	0
KingLakeSeds	KCM-CHSMSWMBCH	47.599892	-122.211	+/- 3 ft (1 m)	8/24/2010	Sediment Surface	0	10	cm	0.14218	mg/kg	0.719194	PQL	0.14218	MDL	U	0.719194	0
KingLakeSeds	KCM-MDNBRSWMBCH	47.611119	-122.2119	+/- 3 ft (1 m)	8/24/2010	Sediment Surface	0	10	cm	0.13905	mg/kg	0.695249	PQL	0.13905	MDL	U	0.695249	0
KingLakeSeds	KCM-CLYDSWMBCH	47.614252	-122.2181	+/- 3 ft (1 m)	8/24/2010	Sediment Surface	0	10	cm	0.150463	mg/kg	0.760417	PQL	0.150463	MDL	U	0.760417	0
KingLakeSeds	KCM-HOUTNSWMBCH	47.660651	-122.2071	+/- 3 ft (1 m)	8/24/2010	Sediment Surface	0	10	cm	0.150812	mg/kg	0.74826	PQL	0.150812	MDL	U	0.74826	0
KingLakeSeds	KCM-MARINAPSDS	47.675151	-122.2085	+/- 3 ft (1 m)	8/24/2010	Sediment Surface	0	10	cm	0.151163	mg/kg	0.755814	PQL	0.151163	MDL	U	0.755814	0
KingLakeSeds	KCM-WAVRLYPSDS	47.687033	-122.2174	+/- 3 ft (1 m)	8/24/2010	Sediment Surface	0	10	cm	0.143805	mg/kg	0.722345	PQL	0.143805	MDL	U	0.722345	0
KingLakeSeds	KCM-0852SBN	47.639105	-122.2763	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	0.13	mg/kg	0.253	PQL	0.13	MDL	U	0.253	0
KingLakeSeds	KCM-0864STNSAY	47.57087	-122.279	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	0.14	mg/kg	0.278	PQL	0.14	MDL	U	0.278	0
KingLakeSeds	KCM-0826SPTN	47.683805	-122.2463	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	9	cm	0.2	mg/kg	0.406	PQL	0.2	MDL	U	0.406	0
KingLakeSeds	KCM-0818THCM	47.694966	-122.2712	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	0.15	mg/kg	0.286	PQL	0.15	MDL	U	0.286	0
KingLakeSeds	KCM-0805BSB	47.708194	-122.251	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	8	cm	0.16	mg/kg	0.333	PQL	0.16	MDL	U	0.333	0
KingLakeSeds	KCM-0806JCM	47.70366	-122.2178	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	0.15	mg/kg	0.298	PQL	0.15	MDL	U	0.298	0
KingLakeSeds	KCM-0805STEDS	47.728466	-122.2628	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	0.17	mg/kg	0.337	PQL	0.17	MDL	U	0.337	0
KingLakeSeds	KCM-08UNBAYNE	47.654946	-122.289	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	1.2	mg/kg	2.45	PQL	1.2	MDL	U	2.45	0
KingLakeSeds	KCM-0805STEDN	47.72965	-122.2635	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	0.17	mg/kg	0.341	PQL	0.17	MDL	U	0.341	0
KingLakeSeds	KCM-LOGBOOM	47.757213	-122.2643	+/- 20 ft (6 m)	9/14/2016	Sediment Surface	0	10	cm	0.17	mg/kg	0.336	PQL	0.17	MDL	U	0.336	0

Table H-1. Selenium Concentrations in Lake Washington Surface Sediments

Study ID	Location ID	Latitude	Longitude	Accuracy	Collection Date	Reference Point	Top Depth	Bottom Depth	Depth Units	Value	Units	RL	RL_Type	DL	DL Type	Qualifier	Selenium (ND=RL)	Detected Selenium (ND=RL)
KingLakeSeds	KCM-LKWABLVD-N	47.568027	-122.2712	+/- 3 ft (1 m)	9/15/2008	Sediment Surface	0	10	cm	0.328947	mg/kg	0.328947	PQL	0.328947	MDL	U	0.328947	0
KingLakeSeds	KCM-LKWABLVD-C	47.561687	-122.2652	+/- 3 ft (1 m)	9/15/2008	Sediment Surface	0	10	cm	0.397456	mg/kg	0.405405	PQL	0.397456	MDL	U	0.405405	0
KingLakeSeds	KCM-LKWABLVD-S	47.557782	-122.2617	+/- 3 ft (1 m)	9/15/2008	Sediment Surface	0	10	cm	0.355556	mg/kg	0.361481	PQL	0.355556	MDL	U	0.361481	0
KingLakeSeds	KCM-BOEING-C	47.50244	-122.2091	+/- 3 ft (1 m)	9/15/2008	Sediment Surface	0	10	cm	0.338753	mg/kg	0.338753	PQL	0.338753	MDL	U	0.338753	0
KingLakeSeds	KCM-COUL-C	47.512038	-122.2045	+/- 3 ft (1 m)	9/15/2008	Sediment Surface	0	10	cm	0.398773	mg/kg	0.398773	PQL	0.398773	MDL	U	0.398773	0
KingLakeSeds	KCM-COUL-S	47.509173	-122.2033	+/- 3 ft (1 m)	9/15/2008	Sediment Surface	0	10	cm	0.591133	mg/kg	0.605911	PQL	0.591133	MDL	U	0.605911	0
KingLakeSeds	KCM-COUL-N	47.515384	-122.2078	+/- 3 ft (1 m)	9/15/2008	Sediment Surface	0	10	cm	0.666667	mg/kg	0.666667	PQL	0.666667	MDL	U	0.666667	0
KingLakeSeds	KCM-0820SB	47.583334	-122.2872	+/- 20 ft (6 m)	9/15/2016	Sediment Surface	0	7	cm	0.14	mg/kg	0.285	PQL	0.14	MDL	U	0.285	0
KingLakeSeds	KCM-SD007SB	47.608778	-122.2826	+/- 20 ft (6 m)	9/15/2016	Sediment Surface	0	6	cm	0.14	mg/kg	0.281	PQL	0.14	MDL	U	0.281	0
KingLakeSeds	KCM-0852SB	47.635722	-122.2765	Unknown	9/15/2016	Sediment Surface	0	7	cm	0.15	mg/kg	0.308	PQL	0.15	MDL	U	0.308	0
KingLakeSeds	KCM-0818SB	47.696749	-122.2727	+/- 20 ft (6 m)	9/15/2016	Sediment Surface	0	6	cm	0.12	mg/kg	0.237	PQL	0.12	MDL	U	0.237	0
KingLakeSeds	KCM-0806SB	47.703721	-122.2149	+/- 20 ft (6 m)	9/15/2016	Sediment Surface	0	8	cm	0.16	mg/kg	0.312	PQL	0.16	MDL	U	0.312	0
KingLakeSeds	KCM-0806JBBW	47.70093	-122.2108	+/- 20 ft (6 m)	9/15/2016	Sediment Surface	0	6	cm	0.16	mg/kg	0.306	PQL	0.16	MDL	U	0.306	0
KingLakeSeds	KCM-SEWBCH-N	47.551506	-122.2581	+/- 3 ft (1 m)	9/16/2008	Sediment Surface	0	10	cm	0.322181	mg/kg	0.322181	PQL	0.322181	MDL	U	0.322181	0
KingLakeSeds	KCM-SEWBCH-S	47.548508	-122.2568	+/- 3 ft (1 m)	9/16/2008	Sediment Surface	0	10	cm	0.358166	mg/kg	0.358166	PQL	0.358166	MDL	U	0.358166	0
KingLakeSeds	KCM-PRITCHBCH	47.529729	-122.263	+/- 3 ft (1 m)	9/16/2008	Sediment Surface	0	10	cm	0.31407	mg/kg	0.31407	PQL	0.31407	MDL	U	0.31407	0
KingLakeSeds	KCM-MARTHAWAPK	47.541803	-122.2594	+/- 3 ft (1 m)	9/16/2008	Sediment Surface	0	10	cm	0.349854	mg/kg	0.349854	PQL	0.349854	MDL	U	0.349854	0
KingLakeSeds	KCM-SEWPK-E	47.553326	-122.2464	+/- 3 ft (1 m)	9/16/2008	Sediment Surface	0	10	cm	0.555556	mg/kg	0.5625	PQL	0.555556	MDL	U	0.5625	0
KingLakeSeds	KCM-SEWPK-N	47.562236	-122.2531	+/- 3 ft (1 m)	9/16/2008	Sediment Surface	0	10	cm	0.367751	mg/kg	0.367751	PQL	0.367751	MDL	U	0.367751	0
KingLakeSeds	KCM-SEWPK-W	47.558547	-122.2554	+/- 3 ft (1 m)	9/16/2008	Sediment Surface	0	10	cm	0.437956	mg/kg	0.439781	PQL	0.437956	MDL	U	0.439781	0
KingLakeSeds	KCM-0826	47.686762	-122.2353	Unknown	9/16/2008	Sediment Surface	0	10	cm	0.710383	mg/kg	0.710383	PQL	0.710383	MDL	U	0.710383	0
KingLakeSeds	KCM-COULBCH	47.50454	-122.2032	+/- 3 ft (1 m)	9/17/2008	Sediment Surface	0	10	cm	0.297767	mg/kg	0.297767	PQL	0.297767	MDL	U	0.297767	0
KingLakeSeds	KCM-NEWCBCH-S	47.563235	-122.1892	+/- 3 ft (1 m)	9/28/2009	Sediment Surface	0	10	cm	0.162602	mg/kg	0.811653	PQL	0.162602	MDL	U	0.811653	0
KingLakeSeds	KCM-COALCRKMTH	47.573795	-122.1912	+/- 3 ft (1 m)	9/28/2009	Sediment Surface	0	10	cm	0.172414	mg/kg	0.869253	PQL	0.172414	MDL	U	0.869253	0
KingLakeSeds	KCM-MERSLOU-S2	47.577474	-122.1885	+/- 3 ft (1 m)	9/28/2009	Sediment Surface	0	10	cm	1.03448	mg/kg	5.37931	PQL	1.03448	MDL	U	5.37931	0
KingLakeSeds	KCM-MERSLOU-N	47.578333	-122.19	+/- 3 ft (1 m)	9/28/2009	Sediment Surface	0	10	cm	0.991736	mg/kg	5.01653	PQL	0.991736	MDL	U	5.01653	0
KingLakeSeds	KCM-NEWCSWMBCH	47.565922	-122.1915	+/- 3 ft (1 m)	9/29/2009	Sediment Surface	0	10	cm	0.195783	mg/kg	0.966867	PQL	0.195783	MDL	U	0.966867	0
KingLakeSeds	KCM-ENATBCHPK	47.578784	-122.197	+/- 3 ft (1 m)	9/29/2009	Sediment Surface	0	10	cm	0.152761	mg/kg	0.753231	PQL	0.152761	MDL	U	0.753231	0
KingLakeSeds	KCM-MAYCRKMTH	47.527947	-122.2051	+/- 3 ft (1 m)	9/30/2009	Sediment Surface	0	10	cm	0.178571	mg/kg	0.861264	PQL	0.178571	MDL	U	0.861264	0
KingLakeSeds	KCM-NEWCBCH-C1	47.563996	-122.1898	+/- 3 ft (1 m)	9/30/2009	Sediment Surface	0	10	cm	0.169731	mg/kg	0.847242	PQL	0.169731	MDL	U	0.847242	0
KingLakeSeds	KCM-NEWCBCH-C2	47.564717	-122.1903	+/- 3 ft (1 m)	9/30/2009	Sediment Surface	0	10	cm	0.173103	mg/kg	0.836218	PQL	0.173103	MDL	U	0.836218	0
KingLakeSeds	KCM-NEWCBCH-C3	47.565189	-122.1909	+/- 3 ft (1 m)	9/30/2009	Sediment Surface	0	10	cm	0.157895	mg/kg	0.819737	PQL	0.157895	MDL	U	0.819737	0
KingLakeSeds	KCM-NEWCBCH-N1	47.565374	-122.1915	+/- 3 ft (1 m)	9/30/2009	Sediment Surface	0	10	cm	0.166667	mg/kg	0.843056	PQL	0.166667	MDL	U	0.843056	0
KingLakeSeds	KCM-NEWCBCH-N2	47.566359	-122.1916	+/- 3 ft (1 m)	9/30/2009	Sediment Surface	0	10	cm	0.14068	mg/kg	0.71864	PQL	0.14068	MDL	U	0.71864	0

Acronyms
cm - centimeters; ft - feet; m - meters; MDL - method detection limit; mg/kg - milligrams per kilogram; ND - non-detect; PQL - practical quantitation limit; RL - reporting levels

Table H-2. Descriptive Statistics for Selenium in Lake Washington Surface Sediments

	Lake Washington[1,2] 2008-2016 (ND=RL)	Barbee Mill[2] RI Current Dataset (ND=MDL)
Descriptive Statistics - Based on Detects and NDs (KM Method)		
Observations	95	29
Detected	13	16
Non detected	82	13
% ND	86.3	45
Min ND	0.237	0.2
Max ND	5.38	1.2
KM Mean	0.340	0.68
KM Variance	0.044	0.22
KM SD	0.210	0.47
KM CV	0.618	0.69
Data Distribution for Detects and NDs (KM Method)		
25%ile(Q1)	0.367	0.41
50%ile(Q2)	0.717	0.86
75%ile(Q3)	0.880	1.09
90%ile	2.00	1.242
95%ile	2.03	1.416
99%ile	5.04	1.737

Notes

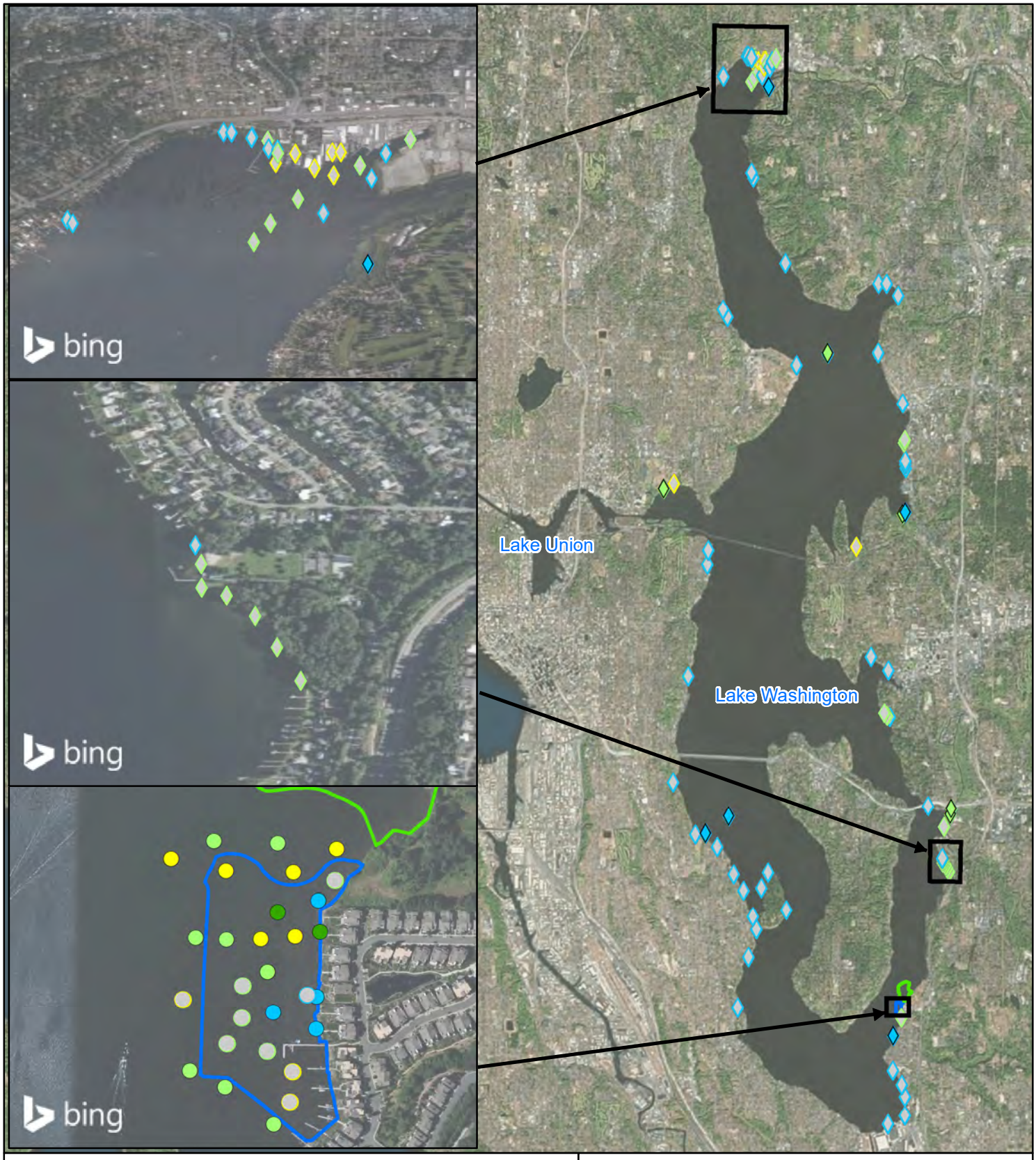
1 Dataset include selenium concentrations in sediment grab samples (0-10 cm below mudline) collected during from 2008 - 2016 within Lake Washington. Data were retrieved from the Environmental Information Management system of the Washington State Department of Ecology on January 13 2022

2 Summary statistics were estimated in ProUCL using the KM method for datasets including non-detects at the reporting limit. The RI current conditions dataset incldues surface sediment colelcted between 1997 and 2022 within the Barbee Mill Site Sediment boundary.

Acronyms

%ile - percentile; cm - centimeters; CV - coefficient of variation; KM - Kaplan Meier; MDL - method detection limit; ND - non-detect; Q - quartile; RL - reporting limit; SD - standard deviation

FIGURE



Legend

Selenium Concentration (mg/kg)

- Non-Detected Sample Location
- < 0.8
- 0.8 - 1.2
- 1.2 - 1.6
- 1.6 - 5.37
- Quendall Sediment Cleanup Area
- Preliminary Sediment Site Boundary
- 2021 Selenium Sample Location
- Historical Background Selenium Sample Location

Notes:
1. Historical surface sediment (top 25 cm) data are from: Kenmore Sediment and Water Investigation, and the King County Lakes Sediment Monitoring Program. Data were retrieved from the State of Washington Department of Ecology EIM database on January 13 2022.
2. Non detected Historical Background Selenium concentrations are reported as the reporting limit listed in the respective EIM flatfile, which represents either the method reporting limit or the practical quantification limit or the limit of quantification.
3. For purposes of comparison, the benthic SCO and CSL are 11 mg/kg and > 20 mg/kg, respectively.

N

0 2,500 5,000 10,000 Feet

Selenium Concentrations in Lake Washington Surface Sediments

Barbee Mill Sediment Site,
Renton, WA

Geosyntec consultants

PNG0869 | January 2023

Figure H-1

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\Preliminary Results\Revisions012622\Figure H-1 Background Selenium ConcentrationV2.mxd 1/5/2023 10:15:56 AM

ATTACHMENT H-1
EIM OUTPUT

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Study_Name	Location_ID	Location_Name	Field_Collection_Type	Field_Collector	Field_Collection_Start_Date	Field_Collection_Start_Time	Field_Collection_Start_Date_Time	Field_Collection_End_Date	Field_Collection_End_Time	Field_Collection_End_Date_Time	Field_Collection_Comment
KENMO19	KENMO19KEN02	Kenmore federal navigation channel characterization, DY19	KENMO19KEN02	Kenmore DMMU 02	Sample	Consultant, Professional	1/21/2019	15:00:00	1/21/2019 15:00	1/21/2019	15:00:00	1/21/2019 15:00	KEN02 and KEN10 field replicates
KENMO19	KENMO19KEN01	Kenmore federal navigation channel characterization, DY19	KENMO19KEN01	Kenmore DMMU 01	Sample	Consultant, Professional	1/23/2019	15:50:00	1/23/2019 15:50	1/23/2019	15:50:00	1/23/2019 15:50	
KENMO19	KENMO19KEN02	Kenmore federal navigation channel characterization, DY19	KENMO19KEN02	Kenmore DMMU 02	Sample	Consultant, Professional	1/24/2019	15:01:00	1/24/2019 15:01	1/24/2019	15:01:00	1/24/2019 15:01	KEN02 and KEN10 field replicates
KENMO19	KENMO19KEN03	Kenmore federal navigation channel characterization, DY19	KENMO19KEN03	Kenmore DMMU 03	Sample	Consultant, Professional	1/25/2019	15:00:00	1/25/2019 15:00	1/25/2019	15:00:00	1/25/2019 15:00	
KENMO19	KENMO19KEN04	Kenmore federal navigation channel characterization, DY19	KENMO19KEN04	Kenmore DMMU 04	Sample	Consultant, Professional	1/28/2019	15:00:00	1/28/2019 15:00	1/28/2019	15:00:00	1/28/2019 15:00	
KENMO19	KENMO19KEN07	Kenmore federal navigation channel characterization, DY19	KENMO19KEN07	Kenmore DMMU 07	Sample	Consultant, Professional	1/28/2019	15:15:00	1/28/2019 15:15	1/28/2019	15:15:00	1/28/2019 15:15	
KENMO19	KENMO19KEN05	Kenmore federal navigation channel characterization, DY19	KENMO19KEN05	Kenmore DMMU 05	Sample	Consultant, Professional	1/29/2019	15:20:00	1/29/2019 15:20	1/29/2019	15:20:00	1/29/2019 15:20	
KENMO19	KENMO19KEN06	Kenmore federal navigation channel characterization, DY19	KENMO19KEN06	Kenmore DMMU 06	Sample	Consultant, Professional	1/30/2019	15:00:00	1/30/2019 15:00	1/30/2019	15:00:00	1/30/2019 15:00	
KENMO19	KENMO19KEN08	Kenmore federal navigation channel characterization, DY19	KENMO19KEN08	Kenmore DMMU 08	Sample	Consultant, Professional	2/1/2019	14:20:00	2/1/2019 14:20	2/1/2019	14:20:00	2/1/2019 14:20	
KENMO19	KENMO19KEN09	Kenmore federal navigation channel characterization, DY19	KENMO19KEN09	Kenmore DMMU 09	Sample	Consultant, Professional	2/2/2019	16:00:00	2/2/2019 16:00	2/2/2019	16:00:00	2/2/2019 16:00	
NYCLW08	DMMP-NYCLW-AF-0255-C1	Newport Yacht Club, Coal Creek Delta, DY09	NYCLW0255-C1	DMMP-NYCLW-AF-0255-C1	sample	Consultant, Professional	5/22/2008		5/22/2008 0:00	5/22/2008		5/22/2008 0:00	
NYCLW08	DMMP-NYCLW-AF-0255-C1	Newport Yacht Club, Coal Creek Delta, DY09	NYCLW0255-C1	DMMP-NYCLW-AF-0255-C1	sample	Consultant, Professional	5/22/2008		5/22/2008 0:00	5/22/2008		5/22/2008 0:00	
BARBB16	DMMU1	Barbee Company Boathouse maintenance dredging DY17	BARBB16DMMU1	DMMU1	Sample	Consultant, Professional	7/4/2016	13:00:00	7/4/2016 13:00	7/4/2016	13:00:00	7/4/2016 13:00	Composite of 3 samples representing 2700 CY
MILLR05	DMMP-MILLR-AF-0221-C2	Mercer Island Lake Line Replacement, DY06	MILLR0221-C2	DMMP-MILLR-AF-0221-C2	Sample	Consultant, Professional	7/25/2005		7/25/2005 0:00	7/25/2005		7/25/2005 0:00	
MILLR05	DMMP-MILLR-AF-0221-C1	Mercer Island Lake Line Replacement, DY06	MILLR0221-C1	DMMP-MILLR-AF-0221-C1	Sample	Consultant, Professional	7/25/2005		7/25/2005 0:00	7/25/2005		7/25/2005 0:00	
MILLR05	DMMP-MILLR-AF-0221-C3	Mercer Island Lake Line Replacement, DY06	MILLR0221-C3	DMMP-MILLR-AF-0221-C3	Sample	Consultant, Professional	7/25/2005		7/25/2005 0:00	7/25/2005		7/25/2005 0:00	
NMERC16	NMERC16C1	North Mercer Island Enatai Interceptor Upgrade Project DY2020	NMERC16C1	NMERC16C1	Sample	Consultant, Professional	8/10/2016	11:30:00	8/10/2016 11:30	8/10/2016	11:30:00	8/10/2016 11:30	
NMERC16	NMERC16C1	North Mercer Island Enatai Interceptor Upgrade Project DY2020	NMERC16C1	NMERC16C1	Sample	Consultant, Professional	8/10/2016	11:50:00	8/10/2016 11:50	8/10/2016	11:50:00	8/10/2016 11:50	
POSFT04	DMMP-POSFT-BF-0208-R2	Port of Seattle - Fishermen's Terminal, DY05	POSFT0208-R2	DMMP-POSFT-BF-0208-R2	sample	Consultant, Professional	10/14/2004		10/14/2004 0:00	10/14/2004		10/14/2004 0:00	
POSFT04	DMMP-POSFT-BF-0208-R1	Port of Seattle - Fishermen's Terminal, DY05	POSFT0208-R1	DMMP-POSFT-BF-0208-R1	sample	Consultant, Professional	10/14/2004		10/14/2004 0:00	10/14/2004		10/14/2004 0:00	
BCBAD07	DMMP-BCBAD-AF-0246-C1	Barbee Company Boathouse maintenance dredging, Lake Washington, DY08	BCBAD0246-C1	DMMP-BCBAD-AF-0246-C1	sample	Consultant, Professional	10/21/2007		10/21/2007 0:00	10/21/2007		10/21/2007 0:00	
AQ_Kenmore2012	HT-01	Kenmore Sediment and Water Investigation	KNMR-HT-01	HT-01	Sample	Consultant, Professional	11/6/2012	8:36:00	11/6/2012 8:36	11/6/2012	8:36:00	11/6/2012 0:00	
AQ_Kenmore2012	HT-02	Kenmore Sediment and Water Investigation	KNMR-HT-02	HT-02	Sample	Consultant, Professional	11/6/2012	8:56:00	11/6/2012 8:56	11/6/2012	8:56:00	11/6/2012 0:00	
AQ_Kenmore2012	HT-03	Kenmore Sediment and Water Investigation	KNMR-HT-03	HT-03	Sample	Consultant, Professional	11/6/2012	9:20:00	11/6/2012 9:20	11/6/2012	9:20:00	11/6/2012 0:00	
AQ_Kenmore2012	HT-04	Kenmore Sediment and Water Investigation	KNMR-HT-04	HT-04	Sample	Consultant, Professional	11/6/2012	10:02:00	11/6/2012 10:02	11/6/2012	10:02:00	11/6/2012 0:00	
AQ_Kenmore2012	HT-05	Kenmore Sediment and Water Investigation	KNMR-HT-05	HT-05	Sample	Consultant, Professional	11/6/2012	10:33:00	11/6/2012 10:33	11/6/2012	10:33:00	11/6/2012 0:00	
AQ_Kenmore2012	HT-06	Kenmore Sediment and Water Investigation	KNMR-HT-06	HT-06	Sample	Consultant, Professional	11/6/2012	11:12:00	11/6/2012 11:12	11/6/2012	11:12:00	11/6/2012 0:00	
AQ_Kenmore2012	HT-11	Kenmore Sediment and Water Investigation	KNMR-HT-11	HT-11	Sample	Consultant, Professional	11/6/2012	13:55:00	11/6/2012 13:55	11/6/2012	13:55:00	11/6/2012 0:00	
AQ_Kenmore2012	HT-10	Kenmore Sediment and Water Investigation	KNMR-HT-10	HT-10	Sample	Consultant, Professional	11/6/2012	14:11:00	11/6/2012 14:11	11/6/2012	14:11:00	11/6/2012 0:00	
AQ_Kenmore2012	SG-10	Kenmore Sediment and Water Investigation	KNMR-SG-10	SG-10	Sample	Consultant, Professional	11/7/2012	8:58:00	11/7/2012 8:58	11/7/2012	8:58:00	11/7/2012 0:00	
AQ_Kenmore2012	SG-11	Kenmore Sediment and Water Investigation	KNMR-SG-11	SG-11	Sample	Consultant, Professional	11/7/2012	9:42:00	11/7/2012 9:42	11/7/2012	9:42:00	11/7/2012 0:00	
AQ_Kenmore2012	SG-12	Kenmore Sediment and Water Investigation	KNMR-SG-12	SG-12	Sample	Consultant, Professional	11/7/2012	10:07:00	11/7/2012 10:07	11/7/2012	10:07:00	11/7/2012 0:00	
AQ_Kenmore2012	SG-13	Kenmore Sediment and Water Investigation	KNMR-SG-13	SG-13	Sample	Consultant, Professional	11/7/2012	10:36:00	11/7/2012 10:36	11/7/2012	10:36:00	11/7/2012 0:00	
AQ_Kenmore2012	SG-13	Kenmore Sediment and Water Investigation	KNMR-SG-13	SG-13	Sample	Consultant, Professional	11/7/2012	10:36:00	11/7/2012 10:36	11/7/2012	10:36:00	11/7/2012 0:00	
AQ_Kenmore2012	SG-15	Kenmore Sediment and Water Investigation	KNMR-SG-15	SG-15	Sample	Consultant, Professional	11/7/2012	11:55:00	11/7/2012 11:55	11/7/2012	11:55:00	11/7/2012 0:00	
AQ_Kenmore2012	SG-01	Kenmore Sediment and Water Investigation	KNMR-SG-01	SG-01	Sample	Consultant, Professional	11/7/2012	14:17:00	11/7/2012 14:17	11/7/2012	14:17:00	11/7/2012 0:00	
AQ_Kenmore2012	WS-10	Kenmore Sediment and Water Investigation	KNMR-WS-10	WS-10	Sample	Consultant, Professional	11/7/2012	14:50:00	11/7/2012 14:50	11/7/2012	14:50:00	11/7/2012 0:00	
AQ_Kenmore2012	WS-10	Kenmore Sediment and Water Investigation	KNMR-WS-10	WS-10	Sample	Consultant, Professional	11/7/2012	14:50:00	11/7/2012 14:50	11/7/2012	14:50:00	11/7/2012 0:00	
AQ_Kenmore2012	HT-01	Kenmore Sediment and Water Investigation	KNMR-HT-01	HT-01	Sample	Consultant, Professional	11/7/2012	15:46:00	11/7/2012 15:46	11/7/2012	15:46:00	11/7/2012 0:00	
AQ_Kenmore2012	HT-01	Kenmore Sediment and Water Investigation	KNMR-HT-01	HT-01	Sample	Consultant, Professional	11/7/2012	15:46:00	11/7/2012 15:46	11/7/2012	15:46:00	11/7/2012 0:00	
AQ_Kenmore2012	HT-04	Kenmore Sediment and Water Investigation	KNMR-HT-04	HT-04	Sample	Consultant, Professional	11/7/2012	16:15:00	11/7/2012 16:15	11/7/2012	16:15:00	11/7/2012 0:00	
AQ_Kenmore2012	HT-04	Kenmore Sediment and Water Investigation	KNMR-HT-04	HT-04	Sample	Consultant, Professional	11/7/2012	16:15:00	11/7/2012 16:15	11/7/2012	16:15:00	11/7/2012 0:00	
AQ_Kenmore2012	HT-04	Kenmore Sediment and Water Investigation	KNMR-HT-04	HT-04	Sample	Consultant, Professional	11/7/2012	16:15:00	11/7/2012 16:15	11/7/2012	16:15:00	11/7/2012 0:00	
AQ_Kenmore2012	HT-04	Kenmore Sediment and Water Investigation	KNMR-HT-04	HT-04	Sample	Consultant, Professional	11/7/2012	16:15:00	11/7/2012 16:15	11/7/2012	16:15:00	11/7/2012 0:00	
AQ_Kenmore2012	HT-04	Kenmore Sediment and Water Investigation	KNMR-HT-04	HT-04	Sample	Consultant, Professional	11/7/2012	16:15:00	11/7/2012 16:15	11/7/2012	16:15:00	11/7/2012 0:00	
AQ_Kenmore2012	SG-14	Kenmore Sediment and Water Investigation	KNMR-SG-14	SG-14	Sample	Consultant, Professional	11/7/2012	18:02:00	11/7/2012 18:02	11/7/2012	18:02:00	11/7/2012 0:00	
AQ_Kenmore2012	SG-02	Kenmore Sediment and Water Investigation	KNMR-SG-02	SG-02	Sample	Consultant, Professional	11/8/2012	8:15:00	11/8/2012 8:15	11/8/2012	8:15:00	11/8/2012 0:00	
AQ_Kenmore2012	SG-03	Kenmore Sediment and Water Investigation	KNMR-SG-03	SG-03	Sample	Consultant, Professional	11/8/2012	8:48:00	11/8/2012 8:48	11/8/2012	8:48:00	11/8/2012 0:00	
AQ_Kenmore2012	SG-04	Kenmore Sediment and Water Investigation	KNMR-SG-04	SG-04	Sample	Consultant, Professional	11/8/2012	9:41:00	11/8/2012 9:41	11/8/2012	9:41:00	11/8/2012 0:00	
AQ_Kenmore2012	SG-05	Kenmore Sediment and Water Investigation	KNMR-SG-05	SG-05	Sample	Consultant, Professional	11/8/2012	10:28:00	11/8/2012 10:28	11/8/2012	10:28:00	11/8/2012 0:00	
AQ_Kenmore2012	SG-06	Kenmore Sediment and Water Investigation	KNMR-SG-06	SG-06	Sample	Consultant, Professional	11/8/2012	11:12:00	11/8/2012 11:12	11/8/2012	11:12:00	11/8/2012 0:00	
AQ_Kenmore2012	SG-07	Kenmore Sediment and Water Investigation	KNMR-SG-07	SG-07	Sample	Consultant, Professional	11/8/2012	12:18:00	11/8/2012 12:18	11/8/2012	12:18:00	11/8/2012 0:00	
AQ_Kenmore2012	SG-07	Kenmore Sediment and Water Investigation	KNMR-SG-07	SG-07	Sample	Consultant, Professional	11/8/2012	12:18:00	11/8/2012 12:18	11/8/2012	12:18:00	11/8/2012 0:00	
AQ_Kenmore2012	SG-08	Kenmore Sediment and Water Investigation	KNMR-SG-08	SG-08	Sample	Consultant, Professional	11/8/2012	13:05:00	11/8/2012 13:05	11/8/2012	13:05:00	11/8/2012 0:00	
AQ_Kenmore2012	SG-09	Kenmore Sediment and Water Investigation	KNMR-SG-09	SG-09	Sample	Consultant, Professional	11/8/2012	13:42:00	11/8/2012 13:42	11/8/2012	13:42:00	11/8/2012 0:00	
RMASB06	DMMP-RMASB-AF-0229-C1	Renton Municipal Airport - Seaplane Base, DY07	RMASB0229-C1	DMMP-RMASB-AF-0229-C1	sample	Consultant, Professional	11/14/2006		11/14/2006 0:00	11/14/2006		11/14/2006 0:00	
RMASB06	DMMP-RMASB-AF-0229-C2	Renton Municipal Airport - Seaplane Base, DY07	RMASB0229-C2	DMMP-RMASB-AF-0229-C2	sample	Consultant, Professional	11/27/2006		11/27/2006 0:00	11/27/2006		11/27/2006 0:00	
EPAGAS95	30	EPA WA Natural Gas - Seattle Plant	EPAGAS9530	EPAGAS95	Sample	Government, Misc Federal	1/27/1995		1/27/1995 0:00	1/27/1995		1/27/1995 0:00	
EPAGAS95	28	EPA WA Natural Gas - Seattle Plant	EPAGAS9528	EPAGAS95	Sample	Government, Misc Federal	12/8/1994		12/8/1994 0:00	12/8/1994		12/8/1994 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	1/6/2015	9:40:00	1/6/2015 9:40	1/6/2015	9:40:00	1/6/2015 9:40	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	1/6/2015	9:43:00	1/6/2015 9:43	1/6/2015	9:43:00	1/6/2015 9:43	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	1/21/2015	12:10:00	1/21/2015 12:10	1/21/2015	12:10:00	1/21/2015 12:10	Peristaltic Pump with C-Flex Tubing
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	1/21/2015	12:20:00	1/21/2015 12:20	1/21/2015	12:20:00	1/21/2015 12:20	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	2/19/2008		2/19/2008 0:00	2/19/2008		2/19/2008 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	2/19/2008		2/19/2008 0:00	2/19/2008		2/19/2008 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	2/19/2008		2/19/2008 0:00	2/19/2008		2/19/2008 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	2/19/2008		2/19/2008 0:00	2/19/2008		2/19/2008 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	2/19/2008		2/19/2008 0:00	2/19/2008		2/19/2008 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	2/19/2008		2/19/2008 0:00	2/19/2008		2/19/2008 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	2/19/2008		2/19/2008 0:00	2/19/2008		2/19/2008 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	2/19/2008		2/19/2008 0:00	2/19/2008		2/19/2008 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	2/24/2015	11:43:00	2/24/2015 11:43	2/24/2015	11:43:00	2/24/2015 11:43	Peristaltic Pump with C-Flex Tubing
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	2/24/2015	11:47:00	2/24/2015 11:47	2/24/2015	11:47:00	2/24/2015 11:47	Peristaltic Pump with C-Flex Tubing_Syringe Filter plus Capsule Filter used
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	2/24/2015	11:47:00	2/24/2015 11:47	2/24/2015	11:47:00	2/24/2015 11:47	Peristaltic Pump with C-Flex Tubing_Syringe Filter plus Capsule Filter used
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	2/24/2015	11:50:00	2/24/2015 11:50	2/24/2015	11:50:00	2/24/2015 11:50	Peristaltic Pump with C-Flex Tubing
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	2/24/2015	11:53:00	2/24/2015 11:53	2/24/2015	11:53:00	2/24/2015 11:53	Peristaltic Pump with C-Flex Tubing_Syringe Filter plus Capsule Filter used
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	2/26/2007		2/26/2007 0:00	2/26/2007		2/26/2007 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	2/26/2007		2/26/2007 0:00	2/26/2007		2/26/2007 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	2/26/2007		2/26/2007 0:00	2/26/2007		2/26/2007 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	2/26/2007		2/26/2007 0:00	2/26/2007		2/26/2007 0:00	

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Field_Collection_Area	Field_Collection_Area_Units	Field_Collection_Reference_Point	Field_Collection_Upper_Depth	Field_Collection_Lower_Depth	Field_Collection_Depth_Units	Upper_Depth_In_Feet	Lower_Depth_In_Feet	Well_Water_Level_Measuring_Point_Or_TOC_ID	Sample_ID	Sample_Field_Replicate_ID	Sample_Replicate_Flag	Sample_Sub_ID	Sample_Composite_Flag	Storm_Event_Qualifier	Sample_Matrix	Sample_Source	Sample_Use	Sample_Collection_Method	Sample_Collection_Method_Description	Sample_Preparation_Method
KENMO19	KENMO19KEN02			Sediment Surface	0	4.2	ft	0	4.2		KENMO19_KEN02	1	Y		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	SW3050B
KENMO19	KENMO19KEN01			Sediment Surface	0	3.1	ft	0	3.1		KENMO19_KEN01		N		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	SW3050B
KENMO19	KENMO19KEN02			Sediment Surface	0	4.2	ft	0	4.2		KENMO19_KEN10	2	Y		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	SW3050B
KENMO19	KENMO19KEN03			Sediment Surface	0	4.2	ft	0	4.2		KENMO19_KEN03		N		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	SW3050B
KENMO19	KENMO19KEN04			Sediment Surface	0	4	ft	0	4		KENMO19_KEN04		N		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	SW3050B
KENMO19	KENMO19KEN07			Sediment Surface	0	4.8	ft	0	4.8		KENMO19_KEN07		N		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	SW3050B
KENMO19	KENMO19KEN05			Sediment Surface	0	4.5	ft	0	4.5		KENMO19_KEN05		N		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	SW3050B
KENMO19	KENMO19KEN06			Sediment Surface	0	4.3	ft	0	4.3		KENMO19_KEN06		N		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	SW3050B
KENMO19	KENMO19KEN08			Sediment Surface	0	4.3	ft	0	4.3		KENMO19_KEN08		N		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	SW3050B
KENMO19	KENMO19KEN09			Sediment Surface	0	3.7	ft	0	3.7		KENMO19_KEN09		N		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	SW3050B
NYCLW08	DMMP-NYCLW-AF-0255-C1			sediment surface	0	4	ft	0	4		C1 (surface)		U		Y		Solid/Sediment	Freshwater Sediment	T	DRILL-RTRY	Drill, Rotary	
NYCLW08	DMMP-NYCLW-AF-0255-C1			sediment surface	4	14.7	ft	4	14.7		C2 (subsurface)		U		Y		Solid/Sediment	Freshwater Sediment	T	CORE-MISC	Corer, type unspecified	
BARBB16	DMMU1			sediment surface	0	2.5	ft	0	2.5		07042016BARBEE-C				Y		Solid/Sediment	Freshwater Sediment	T	GRAB-MISC	Grab sampler, type unspecified	SW3050B
MILLR05	DMMP-MILLR-AF-0221-C2			Sediment Surface	0	2.9	ft	0	2.9		C2				Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	
MILLR05	DMMP-MILLR-AF-0221-C1			Sediment Surface	0	5	ft	0	5		C1				Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	
MILLR05	DMMP-MILLR-AF-0221-C3			Sediment Surface	0	5	ft	0	5		C3				Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	
NMERC16	NMERC16C1			sediment surface	0	4	ft	0	4		NME:0-4c				Y		Solid/Sediment	Freshwater Sediment		CORE-SONIC	Corer, Sonic drill sampler barrel	
NMERC16	NMERC16C1			sediment surface	4	7	ft	4	7		NME:4-7c				Y		Solid/Sediment	Freshwater Sediment		CORE-SONIC	Corer, Sonic drill sampler barrel	
POSFT04	DMMP-POSFT-BF-0208-R2			sediment surface	0	0.3	ft	0	0.3		FT-REF-1		U		N		Solid/Sediment	Freshwater Sediment	R	VANVEEN	Grab sampler, Van Veen, size unspecified	
POSFT04	DMMP-POSFT-BF-0208-R1			sediment surface	0	0.3	ft	0	0.3		FT-REF-2		U		N		Solid/Sediment	Freshwater Sediment	R	VANVEEN	Grab sampler, Van Veen, size unspecified	
BCBAD07	DMMP-BCBAD-AF-0246-C1			sediment surface	0	1.1	ft	0	1.1		DMMU-C1		U		Y		Solid/Sediment	Freshwater Sediment	T	CORE-MISC	Corer, type unspecified	
AQ_Kenmore2012	HT-01			sediment surface	0	10	cm	0	0.328083		HT-01-S-C-121106		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	HT-02			sediment surface	0	10	cm	0	0.328083		HT-02-S-C-121106		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	HT-03			sediment surface	0	10	cm	0	0.328083		HT-03-S-C-121106		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	HT-04			sediment surface	0	10	cm	0	0.328083		HT-04-S-C-121106		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	HT-05			sediment surface	0	10	cm	0	0.328083		HT-05-S-C-121106		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	HT-06			sediment surface	0	10	cm	0	0.328083		HT-06-S-E-121106		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	HT-11			sediment surface	0	10	cm	0	0.328083		HT-11-S-LFP-121106		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	HT-10			sediment surface	0	10	cm	0	0.328083		HT-10-S-LFP-121106		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-10			sediment surface	0	10	cm	0	0.328083		SG-10-S-E-121107		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-11			sediment surface	0	10	cm	0	0.328083		SG-11-S-E-121107		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-12			sediment surface	0	10	cm	0	0.328083		SG-12-S-E-121107		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-13			sediment surface	0	10	cm	0	0.328083		SG-13-S-E-121107		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-13			sediment surface	0	10	cm	0	0.328083		SG-13-S-E-dup-121107		Y		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-15			sediment surface	0	10	cm	0	0.328083		SG-15-S-E-121107		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-01			sediment surface	0	10	cm	0	0.328083		SG-01-S-C-121107		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	WS-10										WS-10-W-C-121107		N		N		Water	Fresh/Surface Water	T			
AQ_Kenmore2012	WS-10										WS-10-W-C-121107		N		N		Water	Fresh/Surface Water	T			
AQ_Kenmore2012	HT-01			water surface	0	10	cm	0	0.328083		HT-01-W-C-121107		N		N		Water	Fresh/Surface Water	T			
AQ_Kenmore2012	HT-01			water surface	0	10	cm	0	0.328083		HT-01-W-C-121107		N		N		Water	Fresh/Surface Water	T			
AQ_Kenmore2012	HT-04			water surface	0	10	cm	0	0.328083		HT-04-W-C-121107		N		N		Water	Fresh/Surface Water	T			
AQ_Kenmore2012	HT-04			water surface	0	10	cm	0	0.328083		HT-04-W-C-121107		N		N		Water	Fresh/Surface Water	T			
AQ_Kenmore2012	HT-04			water surface	0	10	cm	0	0.328083		HT-04-W-C-dup-121107		Y		N		Water	Fresh/Surface Water	T			
AQ_Kenmore2012	HT-04			water surface	0	10	cm	0	0.328083		HT-04-W-C-dup-121107		Y		N		Water	Fresh/Surface Water	T			
AQ_Kenmore2012	SG-14			sediment surface	0	10	cm	0	0.328083		SG-14-S-E-121107		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-02			sediment surface	0	22	cm	0	0.7217826		SG-02-S-C-121108		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-03			sediment surface	0	25	cm	0	0.8202075		SG-03-S-C-121108		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-04			sediment surface	0	15	cm	0	0.4921245		SG-04-S-C-121108		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-05			sediment surface	0	23	cm	0	0.7545909		SG-05-S-C-121108		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-06			sediment surface	0	25	cm	0	0.8202075		SG-06-S-C-121108		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-07			sediment surface	0	25	cm	0	0.8202075		SG-07-S-C-121108		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-07			sediment surface	0	25	cm	0	0.8202075		SG-07-S-C-dup-121108		Y		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-08			sediment surface	0	25	cm	0	0.8202075		SG-08-S-C-121108		N		N		Solid/Sediment	Freshwater Sediment	T			
AQ_Kenmore2012	SG-09			sediment surface	0	25	cm	0	0.8202075		SG-09-S-C-121108		N		N		Solid/Sediment	Freshwater Sediment	T			
RMASB06	DMMP-RMASB-AF-0229-C1			sediment surface	0	5.3	ft	0	5.3		C1		U		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	
RMASB06	DMMP-RMASB-AF-0229-C2			sediment surface	0	4.5	ft	0	4.5		C2		U		Y		Solid/Sediment	Freshwater Sediment	T	CORE-VIBRA	Corer, Vibra-, size unspecified	
EPAGAS95	30				0	0.1	m	0	0.328084		95042151		U		N		Solid/Sediment	Freshwater Sediment	R	ECKMAN	Grab sampler, Eckman, size unspecified	
EPAGAS95	28				0	0.1	m	0	0.328084		94492360		U		Y		Solid/Sediment	Freshwater Sediment	R	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L61880-6				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L61880-7				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L62003-5				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L62003-6				N		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L45088-11		N		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L45088-11		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L45088-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L45088-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L45088-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L45088-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L45088-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L45088-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L62254-9				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L62254-10				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L62254-10				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L62254-11				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L62254-12				N		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L41817-11		N		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L41817-11		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L41817-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L41817-13		N		U		Water	Fresh/Surface Water				

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Sample_Preparation_Method_Description	Sample_Method_Other	Sample_Method_Other_Type	Sample_Method_Other_Description	Sample_Taxon_Name	Sample_Taxon_Common_Name	Sample_Taxon_TSN	Sample_Tissue_Type	Sample_Percent_Sorted	Result_Parameter_Name	Result_Parameter_CAS_Number	Lab_Analysis_Date	Lab_Analysis_Date_Accuracy	Lab_Analysis_Time	Result_Value	Result_Value_Units	Result_Reporting_Limit	Result_Reporting_Limit_Type	Result_Detection_Limit	Result_Detection_Limit_Type
KENMO19	KENMO19KEN02	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	2/21/2019	D	12:45:56	1.93	mg/Kg	1.52	MRL	1.34	MDL
KENMO19	KENMO19KEN01	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	2/21/2019	D	13:00:14	1.71	mg/Kg	1.43	MRL	1.25	MDL
KENMO19	KENMO19KEN02	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	2/21/2019	D	12:50:42	1.43	mg/Kg	1.4	MRL	1.23	MDL
KENMO19	KENMO19KEN03	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	2/21/2019	D	13:56:27	2.03	mg/Kg	1.41	MRL	1.24	MDL
KENMO19	KENMO19KEN04	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	2/20/2019	D	13:41:58	1.2	mg/Kg	1.2	MRL	1.05	MDL
KENMO19	KENMO19KEN07	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	2/20/2019	D	14:45:53	1.27	mg/Kg	1.17	MRL	1.03	MDL
KENMO19	KENMO19KEN05	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	2/20/2019	D	15:00:00	1.37	mg/Kg	1.28	MRL	1.13	MDL
KENMO19	KENMO19KEN06	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	2/20/2019	D	15:04:43	1.17	mg/Kg	1.26	MRL	1.1	MDL
KENMO19	KENMO19KEN08	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	2/20/2019	D	14:50:35	1.23	mg/Kg	1.2	MRL	1.06	MDL
KENMO19	KENMO19KEN09	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	2/20/2019	D	14:55:18	1.11	mg/Kg	1.12	MRL	0.99	MDL
NYCLW08	DMMP-NYCLW-AF-0255-C1										Selenium	7782-49-2	5/28/2008	D		2.1	mg/Kg	2.1	UNKNOWN		
NYCLW08	DMMP-NYCLW-AF-0255-C1										Selenium	7782-49-2	5/28/2008	D		2.1	mg/Kg	2.1	UNKNOWN		
BARBB16	DMMU1	Acid Digestion of Sediments, Sludges, and Soils, Revision 2									Selenium	7782-49-2	7/25/2016	D	15:10:00	0.577	mg/Kg	0.577	LOQ	0.037	MDL
MILLR05	DMMP-MILLR-AF-0221-C2										Selenium	7782-49-2	8/3/2005	D		0.2	mg/Kg	0.2	UNKNOWN		
MILLR05	DMMP-MILLR-AF-0221-C1										Selenium	7782-49-2	8/3/2005	D		0.2	mg/Kg	0.2	UNKNOWN		
MILLR05	DMMP-MILLR-AF-0221-C3										Selenium	7782-49-2	8/3/2005	D		0.3	mg/Kg	0.3	UNKNOWN		
NMERC16	NMERC16C1										Selenium	7782-49-2	8/12/2016	D	14:21:24	1.65	mg/Kg	0.478	PQL	0.0502	MDL
NMERC16	NMERC16C1										Selenium	7782-49-2	8/12/2016	D	14:42:37	1.06	mg/Kg	0.441	PQL	0.0463	MDL
POSFT04	DMMP-POSFT-BF-0208-R2										Selenium	7782-49-2	11/2/2004	D		0.8	mg/Kg				
POSFT04	DMMP-POSFT-BF-0208-R1										Selenium	7782-49-2	11/2/2004	D		1.3	mg/Kg				
BCBAD07	DMMP-BCBAD-AF-0246-C1										Selenium	7782-49-2	10/26/2007	D		0.7	mg/Kg	0.7	UNKNOWN		
AQ_Kenmore2012	HT-01										Selenium	7782-49-2	11/19/2012	D		0.6	mg/Kg	0.6	MRL	0.12	MDL
AQ_Kenmore2012	HT-02										Selenium	7782-49-2	11/19/2012	D		0.6	mg/Kg	0.6	MRL	0.12	MDL
AQ_Kenmore2012	HT-03										Selenium	7782-49-2	11/19/2012	D		0.7	mg/Kg	0.7	MRL	0.14	MDL
AQ_Kenmore2012	HT-04										Selenium	7782-49-2	11/19/2012	D		1	mg/Kg	1	MRL	0.19	MDL
AQ_Kenmore2012	HT-05										Selenium	7782-49-2	11/19/2012	D		0.6	mg/Kg	0.6	MRL	0.12	MDL
AQ_Kenmore2012	HT-06										Selenium	7782-49-2	12/5/2012	D		0.6	mg/Kg	0.6	MRL	0.13	MDL
AQ_Kenmore2012	HT-11										Selenium	7782-49-2	12/5/2012	D		0.6	mg/Kg	0.6	MRL	0.12	MDL
AQ_Kenmore2012	HT-10										Selenium	7782-49-2	12/5/2012	D		0.6	mg/Kg	0.6	MRL	0.11	MDL
AQ_Kenmore2012	SG-10										Selenium	7782-49-2	11/27/2012	D		0.9	mg/Kg	0.9	MRL	0.17	MDL
AQ_Kenmore2012	SG-11										Selenium	7782-49-2	11/27/2012	D		3	mg/Kg	3	MRL	0.58	MDL
AQ_Kenmore2012	SG-12										Selenium	7782-49-2	11/27/2012	D		2	mg/Kg	2	MRL	0.34	MDL
AQ_Kenmore2012	SG-13										Selenium	7782-49-2	11/27/2012	D		2	mg/Kg	2	MRL	0.44	MDL
AQ_Kenmore2012	SG-13										Selenium	7782-49-2	11/27/2012	D		2	mg/Kg	2	MRL	0.43	MDL
AQ_Kenmore2012	SG-15										Selenium	7782-49-2	11/27/2012	D		0.7	mg/Kg	0.7	MRL	0.13	MDL
AQ_Kenmore2012	SG-01										Selenium	7782-49-2	11/27/2012	D		0.6	mg/Kg	0.6	MRL	0.12	MDL
AQ_Kenmore2012	WS-10										Selenium	7782-49-2	11/29/2012	D		0.5	ug/L	0.5	MRL	0.127	MDL
AQ_Kenmore2012	WS-10										Selenium	7782-49-2	11/29/2012	D		0.5	ug/L	0.5	MRL	0.127	MDL
AQ_Kenmore2012	HT-01										Selenium	7782-49-2	11/29/2012	D		0.5	ug/L	0.5	MRL	0.127	MDL
AQ_Kenmore2012	HT-01										Selenium	7782-49-2	11/30/2012	D		2	ug/L	2	MRL	0.64	MDL
AQ_Kenmore2012	HT-04										Selenium	7782-49-2	11/29/2012	D		0.5	ug/L	0.5	MRL	0.127	MDL
AQ_Kenmore2012	HT-04										Selenium	7782-49-2	11/30/2012	D		2	ug/L	2	MRL	0.64	MDL
AQ_Kenmore2012	HT-04										Selenium	7782-49-2	11/29/2012	D		0.5	ug/L	0.5	MRL	0.127	MDL
AQ_Kenmore2012	HT-04										Selenium	7782-49-2	11/29/2012	D		0.5	ug/L	0.5	MRL	0.127	MDL
AQ_Kenmore2012	SG-14										Selenium	7782-49-2	11/27/2012	D		1	mg/Kg	1	MRL	0.23	MDL
AQ_Kenmore2012	SG-02										Selenium	7782-49-2	11/27/2012	D		2	mg/Kg	2	MRL	0.4	MDL
AQ_Kenmore2012	SG-03										Selenium	7782-49-2	11/27/2012	D		2	mg/Kg	2	MRL	0.41	MDL
AQ_Kenmore2012	SG-04										Selenium	7782-49-2	11/27/2012	D		0.6	mg/Kg	0.6	MRL	0.11	MDL
AQ_Kenmore2012	SG-05										Selenium	7782-49-2	11/27/2012	D		1	mg/Kg	1	MRL	0.29	MDL
AQ_Kenmore2012	SG-06										Selenium	7782-49-2	11/27/2012	D		2	mg/Kg	2	MRL	0.34	MDL
AQ_Kenmore2012	SG-07										Selenium	7782-49-2	11/27/2012	D		1	mg/Kg	1	MRL	0.27	MDL
AQ_Kenmore2012	SG-07										Selenium	7782-49-2	11/27/2012	D		1	mg/Kg	1	MRL	0.28	MDL
AQ_Kenmore2012	SG-08										Selenium	7782-49-2	11/27/2012	D		1	mg/Kg	1	MRL	0.24	MDL
AQ_Kenmore2012	SG-09										Selenium	7782-49-2	11/27/2012	D		1	mg/Kg	1	MRL	0.29	MDL
RMASB06	DMMP-RMASB-AF-0229-C1										Selenium	7782-49-2	11/29/2006	D		0.3	mg/Kg	0.3	UNKNOWN		
RMASB06	DMMP-RMASB-AF-0229-C2										Selenium	7782-49-2	12/7/2006	D		0.2	mg/Kg	0.2	UNKNOWN		
EPAGAS95	30										Selenium	7782-49-2	1/27/1995	D		0.2	ppm				
EPAGAS95	28										Selenium	7782-49-2	12/8/1994	D		0.2	ppm				
KClake-1	'0540										Selenium	7782-49-2	2/2/2015		11:45:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	2/2/2015		11:51:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	2/18/2015		14:02:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	2/18/2015		14:07:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	2/25/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	3/19/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	2/25/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	3/19/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	2/25/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	3/19/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	2/25/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	3/19/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	3/19/2015		15:39:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	3/24/2015		11:53:00	0.57	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	3/27/2015		9:48:00	0.015	ug/L	0.05	PQL	0.01	MDL
KClake-1	'0540										Selenium	7782-49-2	3/19/2015		15:45:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	3/24/2015		11:58:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	4/25/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	5/22/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	4/25/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	5/22/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Data_Qualifier	Result_Data_Qualifier_Description	Result_Suspect_or_Rejected_Flag	Result_Suspect_Code	Result_Suspect_Description	Fraction_Analyzed	Field_Filtered_Flag	Result_Basis	Digestion_Method	Water_Level_Accuracy	Result_Method
KENMO19	KENMO19KEN02								Dry	Total		SW6020A
KENMO19	KENMO19KEN01								Dry	Total		SW6020A
KENMO19	KENMO19KEN02								Dry	Total		SW6020A
KENMO19	KENMO19KEN03								Dry	Total		SW6020A
KENMO19	KENMO19KEN04	U	Analyte was not detected at or above the reported result.						Dry	Total		SW6020A
KENMO19	KENMO19KEN07								Dry	Total		SW6020A
KENMO19	KENMO19KEN05								Dry	Total		SW6020A
KENMO19	KENMO19KEN06	J	Analyte was positively identified. The reported result is an estimate.						Dry	Total		SW6020A
KENMO19	KENMO19KEN08								Dry	Total		SW6020A
KENMO19	KENMO19KEN09	J	Analyte was positively identified. The reported result is an estimate.						Dry	Total		SW6020A
NYCLW08	DMMP-NYCLW-AF-0255-C1	U	Analyte was not detected at or above the reported result.				TOTAL		Dry			SW6010
NYCLW08	DMMP-NYCLW-AF-0255-C1	U	Analyte was not detected at or above the reported result.				TOTAL		Dry			SW6010
BARBB16	DMMU1	J	Analyte was positively identified. The reported result is an estimate.						Dry	Total		SW6020A
MILLR05	DMMP-MILLR-AF-0221-C2	U	Analyte was not detected at or above the reported result.				TOTAL		Dry			SW7740
MILLR05	DMMP-MILLR-AF-0221-C1	U	Analyte was not detected at or above the reported result.				TOTAL		Dry			SW7740
MILLR05	DMMP-MILLR-AF-0221-C3	U	Analyte was not detected at or above the reported result.				TOTAL		Dry			SW7740
NMERC16	NMERC16C1								DRY	Total		SW6020A
NMERC16	NMERC16C1								DRY	Total		SW6020A
POSFT04	DMMP-POSFT-BF-0208-R2						TOTAL		Dry			SW7740
POSFT04	DMMP-POSFT-BF-0208-R1						TOTAL		Dry			SW7740
BCBAD07	DMMP-BCBAD-AF-0246-C1	U	Analyte was not detected at or above the reported result.				TOTAL		Dry			EPA200.8
AQ_Kenmore2012	HT-01	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	HT-02	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	HT-03	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	HT-04	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	HT-05	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	HT-06	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	HT-11	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	HT-10	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-10	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-11	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-12	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-13	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-13	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-15	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-01	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	WS-10	U	Analyte was not detected at or above the reported result.				Dissolved		WET			EPA200.8
AQ_Kenmore2012	WS-10	U	Analyte was not detected at or above the reported result.				Total		WET			EPA200.8
AQ_Kenmore2012	HT-01	U	Analyte was not detected at or above the reported result.				Dissolved		WET			EPA200.8
AQ_Kenmore2012	HT-01	U	Analyte was not detected at or above the reported result.				Total		WET			EPA200.8
AQ_Kenmore2012	HT-04	U	Analyte was not detected at or above the reported result.				Dissolved		WET			EPA200.8
AQ_Kenmore2012	HT-04	U	Analyte was not detected at or above the reported result.				Total		WET			EPA200.8
AQ_Kenmore2012	HT-04	U	Analyte was not detected at or above the reported result.				Dissolved		WET			EPA200.8
AQ_Kenmore2012	HT-04	U	Analyte was not detected at or above the reported result.				Total		WET			EPA200.8
AQ_Kenmore2012	HT-04	U	Analyte was not detected at or above the reported result.				Total		WET			EPA200.8
AQ_Kenmore2012	SG-14	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-02	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-03	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-04	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-05	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-06	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-07	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-07	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-08	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
AQ_Kenmore2012	SG-09	U	Analyte was not detected at or above the reported result.				Total		Dry			SW6020A
RMASB06	DMMP-RMASB-AF-0229-C1	U	Analyte was not detected at or above the reported result.				TOTAL		Dry			SW7010
RMASB06	DMMP-RMASB-AF-0229-C2	U	Analyte was not detected at or above the reported result.				TOTAL		Dry			SW7010
EPAGAS95	30	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
EPAGAS95	28	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Dissolved	Y				EPA200.8
KClake-1	'0540	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Dissolved	Y				EPA1640
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Method_Description	Result_Comment	Result_Additional_Comment	Result_Lab_Replicate_ID	Result_Lab_Name	Result_Validation_Level	Result_Taxon_Name	Result_Taxon_Common_Name
KENMO19	KENMO19KEN02	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	EPA2B		
KENMO19	KENMO19KEN01	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	EPA4		
KENMO19	KENMO19KEN02	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	EPA2B		
KENMO19	KENMO19KEN03	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	EPA2B		
KENMO19	KENMO19KEN04	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1		U : This analyte is not detected above the reporting limit (RL) or limit of detection (LOD), when applicable.		Analytical Resources Inc (ARI), Seattle WA	EPA2B		
KENMO19	KENMO19KEN07	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	EPA2B		
KENMO19	KENMO19KEN05	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	EPA2B		
KENMO19	KENMO19KEN06	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1		J : Estimated concentration value detected below the reporting limit.		Analytical Resources Inc (ARI), Seattle WA	EPA2B		
KENMO19	KENMO19KEN08	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	EPA2B		
KENMO19	KENMO19KEN09	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1		J : Estimated concentration value detected below the reporting limit.		Analytical Resources Inc (ARI), Seattle WA	EPA2B		
NYCLW08	DMMP-NYCLW-AF-0255-C1	Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) for Metals and Trace Elements, Rev 0				AmTest Laboratories, Kirkland WA	QA1		
NYCLW08	DMMP-NYCLW-AF-0255-C1	Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) for Metals and Trace Elements, Rev 0				AmTest Laboratories, Kirkland WA	QA1		
BARBB16	DMMU1	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	16-10088-BCW1A			Analytical Resources Inc (ARI), Seattle WA			
MILLR05	DMMP-MILLR-AF-0221-C2	Selenium by Atomic Absorption, Furnace Technique, Revision 0				Analytical Resources Inc (ARI), Seattle WA	QA1		
MILLR05	DMMP-MILLR-AF-0221-C1	Selenium by Atomic Absorption, Furnace Technique, Revision 0				Analytical Resources Inc (ARI), Seattle WA	QA1		
MILLR05	DMMP-MILLR-AF-0221-C3	Selenium by Atomic Absorption, Furnace Technique, Revision 0				Analytical Resources Inc (ARI), Seattle WA	QA1		
NMERC16	NMERC16C1	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Fremont Analytical Inc, Seattle WA	EPA2A		
NMERC16	NMERC16C1	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Fremont Analytical Inc, Seattle WA	EPA2A		
POSFT04	DMMP-POSFT-BF-0208-R2	Selenium by Atomic Absorption, Furnace Technique, Revision 0				Analytical Resources Inc (ARI), Seattle WA	QA1		
POSFT04	DMMP-POSFT-BF-0208-R1	Selenium by Atomic Absorption, Furnace Technique, Revision 0				Analytical Resources Inc (ARI), Seattle WA	QA1		
BCBAD07	DMMP-BCBAD-AF-0246-C1	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-01	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-02	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-03	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-04	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-05	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-06	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-11	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-10	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-10	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-11	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-12	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-13	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-13	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-15	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-01	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	WS-10	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	WS-10	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-01	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-01	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-04	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-04	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-04	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-04	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-04	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	HT-04	Metals and Trace Elements in Waters by ICP-MS				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-14	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-02	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-03	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-04	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-05	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-06	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-07	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-07	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-08	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
AQ_Kenmore2012	SG-09	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				Analytical Resources Inc (ARI), Seattle WA	QA1		
RMASB06	DMMP-RMASB-AF-0229-C1	Metals by Graphite Furnace Atomic Absorption (GFAA) Spectrophotometry, Revision 0				Analytical Resources Inc (ARI), Seattle WA	QA1		
RMASB06	DMMP-RMASB-AF-0229-C2	Metals by Graphite Furnace Atomic Absorption (GFAA) Spectrophotometry, Revision 0				Analytical Resources Inc (ARI), Seattle WA	QA1		
EPAGAS95	30	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
EPAGAS95	28	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <RDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Ambient Waters by On-Line Chelation and ICP-MS	KC Qual: <RDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Taxon_Alias_Other	Result_Taxon_TSN	Result_Taxon_Parent_TSN	Result_Taxon_Unidentified_Species	Result_Taxon_Life_Stage	Study_QA_Planning_Level	Study_QA_Assessment_Level	Study_Type	EIM_Data_Entry_Review_Status	Calculated_Latitude_Decimal_Degrees_NAD83HARN	Calculated_Longitude_Decimal_Degrees_NAD83HARN	Record_Created_On	Result_System_ID
KENMO19	KENMO19KEN02						LEVEL 4: Approved QAPP or SAP.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.75469963	-122.2500209	12/21/2020 14:15	213364526
KENMO19	KENMO19KEN01						LEVEL 4: Approved QAPP or SAP.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.75577163	-122.2584649	12/21/2020 14:15	213364525
KENMO19	KENMO19KEN02						LEVEL 4: Approved QAPP or SAP.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.75469963	-122.2500209	12/21/2020 14:15	213364527
KENMO19	KENMO19KEN03						LEVEL 4: Approved QAPP or SAP.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.75434963	-122.2612429	12/21/2020 14:15	213364528
KENMO19	KENMO19KEN04						LEVEL 4: Approved QAPP or SAP.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.75411563	-122.2615569	12/21/2020 14:15	213364529
KENMO19	KENMO19KEN07						LEVEL 4: Approved QAPP or SAP.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.75310763	-122.2625849	12/21/2020 14:15	213364532
KENMO19	KENMO19KEN05						LEVEL 4: Approved QAPP or SAP.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.75380763	-122.2619009	12/21/2020 14:15	213364530
KENMO19	KENMO19KEN06						LEVEL 4: Approved QAPP or SAP.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.63347063	-122.2622429	12/21/2020 14:15	213364531
KENMO19	KENMO19KEN08						LEVEL 4: Approved QAPP or SAP.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.75270063	-122.2629879	12/21/2020 14:15	213364533
KENMO19	KENMO19KEN09						LEVEL 4: Approved QAPP or SAP.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.75234163	-122.2634559	12/21/2020 14:15	213364534
NYCLW08	DMMP-NYCLW-AF-0255-C1						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Sediment dredging study	Not Reviewed	47.574107	-122.190909		46373948
NYCLW08	DMMP-NYCLW-AF-0255-C1						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Sediment dredging study	Not Reviewed	47.574107	-122.190909		681334
BARBB16	DMMU1						LEVEL 3: QAPP, SAP, or Equivalent.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Not Reviewed	47.52754065	-122.2051895	3/23/2017 21:11	205895960
MILLR05	DMMP-MILLR-AF-0221-C2						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Sediment dredging study	Not Reviewed	47.59327	-122.251711		38795777
MILLR05	DMMP-MILLR-AF-0221-C1						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Sediment dredging study	Not Reviewed	47.583871	-122.253596		42783141
MILLR05	DMMP-MILLR-AF-0221-C3						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Sediment dredging study	Not Reviewed	47.593228	-122.236445		89255943
NMERC16	NMERC16C1						LEVEL 3: QAPP, SAP, or Equivalent.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Reviewed	47.57908663	-122.2014889	4/23/2020 13:18	211897222
NMERC16	NMERC16C1						LEVEL 3: QAPP, SAP, or Equivalent.	Level 4: Data Verified and Assessed for Usability in a Formal Study Report	Sediment dredging study	Reviewed	47.57908663	-122.2014889	4/23/2020 13:18	211897307
POSFT04	DMMP-POSFT-BF-0208-R2						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Sediment dredging study	Not Reviewed	47.749613	-122.268687		89267856
POSFT04	DMMP-POSFT-BF-0208-R1						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Sediment dredging study	Not Reviewed	47.730717	-122.265177		68952230
BCBAD07	DMMP-BCBAD-AF-0246-C1						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Sediment dredging study	Not Reviewed	47.527513	-122.204858		62214937
AQ_Kenmore2012	HT-01						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75752717	-122.2658194		86870628
AQ_Kenmore2012	HT-02						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75750203	-122.2653757		75308660
AQ_Kenmore2012	HT-03						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.7572821	-122.2642562		43850212
AQ_Kenmore2012	HT-04						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75706522	-122.2633924		2328197
AQ_Kenmore2012	HT-05						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.7566362	-122.2633389		54023556
AQ_Kenmore2012	HT-06						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75657444	-122.2628551		93635189
AQ_Kenmore2012	HT-11						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75252343	-122.2740645		54158440
AQ_Kenmore2012	HT-10						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75273109	-122.2743505		44733277
AQ_Kenmore2012	SG-10						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75639567	-122.262841		66096250
AQ_Kenmore2012	SG-11						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75636317	-122.2618928		46096138
AQ_Kenmore2012	SG-12						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75584233	-122.2629647		29381240
AQ_Kenmore2012	SG-13						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75555	-122.260821		58650028
AQ_Kenmore2012	SG-13						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75555	-122.260821		89179422
AQ_Kenmore2012	SG-15						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75500017	-122.257709		91846624
AQ_Kenmore2012	SG-01						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.7531015	-122.260341		18993833
AQ_Kenmore2012	WS-10						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75385733	-122.2666907		58511100
AQ_Kenmore2012	WS-10						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75385733	-122.2666907		63185172
AQ_Kenmore2012	HT-01						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75752717	-122.2658194		7148833
AQ_Kenmore2012	HT-01						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75752717	-122.2658194		63024651
AQ_Kenmore2012	HT-04						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75706522	-122.2633924		9750567
AQ_Kenmore2012	HT-04						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75706522	-122.2633924		40600802
AQ_Kenmore2012	HT-04						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75706522	-122.2633924		43625823
AQ_Kenmore2012	HT-04						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75706522	-122.2633924		96976382
AQ_Kenmore2012	SG-14						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75714617	-122.2555707		66476086
AQ_Kenmore2012	SG-02						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75644183	-122.259857		33383633
AQ_Kenmore2012	SG-03						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.756435	-122.2594023		76019492
AQ_Kenmore2012	SG-04						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.756369	-122.2569292		85302065
AQ_Kenmore2012	SG-05						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.7557175	-122.258341		60454597
AQ_Kenmore2012	SG-06						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.7551605	-122.2597863		7322473
AQ_Kenmore2012	SG-07						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.7538825	-122.261727		19083553
AQ_Kenmore2012	SG-07						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.7538825	-122.261727		34867732
AQ_Kenmore2012	SG-08						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.7525205	-122.2632457		4970654
AQ_Kenmore2012	SG-09						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75149983	-122.2641625		29088447
RMASB06	DMMP-RMASB-AF-0229-C1						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Sediment dredging study	Not Reviewed	47.500735	-122.218264		84140892
RMASB06	DMMP-RMASB-AF-0229-C2						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Sediment dredging study	Not Reviewed	47.50081	-122.217615		70349918
EPAGAS95	30						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Investigation of suspected contaminated site during Initial Investigation or Site Hazard Assessment	Not Reviewed	47.73106944	-122.2632222		22668185
EPAGAS95	28						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Investigation of suspected contaminated site during Initial Investigation or Site Hazard Assessment	Not Reviewed	47.64833889	-122.2743778		88733406
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:45	204293653
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:45	204293673
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:45	204293796
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:45	204293831
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		63590524
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		44247729
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		69198134
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		4988292
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		93408484
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		25799894
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		86704183
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		32904654
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:46	204294110
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:45	204293966
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:45	204293967
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:45	204293998
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:45	204294015
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		55832192
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		23763832
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		59418745
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		59131701

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Study_Name	Location_ID	Location_Name	Field_Collection_Type	Field_Collector	Field_Collection_Start_Date	Field_Collection_Start_Time	Field_Collection_Start_Date_Time	Field_Collection_End_Date	Field_Collection_End_Time	Field_Collection_End_Date_Time	Field_Collection_Comment
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	2/26/2007		2/26/2007 0:00	2/26/2007		2/26/2007 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	2/26/2007		2/26/2007 0:00	2/26/2007		2/26/2007 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	2/26/2007		2/26/2007 0:00	2/26/2007		2/26/2007 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	2/26/2007		2/26/2007 0:00	2/26/2007		2/26/2007 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	3/24/2015	12:30:00	3/24/2015 12:30	3/24/2015	12:30:00	3/24/2015 12:30	Peristaltic Pump with C-Flex Tubing
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	3/24/2015	12:35:00	3/24/2015 12:35	3/24/2015	12:35:00	3/24/2015 12:35	Peristaltic Pump with C-Flex Tubing_Syringe Filter plus Capsule Filter used
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	3/24/2015	12:50:00	3/24/2015 12:50	3/24/2015	12:50:00	3/24/2015 12:50	Peristaltic Pump with C-Flex Tubing
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	3/24/2015	12:51:00	3/24/2015 12:51	3/24/2015	12:51:00	3/24/2015 12:51	Peristaltic Pump with C-Flex Tubing_Syringe Filter plus Capsule Filter used
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	4/29/2015	9:50:00	4/29/2015 9:50	4/29/2015	9:50:00	4/29/2015 9:50	Peristaltic Pump with C-Flex Tubing
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	4/29/2015	9:55:00	4/29/2015 9:55	4/29/2015	9:55:00	4/29/2015 9:55	Peristaltic Pump with C-Flex Tubing_Capsule Filter used
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	4/29/2015	10:00:01	4/29/2015 10:00	4/29/2015	10:00:01	4/29/2015 10:00	Peristaltic Pump with C-Flex Tubing
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	4/29/2015	10:05:00	4/29/2015 10:05	4/29/2015	10:05:00	4/29/2015 10:05	Peristaltic Pump with C-Flex Tubing_Capsule Filter used
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	5/2/2006		5/2/2006 0:00	5/2/2006		5/2/2006 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	5/2/2006		5/2/2006 0:00	5/2/2006		5/2/2006 0:00	
KClake-1	'0831	King County Routine Major Lakes Ambient Monitoring	KCM-0831	LAKE WASHINGTON - 0831	Sample	Government, Misc Local	5/2/2006		5/2/2006 0:00	5/2/2006		5/2/2006 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	5/2/2006		5/2/2006 0:00	5/2/2006		5/2/2006 0:00	
KClake-1	'0826	King County Routine Major Lakes Ambient Monitoring	KCM-0826	LAKE WASHINGTON - 0826	Sample	Government, Misc Local	5/2/2006		5/2/2006 0:00	5/2/2006		5/2/2006 0:00	
KClake-1	'0817	King County Routine Major Lakes Ambient Monitoring	KCM-0817	LAKE WASHINGTON - 0817	Sample	Government, Misc Local	5/2/2006		5/2/2006 0:00	5/2/2006		5/2/2006 0:00	
KClake-1	'0804	King County Routine Major Lakes Ambient Monitoring	KCM-0804	LAKE WASHINGTON - 0804	Sample	Government, Misc Local	5/2/2006		5/2/2006 0:00	5/2/2006		5/2/2006 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	5/2/2006		5/2/2006 0:00	5/2/2006		5/2/2006 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	5/2/2006		5/2/2006 0:00	5/2/2006		5/2/2006 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	5/2/2007		5/2/2007 0:00	5/2/2007		5/2/2007 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	5/2/2007		5/2/2007 0:00	5/2/2007		5/2/2007 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	5/2/2007		5/2/2007 0:00	5/2/2007		5/2/2007 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	5/2/2007		5/2/2007 0:00	5/2/2007		5/2/2007 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	5/2/2007		5/2/2007 0:00	5/2/2007		5/2/2007 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	5/2/2007		5/2/2007 0:00	5/2/2007		5/2/2007 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	5/2/2007		5/2/2007 0:00	5/2/2007		5/2/2007 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	5/2/2007		5/2/2007 0:00	5/2/2007		5/2/2007 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	5/27/2008		5/27/2008 0:00	5/27/2008		5/27/2008 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	5/27/2008		5/27/2008 0:00	5/27/2008		5/27/2008 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	5/27/2008		5/27/2008 0:00	5/27/2008		5/27/2008 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	5/27/2008		5/27/2008 0:00	5/27/2008		5/27/2008 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	5/27/2008		5/27/2008 0:00	5/27/2008		5/27/2008 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	5/27/2008		5/27/2008 0:00	5/27/2008		5/27/2008 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	5/27/2008		5/27/2008 0:00	5/27/2008		5/27/2008 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	5/27/2008		5/27/2008 0:00	5/27/2008		5/27/2008 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	5/27/2008	11:05:00	5/27/2008 11:05	5/27/2008	11:05:00	5/27/2008 11:05	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	5/27/2008	11:05:00	5/27/2008 11:05	5/27/2008	11:05:00	5/27/2008 11:05	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	5/27/2008	11:43:00	5/27/2008 11:43	5/27/2008	11:43:00	5/27/2008 11:43	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	5/27/2008	11:43:00	5/27/2008 11:43	5/27/2008	11:43:00	5/27/2008 11:43	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	5/27/2008	12:29:00	5/27/2008 12:29	5/27/2008	12:29:00	5/27/2008 12:29	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	5/27/2008	12:29:00	5/27/2008 12:29	5/27/2008	12:29:00	5/27/2008 12:29	
KingLakeSeds	KCM-CHSMCNTR	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-CHSMCNTR	KCM-CHSMCNTR	Sample	Government, Misc Local	8/23/2010	9:40:00	8/23/2010 9:40	8/23/2010	9:40:00	8/23/2010 9:40	
KingLakeSeds	KCM-CHSMNORTH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-CHSMNORTH	KCM-CHSMNORTH	Sample	Government, Misc Local	8/23/2010	10:30:00	8/23/2010 10:30	8/23/2010	10:30:00	8/23/2010 10:30	
KingLakeSeds	KCM-COZYCOVE	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-COZYCOVE	KCM-COZYCOVE	Sample	Government, Misc Local	8/23/2010	11:15:00	8/23/2010 11:15	8/23/2010	11:15:00	8/23/2010 11:15	
KingLakeSeds	KCM-YRRWCRKMTH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-YRRWCRKMTH	KCM-YRRWCRKMTH	Sample	Government, Misc Local	8/23/2010	12:00:00	8/23/2010 12:00	8/23/2010	12:00:00	8/23/2010 12:00	
KingLakeSeds	KCM-EYRRWCRKMTH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-EYRRWCRKMTH	KCM-EYRRWCRKMTH	Sample	Government, Misc Local	8/23/2010	12:20:00	8/23/2010 12:20	8/23/2010	12:20:00	8/23/2010 12:20	
KingLakeSeds	KCM-SHOUTNBCH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-SHOUTNBCH	KCM-SHOUTNBCH	Sample	Government, Misc Local	8/23/2010	12:55:00	8/23/2010 12:55	8/23/2010	12:55:00	8/23/2010 12:55	
KingLakeSeds	KCM-NHOUTNBCH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-NHOUTNBCH	KCM-NHOUTNBCH	Sample	Government, Misc Local	8/23/2010	13:15:00	8/23/2010 13:15	8/23/2010	13:15:00	8/23/2010 13:15	
KingLakeSeds	KCM-MRSHPKS	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-MRSHPKS	KCM-MRSHPKS	Sample	Government, Misc Local	8/23/2010	13:50:00	8/23/2010 13:50	8/23/2010	13:50:00	8/23/2010 13:50	
KingLakeSeds	KCM-MRSHPKN	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-MRSHPKN	KCM-MRSHPKN	Sample	Government, Misc Local	8/23/2010	14:30:00	8/23/2010 14:30	8/23/2010	14:30:00	8/23/2010 14:30	
KingLakeSeds	KCM-CHSMSWMBCH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-CHSMSWMBCH	KCM-CHSMSWMBCH	Sample	Government, Misc Local	8/24/2010	9:15:00	8/24/2010 9:15	8/24/2010	9:15:00	8/24/2010 9:15	
KingLakeSeds	KCM-MDNBRSWMBCH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-MDNBRSWMBCH	KCM-MDNBRSWMBCH	Sample	Government, Misc Local	8/24/2010	9:48:00	8/24/2010 9:48	8/24/2010	9:48:00	8/24/2010 9:48	
KingLakeSeds	KCM-CLYDSWMBCH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-CLYDSWMBCH	KCM-CLYDSWMBCH	Sample	Government, Misc Local	8/24/2010	10:00:00	8/24/2010 10:00	8/24/2010	10:00:00	8/24/2010 10:00	
KingLakeSeds	KCM-HOUTNSWMBCH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-HOUTNSWMBCH	KCM-HOUTNSWMBCH	Sample	Government, Misc Local	8/24/2010	10:50:00	8/24/2010 10:50	8/24/2010	10:50:00	8/24/2010 10:50	
KingLakeSeds	KCM-MARINAPSDS	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-MARINAPSDS	KCM-MARINAPSDS	Sample	Government, Misc Local	8/24/2010	11:20:00	8/24/2010 11:20	8/24/2010	11:20:00	8/24/2010 11:20	
KingLakeSeds	KCM-0826	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0826	LAKE WASHINGTON - 0826	Sample	Government, Misc Local	8/24/2010	11:37:00	8/24/2010 11:37	8/24/2010	11:37:00	8/24/2010 11:37	
KingLakeSeds	KCM-WAVRLYPSDS	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-WAVRLYPSDS	KCM-WAVRLYPSDS	Sample	Government, Misc Local	8/24/2010	11:40:00	8/24/2010 11:40	8/24/2010	11:40:00	8/24/2010 11:40	
KingLakeSeds	KCM-0890	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0890	LAKE WASHINGTON - 0890	Sample	Government, Misc Local	8/24/2010	14:05:00	8/24/2010 14:05	8/24/2010	14:05:00	8/24/2010 14:05	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	8/26/2014	10:10:00	8/26/2014 10:10	8/26/2014	10:10:00	8/26/2014 10:10	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	8/26/2014	10:10:00	8/26/2014 10:10	8/26/2014	10:10:00	8/26/2014 10:10	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	8/26/2014	10:13:00	8/26/2014 10:13	8/26/2014	10:13:00	8/26/2014 10:13	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	8/26/2014	10:13:00	8/26/2014 10:13	8/26/2014	10:13:00	8/26/2014 10:13	
KingLakeSeds	'0852SBN	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0852SBN	MADISON PARK NORTH BEACH	Sample	Government, Misc Local	9/14/2016	7:56:00	9/14/2016 7:56	9/14/2016	8:11:00	9/14/2016 8:11	
KingLakeSeds	'0864A	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0864A	SAYER CSO	Sample	Government, Misc Local	9/14/2016	8:36:00	9/14/2016 8:36	9/14/2016	8:51:00	9/14/2016 8:51	
KingLakeSeds	'0864STNSAY	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0864STNSAY	STAN SAYER PARK	Sample	Government, Misc Local	9/14/2016	8:58:00	9/14/2016 8:58	9/14/2016	9:13:00	9/14/2016 9:13	
KingLakeSeds	'0826SPTN	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0826SPTN	SAND POINT NORTH	Sample	Government, Misc Local	9/14/2016	9:55:00	9/14/2016 9:55	9/14/2016	10:10:00	9/14/2016 10:10	
KingLakeSeds	'0818THCM	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0818THCM	THORNTON CREEK MOUTH	Sample	Government, Misc Local	9/14/2016	10:29:00	9/14/2016 10:29	9/14/2016	10:44:00	9/14/2016 10:44	

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Field_Collection_Area	Field_Collection_Area_Units	Field_Collection_Reference_Point	Field_Collection_Upper_Depth	Field_Collection_Lower_Depth	Field_Collection_Depth_Units	Upper_Depth_In_Feet	Lower_Depth_In_Feet	Well_Water_Level_Measuring_Point_Or_TOC_ID	Sample_ID	Sample_Field_Replicate_ID	Sample_Replicate_Flag	Sample_Sub_ID	Sample_Composite_Flag	Storm_Event_Qualifier	Sample_Matrix	Sample_Source	Sample_Use	Sample_Collection_Method	Sample_Collection_Method_Description	Sample_Preparation_Method
KClake-1	'0540				1	1	m	3.28084	3.28084		L41817-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L41817-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L41817-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L41817-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L62425-9				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L62425-10				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L62425-11				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L62425-12				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L62641-11				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L62641-12				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L62641-9				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L62641-10				N		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L38942-10		Y		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L38942-11		U		U		Water	Fresh/Surface Water				
KClake-1	'0831				1	1	m	3.28084	3.28084		L38942-12		U		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L38942-13		U		U		Water	Fresh/Surface Water				
KClake-1	'0826				1	1	m	3.28084	3.28084		L38942-14		U		U		Water	Fresh/Surface Water				
KClake-1	'0817				1	1	m	3.28084	3.28084		L38942-15		U		U		Water	Fresh/Surface Water				
KClake-1	'0804				1	1	m	3.28084	3.28084		L38942-16		U		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L38942-8		U		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L38942-9		N		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L42481-11		N		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L42481-11		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L42481-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L42481-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L42481-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L42481-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L42481-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L42481-9		N		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L45671-11		N		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L45671-11		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L45671-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L45671-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L45671-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L45671-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L45671-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L45671-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L45671-9				N		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L45671-9				N		Water	Fresh/Surface Water				
KClake-1	4903			Water Surface	1	1	m	3.28084	3.28084		L45671-11				N		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L45671-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L45671-9				N		Water	Fresh/Surface Water				
KClake-1	4903			Water Surface	1	1	m	3.28084	3.28084		L45671-11				N		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L45671-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L45671-9				N		Water	Fresh/Surface Water				
KClake-1	4903			Water Surface	1	1	m	3.28084	3.28084		L45671-11				N		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L45671-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L61011-9				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L61011-9				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L61011-8				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L61011-8				N		Water	Fresh/Surface Water				
KingLakeSeds	'0852SBN			Sediment Surface	0	10	cm	0	0.328083		L66132-32				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0864A			Sediment Surface	0	10	cm	0	0.328083		L66132-40				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0864STNSAY			Sediment Surface	0	10	cm	0	0.328083		L66132-38				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0826SPTN			Sediment Surface	0	9	cm	0	0.2952747		L66132-22				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0818THCM			Sediment Surface	0	10	cm	0	0.328083		L66132-20				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	KCM-CHSMCNTR			Sediment Surface	0	10	cm	0	0.328083		L51549-4		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-CHSMNORTH			Sediment Surface	0	10	cm	0	0.328083		L51549-6		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-COZYCOVE			Sediment Surface	0	10	cm	0	0.328083		L51549-12		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-YRRWCRKMTH			Sediment Surface	0	10	cm	0	0.328083		L51549-14		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-EYRRWCRKMTH			Sediment Surface	0	10	cm	0	0.328083		L51549-16		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-SHOUTNBCH			Sediment Surface	0	10	cm	0	0.328083		L51549-22		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-NHOUTNBCH			Sediment Surface	0	10	cm	0	0.328083		L51549-20		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-MRSHPKS			Sediment Surface	0	10	cm	0	0.328083		L51549-26		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-MRSHPKN			Sediment Surface	0	10	cm	0	0.328083		L51549-24		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-CHSMSWMBCH			Sediment Surface	0	10	cm	0	0.328083		L51549-2		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-MDNBRSWMBCH			Sediment Surface	0	10	cm	0	0.328083		L51549-10		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-CLYDSWMBCH			Sediment Surface	0	10	cm	0	0.328083		L51549-8		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-HOUTNSWMBCH			Sediment Surface	0	10	cm	0	0.328083		L51549-18		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-MARINAPSDS			Sediment Surface	0	10	cm	0	0.328083		L51549-28		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-0826			Sediment Surface	0	10	cm	0	0.328083		L51549-34		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-WAVRLYPSDS			Sediment Surface	0	10	cm	0	0.328083		L51549-30		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-0890			Sediment Surface	0	10	cm	0	0.328083		L51549-36		U		U		Solid/Sediment	Freshwater Sediment				
FWLKUN01	FWLKUN-21645-1			Sediment Surface	0	10	cm	0	0.328083		21645-1		N		Y		Solid/Sediment	Freshwater Sediment				
FWLKUN01	FWLKUN-21689-11			Sediment Surface	0	10	cm	0	0.328083		21689-11		N		Y		Solid/Sediment	Freshwater Sediment	R			

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Sample_Preparation_Method_Description	Sample_Method_Other	Sample_Method_Other_Type	Sample_Method_Other_Description	Sample_Taxon_Name	Sample_Taxon_Common_Name	Sample_Taxon_TSN	Sample_Tissue_Type	Sample_Percent_Sorted	Result_Parameter_Name	Result_Parameter_CAS_Number	Lab_Analysis_Date	Lab_Analysis_Date_Accuracy	Lab_Analysis_Time	Result_Value	Result_Value_Units	Result_Reporting_Limit	Result_Reporting_Limit_Type	Result_Detection_Limit	Result_Detection_Limit_Type
KClake-1	'0540										Selenium	7782-49-2	4/25/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	5/22/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	4/25/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	5/22/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	4/22/2015		10:15:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	4/20/2015		12:37:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	4/22/2015		10:20:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	4/20/2015		12:43:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	5/27/2015		15:34:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	5/27/2015		16:31:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	5/27/2015		15:29:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	5/27/2015		16:26:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	5/2/2006	D		0.5	ug/L	2.5	UNKNOWN		
KClake-1	4903										Selenium	7782-49-2	5/2/2006	D		0.5	ug/L	2.5	UNKNOWN		
KClake-1	'0831										Selenium	7782-49-2	5/2/2006	D		0.5	ug/L	2.5	UNKNOWN		
KClake-1	'0834										Selenium	7782-49-2	5/2/2006	D		0.5	ug/L	2.5	UNKNOWN		
KClake-1	'0826										Selenium	7782-49-2	5/2/2006	D		0.5	ug/L	2.5	UNKNOWN		
KClake-1	'0817										Selenium	7782-49-2	5/2/2006	D		0.5	ug/L	2.5	UNKNOWN		
KClake-1	'0804										Selenium	7782-49-2	5/2/2006	D		0.5	ug/L	2.5	UNKNOWN		
KClake-1	'0540										Selenium	7782-49-2	5/2/2006	D		0.5	ug/L	2.5	UNKNOWN		
KClake-1	'0852										Selenium	7782-49-2	5/2/2006	D		0.5	ug/L	2.5	UNKNOWN		
KClake-1	4903										Selenium	7782-49-2	6/1/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	6/6/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	6/1/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	6/6/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	6/1/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	6/6/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/1/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/6/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	6/12/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	6/26/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	6/12/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	6/26/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	6/12/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	6/26/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/12/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/26/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/12/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/26/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	6/12/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/26/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/12/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/26/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	6/12/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/26/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/12/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	6/26/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	6/12/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	6/26/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	6/12/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	6/26/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	8/21/2014		14:56:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	8/25/2014		10:18:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	8/21/2014		14:50:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	8/25/2014		10:12:00	0.5	ug/L	1	PQL	0.5	MDL
FWLKUN01	FWLKUN-21645-1										Selenium	7782-49-2	9/1/2001	M		0.518	mg/Kg	0.518	PQL	0.1	MDL
FWLKUN01	FWLKUN-21689-11										Selenium	7782-49-2	9/1/2001	M		1.82	mg/Kg	1.82	PQL	0.36	MDL
KClake-1	'0540										Selenium	7782-49-2	8/21/2014		16:00:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	8/25/2014		11:23:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	8/21/2014		15:43:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	8/25/2014		11:17:00	0.5	ug/L	1	PQL	0.5	MDL
KingLakeSeds	KCM-CHSMCNTR										Selenium	7782-49-2	10/7/2010	D	11:57:00	0.211382	mg/Kg	1.0374	PQL	0.211382	MDL
KingLakeSeds	KCM-CHSMNORTH										Selenium	7782-49-2	10/7/2010	D	12:02:00	0.16624	mg/Kg	0.828645	PQL	0.16624	MDL
KingLakeSeds	KCM-COZYCOVE										Selenium	7782-49-2	10/7/2010	D	12:19:00	0.416667	mg/Kg	2.10069	PQL	0.416667	MDL
KingLakeSeds	KCM-YRRWCRKMTH										Selenium	7782-49-2	10/7/2010	D	12:36:00	0.89172	mg/Kg	3.94268	PQL	0.764331	MDL
KingLakeSeds	KCM-EYRRWCRKMTH										Selenium	7782-49-2	10/7/2010	D	12:42:00	0.486891	mg/Kg	2.26966	PQL	0.449438	MDL
KingLakeSeds	KCM-SHOUTNBCH										Selenium	7782-49-2	10/7/2010	D	12:59:00	0.150376	mg/Kg	0.755639	PQL	0.150376	MDL
KingLakeSeds	KCM-NHOUTNBCH										Selenium	7782-49-2	10/7/2010	D	12:53:00	0.144284	mg/Kg	0.716981	PQL	0.144284	MDL
KingLakeSeds	KCM-MRSHPKS										Selenium	7782-49-2	10/7/2010	D	13:11:00	0.160214	mg/Kg	0.807744	PQL	0.160214	MDL
KingLakeSeds	KCM-MRSHPKN										Selenium	7782-49-2	10/7/2010	D	13:05:00	0.169271	mg/Kg	0.824219	PQL	0.169271	MDL
KingLakeSeds	KCM-CHSMSWMBCH										Selenium	7782-49-2	10/7/2010	D	11:51:00	0.14218	mg/Kg	0.719194	PQL	0.14218	MDL
KingLakeSeds	KCM-MDNBRSWMBCH										Selenium	7782-49-2	10/7/2010	D	12:14:00	0.13905	mg/Kg	0.695249	PQL	0.13905	MDL
KingLakeSeds	KCM-CLYDSWMBCH										Selenium	7782-49-2	10/7/2010	D	12:08:00	0.150463	mg/Kg	0.760417	PQL	0.150463	MDL
KingLakeSeds	KCM-HOUTNSWMBCH										Selenium	7782-49-2	10/7/2010	D	12:48:00	0.150812	mg/Kg	0.74826	PQL	0.150812	MDL
KingLakeSeds	KCM-MARINAPSDS										Selenium	7782-49-2	10/7/2010	D	13:16:00	0.151163	mg/Kg	0.755814	PQL	0.151163	MDL
KingLakeSeds	KCM-0826										Selenium	7782-49-2	10/7/2010	D	14:02:00	0.829268	mg/Kg	3.18049	PQL	0.634146	MDL
KingLakeSeds	KCM-WAVRLYPSDS										Selenium	7782-49-2	10/7/2010	D	13:22:00	0.143805	mg/Kg	0.722345	PQL	0.143805	MDL
KingLakeSeds	KCM-0890										Selenium	7782-49-2	10/7/2010	D	14:08:00	0.861244	mg/Kg	3.04785	PQL	0.62201	MDL
KClake-1	'0540										Selenium	7782-49-2	9/22/2014		13:16:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	9/23/2014		17:23:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	9/22/2014		12:59:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	9/23/2014		17:05:00	0.5	ug/L	1	PQL	0.5	MDL
KingLakeSeds	'0852SBN										Selenium	7782-49-2	12/21/2016		13:45:00	0.13	mg/Kg	0.253	PQL	0.13	MDL
KingLakeSeds	'0864A										Selenium	7782-49-2	12/21/2016		14:05:00	0.32	mg/Kg	0.351	PQL	0.18	MDL
KingLakeSeds	'0864STNSAY										Selenium	7782-49-2	12/21/2016		14:00:00	0.14	mg/Kg	0.278	PQL	0.14	MDL
KingLakeSeds	'0826SPTN										Selenium	7782-49-2	12/21/2016		13:05:00	0.2	mg/Kg	0.406	PQL	0.2	MDL
KingLakeSeds	'0818THCM										Selenium	7782-49-2	12/21/2016		13:00:00	0.15	mg/Kg	0.286	PQL	0.15	MDL

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Data_Qualifier	Result_Data_Qualifier_Description	Result_Suspect_or_Rejected_Flag	Result_Suspect_Code	Result_Suspect_Description	Fraction_Analyzed	Field_Filtered_Flag	Result_Basis	Digestion_Method	Water_Level_Accuracy	Result_Method
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0852	UJ	Analyte was not detected at or above the reported estimate				Total					EPA200.8
KClake-1	4903	UJ	Analyte was not detected at or above the reported estimate				Total					EPA200.8
KClake-1	'0831	UJ	Analyte was not detected at or above the reported estimate				Total					EPA200.8
KClake-1	'0834	UJ	Analyte was not detected at or above the reported estimate				Total					EPA200.8
KClake-1	'0826	UJ	Analyte was not detected at or above the reported estimate				Total					EPA200.8
KClake-1	'0817	UJ	Analyte was not detected at or above the reported estimate				Total					EPA200.8
KClake-1	'0804	UJ	Analyte was not detected at or above the reported estimate				Total					EPA200.8
KClake-1	'0540	UJ	Analyte was not detected at or above the reported estimate				Total					EPA200.8
KClake-1	'0852	UJ	Analyte was not detected at or above the reported estimate				Total					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Dissolved	U				EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Dissolved	U				EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Dissolved	U				EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Dissolved	U				EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
FWLKUN01	FWLKUN-21645-1	U	Analyte was not detected at or above the reported result.				Total		WET			SW6020
FWLKUN01	FWLKUN-21689-11	U	Analyte was not detected at or above the reported result.				Total		WET			SW6020
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KingLakeSeds	KCM-CHSMCNTR	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-CHSMNORTH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-COZYCOVE	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-YRRWCRKMTH	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-EYRRWCRKMTH	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-SHOUTNBCH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-NHOUTNBCH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-MRSHPKS	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-MRSHPKN	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-CHSMSWMBCH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-MDNBRSWMBCH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-CLYDSWMBCH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-HOUTNSWMBCH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-MARINAPSDS	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-0826	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-WAVRLYPSDS	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-0890	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Tot Recoverable		DRY			SW6020A
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KingLakeSeds	'0852SBN	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0864A	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.						DRY	Total		SW6020A
KingLakeSeds	'0864STNSAY	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0826SPTN	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0818THCM	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Method_Description	Result_Comment	Result_Additional_Comment	Result_Lab_Replicate_ID	Result_Lab_Name	Result_Validation_Level	Result_Taxon_Name	Result_Taxon_Common_Name
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0831	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0826	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0817	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0804	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
FWLKUN01	FWLKUN-21645-1	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) for Metals and Trace Elements, Revision 0	Value determined using ICP-MS			King County Environmental Laboratory, Seattle WA			
FWLKUN01	FWLKUN-21689-11	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) for Metals and Trace Elements, Revision 0	Value determined using ICP-MS	Surrogate recovery <50 percent		King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	KCM-CHSMCNTR	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-CHSMNORTH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-COZYCOVE	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-YRRWCRKMTH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-EYRRWCRKMTH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-SHOUTNBCH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-NHOUTNBCH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-MRSHPKS	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-MRSHPKN	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-CHSMSWMBCH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-MDNBRSWMBCH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-CLYDSWMBCH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-HOUTNSWMBCH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-MARINAPSDS	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-0826	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-WAVRLYPSDS	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-0890	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0852SBN	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0864A	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <RDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0864STNSAY	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0826SPTN	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0818THCM	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Taxon_Alias_Other	Result_Taxon_TSN	Result_Taxon_Parent_TSN	Result_Taxon_Unidentified_Species	Result_Taxon_Life_Stage	Study_QA_Planning_Level	Study_QA_Assessment_Level	Study_Type	EIM_Data_Entry_Review_Status	Calculated_Latitude_Decimal_Degrees_NAD83HARN	Calculated_Longitude_Decimal_Degrees_NAD83HARN	Record_Created_On	Result_System_ID
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		74133722
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		31278602
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		41145296
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		50315717
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:46	204294653
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:46	204294524
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:46	204294554
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:46	204294567
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:47	204297226
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:47	204297239
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:47	204297325
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:47	204297196
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		16674537
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		87597927
KClake-1	'0831						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.51585045	-122.21908		22589356
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		34371968
KClake-1	'0826						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.68676202	-122.235333		10479298
KClake-1	'0817						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.69483229	-122.2696254		59610721
KClake-1	'0804						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.74676382	-122.2712374		84413437
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		59292864
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		42048736
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		79283808
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		657476
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		66905939
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		37919748
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		26915904
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		48670319
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		82771281
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		46482546
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		99687010
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		48003282
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		60614936
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		28812669
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		44273583
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		39594765
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		43703292
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		94926322
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634	1/21/2014 11:23	200267653
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634	1/21/2014 11:23	200267654
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904	1/21/2014 11:23	200267563
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904	1/21/2014 11:23	200267564
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072	1/21/2014 11:23	200267608
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072	1/21/2014 11:23	200267609
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204287215
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204287216
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204287178
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204287179
FWLKUN01	FWLKUN-21645-1						LEVEL 3: QAPP, SAP, or Equivalent.	Level 5: Data Verified and Assessed for Usability in a Peer-Reviewed Study Report	General environmental study	Not Reviewed	47.65333317	-122.2860182		95111033
FWLKUN01	FWLKUN-21689-11						LEVEL 3: QAPP, SAP, or Equivalent.	Level 5: Data Verified and Assessed for Usability in a Peer-Reviewed Study Report	General environmental study	Not Reviewed	47.64668516	-122.2759968		95297936
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204287520
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204287521
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204287483
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204287484
KingLakeSeds	KCM-CHSMCNTR						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.60020049	-122.2120951		12109428
KingLakeSeds	KCM-CHSMNORTH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.60088341	-122.2129848		40625831
KingLakeSeds	KCM-COZYCOVE						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.64060924	-122.2239663		84533288
KingLakeSeds	KCM-YRRWCRKMTH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.64852988	-122.207773		57948446
KingLakeSeds	KCM-EYRRWCRKMTH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.64896375	-122.2068106		7913291
KingLakeSeds	KCM-SHOUTNBCH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.6596626	-122.2070486		70598657
KingLakeSeds	KCM-NHOUTNBCH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.66121188	-122.2072681		42435213
KingLakeSeds	KCM-MRSHPKS						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.6655981	-122.207794		37839804
KingLakeSeds	KCM-MRSHPKN						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.6662212	-122.2075101		29478988
KingLakeSeds	KCM-CHSMSWMBCH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5998924	-122.2110451		40670215
KingLakeSeds	KCM-MDNBRSWMBCH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.61111865	-122.2118857		25227001
KingLakeSeds	KCM-CLYDSWMBCH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.6142518	-122.2180553		12690399
KingLakeSeds	KCM-HOUTNSWMBCH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.66065124	-122.2071478		62166067
KingLakeSeds	KCM-MARINAPSDS						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.67515123	-122.2084526		53900247
KingLakeSeds	KCM-0826						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.68676202	-122.235333		92291173
KingLakeSeds	KCM-WAVRLYPSDS						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.68703284	-122.2174407		78480508
KingLakeSeds	KCM-0890						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5754354	-122.2672963		43645496
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204288263
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204288264
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204288226
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:42	204288227
KingLakeSeds	'0852SBN						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.63910513	-122.2763099	3/28/2018 9:55	207594627
KingLakeSeds	'0864A						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57112599	-122.2754594	3/28/2018 9:55	207595177
KingLakeSeds	'0864STNSAY						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57086951	-122.2790299	3/28/2018 9:55	207594957
KingLakeSeds	'0826SPTN						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.68380483	-122.246322	3/28/2018 9:55	207594187
KingLakeSeds	'0818THCM						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.69496649	-122.2711603	3/28/2018 9:55	207594077

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Study_Name	Location_ID	Location_Name	Field_Collection_Type	Field_Collector	Field_Collection_Start_Date	Field_Collection_Start_Time	Field_Collection_Start_Date_Time	Field_Collection_End_Date	Field_Collection_End_Time	Field_Collection_End_Date_Time	Field_Collection_Comment
KingLakeSeds	'0805BSB	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0805BSB	O O DENNY PARK	Sample	Government, Misc Local	9/14/2016	10:59:00	9/14/2016 10:59	9/14/2016	11:14:00	9/14/2016 11:14	
KingLakeSeds	'0806JCM	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0806JCM	JUANITA CREEK MOUTH	Sample	Government, Misc Local	9/14/2016	11:25:00	9/14/2016 11:25	9/14/2016	11:40:00	9/14/2016 11:40	
KingLakeSeds	'0805STEDS	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0805STEDS	ST EDWARDS SOUTH	Sample	Government, Misc Local	9/14/2016	13:07:00	9/14/2016 13:07	9/14/2016	13:22:00	9/14/2016 13:22	
KingLakeSeds	'08UNBAYNE	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-08UNBAYNE	UNION BAY NE SHORE	Sample	Government, Misc Local	9/14/2016	13:25:00	9/14/2016 13:25	9/14/2016	13:40:00	9/14/2016 13:40	
KingLakeSeds	'0805STEDN	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0805STEDN	ST EDWARDS NORTH	Sample	Government, Misc Local	9/14/2016	13:37:00	9/14/2016 13:37	9/14/2016	13:52:00	9/14/2016 13:52	
KingLakeSeds	'0804INGWET	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0804INGWET	INGLEWOOD WETLANDS KENMORE	Sample	Government, Misc Local	9/14/2016	14:08:00	9/14/2016 14:08	9/14/2016	14:23:00	9/14/2016 14:23	
KingLakeSeds	LOGBOOM	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-LOGBOOM	SEAFAIR LOG BOOM	Sample	Government, Misc Local	9/14/2016	14:34:00	9/14/2016 14:34	9/14/2016	14:49:00	9/14/2016 14:49	
KingLakeSeds	'08UNBAYNW	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-08UNBAYNW	UNION BAY NW SHORE	Sample	Government, Misc Local	9/14/2016	15:43:00	9/14/2016 15:43	9/14/2016	15:58:00	9/14/2016 15:58	
KingLakeSeds	KCM-LKWABLVD-N	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-LKWABLVD-N	KCM-LKWABLVD-N	Sample	Government, Misc Local	9/15/2008	9:50:00	9/15/2008 9:50	9/15/2008	9:50:00	9/15/2008 9:50	
KingLakeSeds	KCM-LKWABLVD-C	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-LKWABLVD-C	KCM-LKWABLVD-C	Sample	Government, Misc Local	9/15/2008	11:13:00	9/15/2008 11:13	9/15/2008	11:13:00	9/15/2008 11:13	
KingLakeSeds	KCM-LKWABLVD-S	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-LKWABLVD-S	KCM-LKWABLVD-S	Sample	Government, Misc Local	9/15/2008	12:12:00	9/15/2008 12:12	9/15/2008	12:12:00	9/15/2008 12:12	
KingLakeSeds	KCM-BOEING-C	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-BOEING-C	KCM-BOEING-C	Sample	Government, Misc Local	9/15/2008	14:02:00	9/15/2008 14:02	9/15/2008	14:02:00	9/15/2008 14:02	
KingLakeSeds	KCM-COUL-C	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-COUL-C	KCM-COUL-C	Sample	Government, Misc Local	9/15/2008	14:48:00	9/15/2008 14:48	9/15/2008	14:48:00	9/15/2008 14:48	
KingLakeSeds	KCM-COUL-S	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-COUL-S	KCM-COUL-S	Sample	Government, Misc Local	9/15/2008	15:20:00	9/15/2008 15:20	9/15/2008	15:20:00	9/15/2008 15:20	
KingLakeSeds	KCM-COUL-N	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-COUL-N	KCM-COUL-N	Sample	Government, Misc Local	9/15/2008	15:54:00	9/15/2008 15:54	9/15/2008	15:54:00	9/15/2008 15:54	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/15/2014	10:06:00	9/15/2014 10:06	9/15/2014	10:06:00	9/15/2014 10:06	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/15/2014	10:06:00	9/15/2014 10:06	9/15/2014	10:06:00	9/15/2014 10:06	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/15/2014	10:11:00	9/15/2014 10:11	9/15/2014	10:11:00	9/15/2014 10:11	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/15/2014	10:11:00	9/15/2014 10:11	9/15/2014	10:11:00	9/15/2014 10:11	
KingLakeSeds	'0820SB	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0820SB	MOUNT BAKER PARK(SEATTLE PARKS)	Sample	Government, Misc Local	9/15/2016	8:50:00	9/15/2016 8:50	9/15/2016	9:05:00	9/15/2016 9:05	
KingLakeSeds	SD007SB	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-SD007SB	MADRONA PARK(SEATTLE PARKS)	Sample	Government, Misc Local	9/15/2016	9:40:00	9/15/2016 9:40	9/15/2016	9:55:00	9/15/2016 9:55	
KingLakeSeds	'0852SB	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0852SB	LAKE WASHINGTON - 0852SB	Sample	Government, Misc Local	9/15/2016	10:11:00	9/15/2016 10:11	9/15/2016	10:26:00	9/15/2016 10:26	
KingLakeSeds	'0818SB	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0818SB	MATHEWS BEACH PARK(SEATTLE PARKS)	Sample	Government, Misc Local	9/15/2016	11:20:00	9/15/2016 11:20	9/15/2016	11:35:00	9/15/2016 11:35	
KingLakeSeds	'0806SB	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0806SB	JUANITA BEACH(KING COUNTY PARK)	Sample	Government, Misc Local	9/15/2016	13:15:00	9/15/2016 13:15	9/15/2016	13:30:00	9/15/2016 13:30	
KingLakeSeds	'0806JBBW	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0806JBBW	JUANITA BAY BOARDWALK	Sample	Government, Misc Local	9/15/2016	14:30:00	9/15/2016 14:30	9/15/2016	14:45:00	9/15/2016 14:45	
KingLakeSeds	KCM-SEWBCH-N	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-SEWBCH-N	KCM-SEWBCH-N	Sample	Government, Misc Local	9/16/2008	9:16:00	9/16/2008 9:16	9/16/2008	9:16:00	9/16/2008 9:16	
KingLakeSeds	KCM-SEWBCH-S	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-SEWBCH-S	KCM-SEWBCH-S	Sample	Government, Misc Local	9/16/2008	9:55:00	9/16/2008 9:55	9/16/2008	9:55:00	9/16/2008 9:55	
KingLakeSeds	KCM-PRITCHBCH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-PRITCHBCH	KCM-PRITCHBCH	Sample	Government, Misc Local	9/16/2008	10:36:00	9/16/2008 10:36	9/16/2008	10:36:00	9/16/2008 10:36	
KingLakeSeds	KCM-MARTHAWAPK	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-MARTHAWAPK	KCM-MARTHAWAPK	Sample	Government, Misc Local	9/16/2008	11:08:00	9/16/2008 11:08	9/16/2008	11:08:00	9/16/2008 11:08	
KingLakeSeds	KCM-SEWPK-E	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-SEWPK-E	KCM-SEWPK-E	Sample	Government, Misc Local	9/16/2008	11:51:00	9/16/2008 11:51	9/16/2008	11:51:00	9/16/2008 11:51	
KingLakeSeds	KCM-SEWPK-N	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-SEWPK-N	KCM-SEWPK-N	Sample	Government, Misc Local	9/16/2008	12:21:00	9/16/2008 12:21	9/16/2008	12:21:00	9/16/2008 12:21	
KingLakeSeds	KCM-SEWPK-W	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-SEWPK-W	KCM-SEWPK-W	Sample	Government, Misc Local	9/16/2008	13:18:00	9/16/2008 13:18	9/16/2008	13:18:00	9/16/2008 13:18	
KingLakeSeds	KCM-0890	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0890	LAKE WASHINGTON - 0890	Sample	Government, Misc Local	9/16/2008	14:24:00	9/16/2008 14:24	9/16/2008	14:24:00	9/16/2008 14:24	
KingLakeSeds	KCM-0826	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0826	LAKE WASHINGTON - 0826	Sample	Government, Misc Local	9/16/2008	16:01:00	9/16/2008 16:01	9/16/2008	16:01:00	9/16/2008 16:01	
KingLakeSeds	KCM-COULBCH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-COULBCH	KCM-COULBCH	Sample	Government, Misc Local	9/17/2008	14:45:00	9/17/2008 14:45	9/17/2008	14:45:00	9/17/2008 14:45	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	9/19/2007		9/19/2007 0:00	9/19/2007		9/19/2007 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	9/19/2007		9/19/2007 0:00	9/19/2007		9/19/2007 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	9/19/2007		9/19/2007 0:00	9/19/2007		9/19/2007 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	9/19/2007		9/19/2007 0:00	9/19/2007		9/19/2007 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/19/2007		9/19/2007 0:00	9/19/2007		9/19/2007 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/19/2007		9/19/2007 0:00	9/19/2007		9/19/2007 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	9/19/2007		9/19/2007 0:00	9/19/2007		9/19/2007 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	9/19/2007		9/19/2007 0:00	9/19/2007		9/19/2007 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/23/2008		9/23/2008 0:00	9/23/2008		9/23/2008 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/23/2008		9/23/2008 0:00	9/23/2008		9/23/2008 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	9/23/2008	12:12:00	9/23/2008 12:12	9/23/2008	12:12:00	9/23/2008 12:12	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	9/23/2008	12:12:00	9/23/2008 12:12	9/23/2008	12:12:00	9/23/2008 12:12	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	9/23/2008	13:00:00	9/23/2008 13:00	9/23/2008	13:00:00	9/23/2008 13:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	9/23/2008	13:00:00	9/23/2008 13:00	9/23/2008	13:00:00	9/23/2008 13:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	9/23/2008	13:55:00	9/23/2008 13:55	9/23/2008	13:55:00	9/23/2008 13:55	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	9/23/2008	13:55:00	9/23/2008 13:55	9/23/2008	13:55:00	9/23/2008 13:55	
KingLakeSeds	KCM-NEWCBCH-S	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-NEWCBCH-S	KCM-NEWCBCH-S	Sample	Government, Misc Local	9/28/2009	11:25:00	9/28/2009 11:25	9/28/2009	11:25:00	9/28/2009 11:25	
KingLakeSeds	KCM-COALCRKMTH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-COALCRKMTH	KCM-COALCRKMTH	Sample	Government, Misc Local	9/28/2009	12:10:00	9/28/2009 12:10	9/28/2009	12:10:00	9/28/2009 12:10	
KingLakeSeds	KCM-MERSLOU-S1	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-MERSLOU-S1	KCM-MERSLOU-S1	Sample	Government, Misc Local	9/28/2009	12:40:00	9/28/2009 12:40	9/28/2009	12:40:00	9/28/2009 12:40	
KingLakeSeds	KCM-MERSLOU-S2	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-MERSLOU-S2	KCM-MERSLOU-S2	Sample	Government, Misc Local	9/28/2009	13:08:00	9/28/2009 13:08	9/28/2009	13:08:00	9/28/2009 13:08	
KingLakeSeds	KCM-MERSLOUMTH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-MERSLOUMTH	KCM-MERSLOUMTH	Sample	Government, Misc Local	9/28/2009	14:06:00	9/28/2009 14:06	9/28/2009	14:06:00	9/28/2009 14:06	
KingLakeSeds	KCM-MERSLOU-N	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-MERSLOU-N	KCM-MERSLOU-N	Sample	Government, Misc Local	9/28/2009	14:48:00	9/28/2009 14:48	9/28/2009	14:48:00	9/28/2009 14:48	
KingLakeSeds	KCM-NEWCSWMBCH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-NEWCSWMBCH	KCM-NEWCSWMBCH	Sample	Government, Misc Local	9/29/2009	14:29:00	9/29/2009 14:29	9/29/2009	14:29:00	9/29/2009 14:29	
KingLakeSeds	KCM-ENATBCHPK	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-ENATBCHPK	KCM-ENATBCHPK	Sample	Government, Misc Local	9/29/2009	14:55:00	9/29/2009 14:55	9/29/2009	14:55:00	9/29/2009 14:55	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/29/2014	12:50:00	9/29/2014 12:50	9/29/2014	12:50:00	9/29/2014 12:50	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/29/2014	12:50:00	9/29/2014 12:50	9/29/2014	12:50:00	9/29/2014 12:50	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/29/2014	12:55:00	9/29/2014 12:55	9/29/2014	12:55:00	9/29/2014 12:55	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	9/29/2014	12:55:00	9/29/2014 12:55	9/29/2014	12:55:00	9/29/2014 12:55	
KingLakeSeds	KCM-0826	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0826	LAKE WASHINGTON - 0826	Sample	Government, Misc Local	9/30/2009	10:27:00	9/30/2009 10:27	9/30/2009	10:27:00	9/30/2009 10:27	
KingLakeSeds	KCM-0890	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-0890	LAKE WASHINGTON - 0890	Sample	Government, Misc Local	9/30/2009	11:20:00	9/30/2009 11:20	9/30/2009	11:20:00	9/30/2009 11:20	
KingLakeSeds	KCM-KENNYBCHPK	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-KENNYBCHPK	KCM-KENNYBCHPK	Sample	Government, Misc Local	9/30/2009	12:05:00	9/30/2009 12:05	9/30/2009	12:05:00	9/30/2009 12:05	
KingLakeSeds	KCM-MAYCRKMTH	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-MAYCRKMTH	KCM-MAYCRKMTH	Sample	Government, Misc Local	9/30/2009	12:34:00	9/30/2009 12:34	9/30/2009	12:34:00	9/30/2009 12:34	
KingLakeSeds	KCM-NEWCBCH-C1	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-NEWCBCH-C1	KCM-NEWCBCH-C1	Sample	Government, Misc Local	9/30/2009	13:06:00	9/30/2009 13:06	9/30/2009	13:06:00	9/30/2009 13:06	
KingLakeSeds	KCM-NEWCBCH-C2	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-NEWCBCH-C2	KCM-NEWCBCH-C2	Sample	Government, Misc Local	9/30/2009	13:25:00	9/30/2009 13:25	9/30/2009	13:25:00	9/30/2009 13:25	
KingLakeSeds	KCM-NEWCBCH-C3	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-NEWCBCH-C3	KCM-NEWCBCH-C3	Sample	Government, Misc Local	9/30/2009	13:45:00	9/30/2009 13:45	9/30/2009	13:45:00	9/30/2009 13:45	
KingLakeSeds	KCM-NEWCBCH-N1	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-NEWCBCH-N1	KCM-NEWCBCH-N1	Sample	Government, Misc Local	9/30/2009	14:06:00	9/30/2009 14:06	9/30/2009	14:06:00	9/30/2009 14:06	
KingLakeSeds	KCM-NEWCBCH-N2	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	KCM-NEWCBCH-N2	KCM-NEWCBCH-N2	Sample	Government, Misc Local	9/30/2009	14:40:00	9/30/2009 14:40	9/30/2009	14:40:00	9/30/2009 14:40	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	11/9/2006		11/9/2006 0:00	11/9/2006		11/9/2006 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	11/9/2006		11/9/2006 0:00	11/9/2006		11/9/2006 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	11/9/2006		11/9/2006 0:00	11/9/2006		11/9/2006 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	11/9/2006		11/9/2006 0:00	11/9/2006		11/9/2006 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	11/9/2006		11/9/2006 0:00	11/9/2006		11/9/2006 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	11/9/2006		11/9/2006 0:00	11/9/2006		11/9/2006 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	11/9/2006		11/9/2006 0:00	11/9/2006		11/9/2006 0:00	

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Field_Collection_Area	Field_Collection_Area_Units	Field_Collection_Reference_Point	Field_Collection_Upper_Depth	Field_Collection_Lower_Depth	Field_Collection_Depth_Units	Upper_Depth_In_Feet	Lower_Depth_In_Feet	Well_Water_Level_Measuring_Point_Or_TOC_ID	Sample_ID	Sample_Field_Replicate_ID	Sample_Replicate_Flag	Sample_Sub_ID	Sample_Composite_Flag	Storm_Event_Qualifier	Sample_Matrix	Sample_Source	Sample_Use	Sample_Collection_Method	Sample_Collection_Method_Description	Sample_Preparation_Method
KingLakeSeds	'0805BSB			Sediment Surface	0	8	cm	0	0.2624664		L66132-8				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0806JCM			Sediment Surface	0	10	cm	0	0.328083		L66132-6				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0805STEDS			Sediment Surface	0	10	cm	0	0.328083		L66132-10				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'08UNBAYNE			Sediment Surface	0	10	cm	0	0.328083		L66132-26				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0805STEDN			Sediment Surface	0	10	cm	0	0.328083		L66132-12				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0804INGWET			Sediment Surface	0	10	cm	0	0.328083		L66132-14				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	LOGBOOM			Sediment Surface	0	10	cm	0	0.328083		L66132-16				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'08UNBAYNW			Sediment Surface	0	10	cm	0	0.328083		L66132-28				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	KCM-LKWABLVD-N			Sediment Surface	0	10	cm	0	0.328083		L46506-2		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-LKWABLVD-C			Sediment Surface	0	10	cm	0	0.328083		L46506-4		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-LKWABLVD-S			Sediment Surface	0	10	cm	0	0.328083		L46506-6		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-BOEING-C			Sediment Surface	0	10	cm	0	0.328083		L46506-22		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-COUL-C			Sediment Surface	0	10	cm	0	0.328083		L46506-28		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-COUL-S			Sediment Surface	0	10	cm	0	0.328083		L46506-26		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-COUL-N			Sediment Surface	0	10	cm	0	0.328083		L46506-30		U		U		Solid/Sediment	Freshwater Sediment				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L61142-8				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L61142-8				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L61142-9				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L61142-9				N		Water	Fresh/Surface Water				
KingLakeSeds	'0820SB			Sediment Surface	0	7	cm	0	0.2296581		L66132-36				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	SD007SB			Sediment Surface	0	6	cm	0	0.1968498		L66132-34				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0852SB			Sediment Surface	0	7	cm	0	0.2296581		L66132-30				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0818SB			Sediment Surface	0	6	cm	0	0.1968498		L66132-18				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0806SB			Sediment Surface	0	8	cm	0	0.2624664		L66132-2				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	'0806JBBW			Sediment Surface	0	6	cm	0	0.1968498		L66132-4				N		Solid/Sediment	Freshwater Sediment		VANVEEN	Grab sampler, Van Veen, size unspecified	
KingLakeSeds	KCM-SEWBCH-N			Sediment Surface	0	10	cm	0	0.328083		L46506-14		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-SEWBCH-S			Sediment Surface	0	10	cm	0	0.328083		L46506-16		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-PRITCHBCH			Sediment Surface	0	10	cm	0	0.328083		L46506-20		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-MARTHAWAPK			Sediment Surface	0	10	cm	0	0.328083		L46506-18		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-SEWPK-E			Sediment Surface	0	10	cm	0	0.328083		L46506-12		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-SEWPK-N			Sediment Surface	0	10	cm	0	0.328083		L46506-10		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-SEWPK-W			Sediment Surface	0	10	cm	0	0.328083		L46506-8		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-0890			Sediment Surface	0	10	cm	0	0.328083		L46506-36		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-0826			Sediment Surface	0	10	cm	0	0.328083		L46506-34		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-COULBCH			Sediment Surface	0	10	cm	0	0.328083		L46506-24		U		U		Solid/Sediment	Freshwater Sediment				
KClake-1	4903				1	1	m	3.28084	3.28084		L43833-11		N		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L43833-11		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L43833-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L43833-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L43833-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L43833-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L43833-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L43833-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L43833-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L46507-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L46507-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L46507-9				N		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L46507-9				N		Water	Fresh/Surface Water				
KClake-1	4903			Water Surface	1	1	m	3.28084	3.28084		L46507-11				N		Water	Fresh/Surface Water				
KClake-1	4903			Water Surface	1	1	m	3.28084	3.28084		L46507-11				N		Water	Fresh/Surface Water				
KClake-1	'0834			Water Surface	1	1	m	3.28084	3.28084		L46507-13				N		Water	Fresh/Surface Water				
KClake-1	'0834			Water Surface	1	1	m	3.28084	3.28084		L46507-13				N		Water	Fresh/Surface Water				
KingLakeSeds	KCM-NEWCBCH-S			Sediment Surface	0	10	cm	0	0.328083		L49021-6		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-COALCRKMTH			Sediment Surface	0	10	cm	0	0.328083		L49021-20		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-MERSLOU-S1			Sediment Surface	0	10	cm	0	0.328083		L49021-22		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-MERSLOU-S2			Sediment Surface	0	10	cm	0	0.328083		L49021-24		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-MERSLOUMTH			Sediment Surface	0	10	cm	0	0.328083		L49021-26		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-MERSLOU-N			Sediment Surface	0	10	cm	0	0.328083		L49021-28		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-NEWCSWMBCH			Sediment Surface	0	10	cm	0	0.328083		L49021-18		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-ENATBCHPK			Sediment Surface	0	10	cm	0	0.328083		L49021-30		U		U		Solid/Sediment	Freshwater Sediment				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L61280-8				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	1	1	m	3.28084	3.28084		L61280-8				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L61280-9				N		Water	Fresh/Surface Water				
KClake-1	'0540			Water Surface	8	8	m	26.24672	26.24672		L61280-9				N		Water	Fresh/Surface Water				
KingLakeSeds	KCM-0826			Sediment Surface	0	10	cm	0	0.328083		L49021-34		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-0890			Sediment Surface	0	10	cm	0	0.328083		L49021-36		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-KENNYBCHPK			Sediment Surface	0	10	cm	0	0.328083		L49021-2		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-MAYCRKMTH			Sediment Surface	0	10	cm	0	0.328083		L49021-4		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-NEWCBCH-C1			Sediment Surface	0	10	cm	0	0.328083		L49021-8		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-NEWCBCH-C2			Sediment Surface	0	10	cm	0	0.328083		L49021-10		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-NEWCBCH-C3			Sediment Surface	0	10	cm	0	0.328083		L49021-12		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-NEWCBCH-N1			Sediment Surface	0	10	cm	0	0.328083		L49021-14		U		U		Solid/Sediment	Freshwater Sediment				
KingLakeSeds	KCM-NEWCBCH-N2			Sediment Surface	0	10	cm	0	0.328083		L49021-16		U		U		Solid/Sediment	Freshwater Sediment				
KClake-1	4903				1	1	m	3.28084	3.28084		L40872-11		N		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L40872-11		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L40872-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L40872-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L40872-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L40872-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L40872-9		N		U		Water	Fresh/Surface Water				

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Sample_Preparation_Method_Description	Sample_Method_Other	Sample_Method_Other_Type	Sample_Method_Other_Description	Sample_Taxon_Name	Sample_Taxon_Common_Name	Sample_Taxon_TSN	Sample_Tissue_Type	Sample_Percent_Sorted	Result_Parameter_Name	Result_Parameter_CAS_Number	Lab_Analysis_Date	Lab_Analysis_Date_Accuracy	Lab_Analysis_Time	Result_Value	Result_Value_Units	Result_Reporting_Limit	Result_Reporting_Limit_Type	Result_Detection_Limit	Result_Detection_Limit_Type
KingLakeSeds	'0805BSB										Selenium	7782-49-2	12/21/2016		12:20:00	0.16	mg/Kg	0.333	PQL	0.16	MDL
KingLakeSeds	'0806JCM										Selenium	7782-49-2	12/21/2016		12:15:00	0.15	mg/Kg	0.298	PQL	0.15	MDL
KingLakeSeds	'0805STEDS										Selenium	7782-49-2	12/21/2016		12:25:00	0.17	mg/Kg	0.337	PQL	0.17	MDL
KingLakeSeds	'08UNBAYNE										Selenium	7782-49-2	12/21/2016		13:10:00	1.2	mg/Kg	2.45	PQL	1.2	MDL
KingLakeSeds	'0805STEDN										Selenium	7782-49-2	12/21/2016		12:40:00	0.17	mg/Kg	0.341	PQL	0.17	MDL
KingLakeSeds	'0804INGWET										Selenium	7782-49-2	12/21/2016		12:45:00	0.48	mg/Kg	0.693	PQL	0.35	MDL
KingLakeSeds	LOGBOOM										Selenium	7782-49-2	12/21/2016		12:50:00	0.17	mg/Kg	0.336	PQL	0.17	MDL
KingLakeSeds	'08UNBAYNW										Selenium	7782-49-2	12/21/2016		13:15:00	1	mg/Kg	1.9	PQL	0.95	MDL
KingLakeSeds	KCM-LKWABLVD-N										Selenium	7782-49-2	11/3/2008	D	16:25:00	0.328947	mg/Kg	0.328947	PQL	0.328947	MDL
KingLakeSeds	KCM-LKWABLVD-C										Selenium	7782-49-2	11/3/2008	D	16:30:00	0.397456	mg/Kg	0.405405	PQL	0.397456	MDL
KingLakeSeds	KCM-LKWABLVD-S										Selenium	7782-49-2	11/3/2008	D	16:35:00	0.355556	mg/Kg	0.361481	PQL	0.355556	MDL
KingLakeSeds	KCM-BOEING-C										Selenium	7782-49-2	11/3/2008	D	17:28:00	0.338753	mg/Kg	0.338753	PQL	0.338753	MDL
KingLakeSeds	KCM-COUL-C										Selenium	7782-49-2	11/3/2008	D	17:54:00	0.398773	mg/Kg	0.398773	PQL	0.398773	MDL
KingLakeSeds	KCM-COUL-S										Selenium	7782-49-2	11/3/2008	D	17:49:00	0.591133	mg/Kg	0.605911	PQL	0.591133	MDL
KingLakeSeds	KCM-COUL-N										Selenium	7782-49-2	11/3/2008	D	18:10:00	0.666667	mg/Kg	0.666667	PQL	0.666667	MDL
KClake-1	'0540										Selenium	7782-49-2	9/26/2014		13:07:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	10/13/2014		13:03:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	9/26/2014		13:12:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	10/13/2014		13:07:00	0.5	ug/L	1	PQL	0.5	MDL
KingLakeSeds	'0820SB										Selenium	7782-49-2	12/21/2016		13:55:00	0.14	mg/Kg	0.285	PQL	0.14	MDL
KingLakeSeds	SD007SB										Selenium	7782-49-2	12/21/2016		15:35:00	0.14	mg/Kg	0.281	PQL	0.14	MDL
KingLakeSeds	'0852SB										Selenium	7782-49-2	12/21/2016		15:20:00	0.15	mg/Kg	0.308	PQL	0.15	MDL
KingLakeSeds	'0818SB										Selenium	7782-49-2	12/21/2016		12:55:00	0.12	mg/Kg	0.237	PQL	0.12	MDL
KingLakeSeds	'0806SB										Selenium	7782-49-2	12/21/2016		12:05:00	0.16	mg/Kg	0.312	PQL	0.16	MDL
KingLakeSeds	'0806JBBW										Selenium	7782-49-2	12/21/2016		12:10:00	0.16	mg/Kg	0.306	PQL	0.16	MDL
KingLakeSeds	KCM-SEWBCH-N										Selenium	7782-49-2	11/3/2008	D	17:07:00	0.322181	mg/Kg	0.322181	PQL	0.322181	MDL
KingLakeSeds	KCM-SEWBCH-S										Selenium	7782-49-2	11/3/2008	D	17:12:00	0.358166	mg/Kg	0.358166	PQL	0.358166	MDL
KingLakeSeds	KCM-PRITCHBCH										Selenium	7782-49-2	11/3/2008	D	17:22:00	0.31407	mg/Kg	0.31407	PQL	0.31407	MDL
KingLakeSeds	KCM-MARTHAWAPK										Selenium	7782-49-2	11/3/2008	D	17:17:00	0.349854	mg/Kg	0.349854	PQL	0.349854	MDL
KingLakeSeds	KCM-SEWPK-E										Selenium	7782-49-2	11/3/2008	D	16:51:00	0.555556	mg/Kg	0.5625	PQL	0.555556	MDL
KingLakeSeds	KCM-SEWPK-N										Selenium	7782-49-2	11/3/2008	D	16:46:00	0.367751	mg/Kg	0.367751	PQL	0.367751	MDL
KingLakeSeds	KCM-SEWPK-W										Selenium	7782-49-2	11/3/2008	D	16:40:00	0.437956	mg/Kg	0.439781	PQL	0.437956	MDL
KingLakeSeds	KCM-0890										Selenium	7782-49-2	11/3/2008	D	18:25:00	0.699482	mg/Kg	0.673575	PQL	0.673575	MDL
KingLakeSeds	KCM-0826										Selenium	7782-49-2	11/3/2008	D	18:20:00	0.710383	mg/Kg	0.710383	PQL	0.710383	MDL
KingLakeSeds	KCM-COULBCH										Selenium	7782-49-2	11/3/2008	D	17:43:00	0.297767	mg/Kg	0.297767	PQL	0.297767	MDL
KClake-1	4903										Selenium	7782-49-2	9/28/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	10/1/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	9/28/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	10/1/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	9/28/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	10/1/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	9/28/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	10/1/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	10/16/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	10/21/2008	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	10/16/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	10/21/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	10/16/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	10/21/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	10/16/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	10/21/2008			0.5	ug/L	2.5	PQL	0.5	MDL
KingLakeSeds	KCM-NEWCBCH-S										Selenium	7782-49-2	1/6/2010	D	11:41:00	0.162602	mg/Kg	0.811653	PQL	0.162602	MDL
KingLakeSeds	KCM-COALCRKMTH										Selenium	7782-49-2	1/6/2010	D	12:43:00	0.172414	mg/Kg	0.869253	PQL	0.172414	MDL
KingLakeSeds	KCM-MERSLOU-S1										Selenium	7782-49-2	1/6/2010	D	12:49:00	0.84507	mg/Kg	4.23239	PQL	0.84507	MDL
KingLakeSeds	KCM-MERSLOU-S2										Selenium	7782-49-2	1/6/2010	D	12:54:00	1.03448	mg/Kg	5.37931	PQL	1.03448	MDL
KingLakeSeds	KCM-MERSLOUMTH										Selenium	7782-49-2	1/6/2010	D	13:00:00	1.02362	mg/Kg	4.77953	PQL	0.944882	MDL
KingLakeSeds	KCM-MERSLOU-N										Selenium	7782-49-2	1/6/2010	D	13:05:00	0.991736	mg/Kg	5.01653	PQL	0.991736	MDL
KingLakeSeds	KCM-NEWCSWMBCH										Selenium	7782-49-2	1/6/2010	D	12:37:00	0.195783	mg/Kg	0.966867	PQL	0.195783	MDL
KingLakeSeds	KCM-ENATBCHPK										Selenium	7782-49-2	1/6/2010	D	13:11:00	0.152761	mg/Kg	0.753231	PQL	0.152761	MDL
KClake-1	'0540										Selenium	7782-49-2	10/21/2014		14:29:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	10/21/2014		17:08:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	10/21/2014		14:35:00	0.5	ug/L	1	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	10/21/2014		17:13:00	0.5	ug/L	1	PQL	0.5	MDL
KingLakeSeds	KCM-0826										Selenium	7782-49-2	1/6/2010	D	13:34:00	0.857143	mg/Kg	2.99048	PQL	0.619048	MDL
KingLakeSeds	KCM-0890										Selenium	7782-49-2	1/6/2010	D	13:39:00	0.780488	mg/Kg	2.97561	PQL	0.585366	MDL
KingLakeSeds	KCM-KENNYBCHPK										Selenium	7782-49-2	1/6/2010	D	11:30:00	0.365854	mg/Kg	1.83537	PQL	0.365854	MDL
KingLakeSeds	KCM-MAYCRKMTH										Selenium	7782-49-2	1/6/2010	D	11:35:00	0.178571	mg/Kg	0.861264	PQL	0.178571	MDL
KingLakeSeds	KCM-NEWCBCH-C1										Selenium	7782-49-2	1/6/2010	D	11:46:00	0.169731	mg/Kg	0.847242	PQL	0.169731	MDL
KingLakeSeds	KCM-NEWCBCH-C2										Selenium	7782-49-2	1/6/2010	D	12:03:00	0.173103	mg/Kg	0.836218	PQL	0.173103	MDL
KingLakeSeds	KCM-NEWCBCH-C3										Selenium	7782-49-2	1/6/2010	D	12:20:00	0.157895	mg/Kg	0.819737	PQL	0.157895	MDL
KingLakeSeds	KCM-NEWCBCH-N1										Selenium	7782-49-2	1/6/2010	D	12:26:00	0.166667	mg/Kg	0.843056	PQL	0.166667	MDL
KingLakeSeds	KCM-NEWCBCH-N2										Selenium	7782-49-2	1/6/2010	D	12:32:00	0.14068	mg/Kg	0.71864	PQL	0.14068	MDL
KClake-1	4903										Selenium	7782-49-2	1/5/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	1/16/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	1/5/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	1/16/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	1/5/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	1/16/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	1/5/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Data_Qualifier	Result_Data_Qualifier_Description	Result_Suspect_or_Rejected_Flag	Result_Suspect_Code	Result_Suspect_Description	Fraction_Analyzed	Field_Filtered_Flag	Result_Basis	Digestion_Method	Water_Level_Accuracy	Result_Method
KingLakeSeds	'0805BSB	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0806JCM	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0805STEDS	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'08UNBAYNE	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0805STEDN	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0804INGWET	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.						DRY	Total		SW6020A
KingLakeSeds	LOGBOOM	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'08UNBAYNW	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.						DRY	Total		SW6020A
KingLakeSeds	KCM-LKWABLVD-N	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-LKWABLVD-C	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-LKWABLVD-S	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-BOEING-C	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-COUL-C	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-COUL-S	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-COUL-N	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KingLakeSeds	'0820SB	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	SD007SB	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0852SB	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0818SB	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0806SB	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	'0806JBBW	U	Analyte was not detected at or above the reported result.						DRY	Total		SW6020A
KingLakeSeds	KCM-SEWBCH-N	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-SEWBCH-S	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-PRITCHBCH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-MARTHAWAPK	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-SEWPK-E	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-SEWPK-N	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-SEWPK-W	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-0890						Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-0826	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-COULBCH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	4903	UJK	Analyte was not detected at or above the reported estimate with unknown bias.				Dissolved					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0834	UJK	Analyte was not detected at or above the reported estimate with unknown bias.				Dissolved					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	UJK	Analyte was not detected at or above the reported estimate with unknown bias.				Dissolved					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0852	UJK	Analyte was not detected at or above the reported estimate with unknown bias.				Dissolved					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0540	UJK	Analyte was not detected at or above the reported estimate with unknown bias.				Total					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0852	UJK	Analyte was not detected at or above the reported estimate with unknown bias.				Dissolved					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Dissolved	U				EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Dissolved	U				EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Dissolved	U				EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KingLakeSeds	KCM-NEWCBCH-S	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-COALCRKMTH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-MERSLOU-S1	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-MERSLOU-S2	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-MERSLOUMTH	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-MERSLOU-N	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-NEWCSWMBCH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-ENATBCHPK	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved	Y				EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KingLakeSeds	KCM-0826	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-0890	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-KENNYBCHPK	JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-MAYCRKMTH	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-NEWCBCH-C1	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-NEWCBCH-C2	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-NEWCBCH-C3	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-NEWCBCH-N1	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KingLakeSeds	KCM-NEWCBCH-N2	U	Analyte was not detected at or above the reported result.				Tot Recoverable		DRY			SW6020A
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Method_Description	Result_Comment	Result_Additional_Comment	Result_Lab_Replicate_ID	Result_Lab_Name	Result_Validation_Level	Result_Taxon_Name	Result_Taxon_Common_Name
KingLakeSeds	'0805BSB	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0806JCM	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0805STEDS	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'08UNBAYNE	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0805STEDN	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0804INGWET	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <RDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	LOGBOOM	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'08UNBAYNW	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <RDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	KCM-LKWABLVD-N	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-LKWABLVD-C	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-LKWABLVD-S	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-BOEING-C	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-COUL-C	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-COUL-S	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-COUL-N	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0820SB	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	SD007SB	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0852SB	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0818SB	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0806SB	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	'0806JBBW	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	KCM-SEWBCH-N	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-SEWBCH-S	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-PRITCHBCH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-MARTHAWAPK	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-SEWPK-E	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-SEWPK-N	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-SEWPK-W	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-0890	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-0826	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-COULBCH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	KCM-NEWCBCH-S	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-COALCRKMTH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-MERSLOU-S1	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-MERSLOU-S2	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-MERSLOUMTH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-MERSLOU-N	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-NEWCSWMBCH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-ENATBCHPK	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KingLakeSeds	KCM-0826	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-0890	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-KENNYBCHPK	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-MAYCRKMTH	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-NEWCBCH-C1	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-NEWCBCH-C2	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-NEWCBCH-C3	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-NEWCBCH-N1	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KingLakeSeds	KCM-NEWCBCH-N2	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), Revision 1				King County Environmental Laboratory, Seattle WA	QA1		
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Taxon_Alias_Other	Result_Taxon_TSN	Result_Taxon_Parent_TSN	Result_Taxon_Unidentified_Species	Result_Taxon_Life_Stage	Study_QA_Planning_Level	Study_QA_Assessment_Level	Study_Type	EIM_Data_Entry_Review_Status	Calculated_Latitude_Decimal_Degrees_NAD83HARN	Calculated_Longitude_Decimal_Degrees_NAD83HARN	Record_Created_On	Result_System_ID
KingLakeSeds	'0805BSB						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.70819419	-122.2509789	3/28/2018 9:55	207595397
KingLakeSeds	'0806JCM						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.70366042	-122.2178473	3/28/2018 9:55	207595287
KingLakeSeds	'0805STEDS						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.72846597	-122.2627937	3/28/2018 9:55	207593417
KingLakeSeds	'08UNBAYNE						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.65494606	-122.2889771	3/28/2018 9:55	207594297
KingLakeSeds	'0805STEDN						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.72964985	-122.2635009	3/28/2018 9:55	207593527
KingLakeSeds	'0804INGWET						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75027903	-122.2579018	3/28/2018 9:55	207593637
KingLakeSeds	LOGBOOM						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.7572133	-122.2642647	3/28/2018 9:55	207593747
KingLakeSeds	'08UNBAYNW						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.65362038	-122.2925071	3/28/2018 9:55	207594407
KingLakeSeds	KCM-LKWABLVD-N						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.56802691	-122.2711803		86916060
KingLakeSeds	KCM-LKWABLVD-C						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.56168654	-122.2651718		27242541
KingLakeSeds	KCM-LKWABLVD-S						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5577815	-122.2617227		14539173
KingLakeSeds	KCM-BOEING-C						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.50244008	-122.2091217		91375035
KingLakeSeds	KCM-COUL-C						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.51203791	-122.2044983		27245075
KingLakeSeds	KCM-COUL-S						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.50917323	-122.2033101		62693807
KingLakeSeds	KCM-COUL-N						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.51538448	-122.2077837		1140343
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:43	204289335
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:43	204289336
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:43	204289372
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:43	204289373
KingLakeSeds	'0820SB						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.58333414	-122.2872342	3/28/2018 9:55	207594847
KingLakeSeds	SD007SB						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.60877839	-122.2826092	3/28/2018 9:55	207594737
KingLakeSeds	'0852SB						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.63572187	-122.2765	3/28/2018 9:55	207594517
KingLakeSeds	'0818SB						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.69674893	-122.2726677	3/28/2018 9:55	207593857
KingLakeSeds	'0806SB						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.70372066	-122.2149161	3/28/2018 9:55	207593967
KingLakeSeds	'0806JBBW						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.70092974	-122.2108085	3/28/2018 9:55	207595067
KingLakeSeds	KCM-SEWBCH-N						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.55150614	-122.2581485		68697423
KingLakeSeds	KCM-SEWBCH-S						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5485075	-122.2567502		75040281
KingLakeSeds	KCM-PRITCHBCH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.52972887	-122.2629983		97989299
KingLakeSeds	KCM-MARTHAWAPK						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.54180266	-122.2594341		67611653
KingLakeSeds	KCM-SEWPK-E						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.553326	-122.2463511		67738181
KingLakeSeds	KCM-SEWPK-N						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.56223559	-122.2530947		72218912
KingLakeSeds	KCM-SEWPK-W						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.55854672	-122.2553638		33394101
KingLakeSeds	KCM-0890						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5754354	-122.2672963		92989589
KingLakeSeds	KCM-0826						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.68676202	-122.235333		15014590
KingLakeSeds	KCM-COULBCH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.50454011	-122.203249		4668361
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		23069029
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		26748332
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		48913499
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		53965046
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		80973281
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		2607833
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		42369942
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		38896705
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		7130651
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		90552495
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634	1/21/2014 11:25	200273079
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634	1/21/2014 11:25	200273080
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904	1/21/2014 11:25	200272989
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904	1/21/2014 11:25	200272990
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072	1/21/2014 11:25	200273034
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072	1/21/2014 11:25	200273035
KingLakeSeds	KCM-NEWCBCH-S						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.56323474	-122.1892167		59611571
KingLakeSeds	KCM-COALCRKMTH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57379496	-122.1911934		66713437
KingLakeSeds	KCM-MERSLOU-S1						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57680978	-122.1890029		99067000
KingLakeSeds	KCM-MERSLOU-S2						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57747391	-122.1884934		73727719
KingLakeSeds	KCM-MERSLOUMTH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57821038	-122.1888165		82840558
KingLakeSeds	KCM-MERSLOU-N						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57833318	-122.1900151		73770017
KingLakeSeds	KCM-NEWCSWMBCH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.56592181	-122.1915148		1213777
KingLakeSeds	KCM-ENATBCHPK						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57878387	-122.1970372		8731690
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:43	204289640
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:43	204289641
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:43	204289677
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493	6/17/2016 8:43	204289678
KingLakeSeds	KCM-0826						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.68676202	-122.235333		99627598
KingLakeSeds	KCM-0890						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5754354	-122.2672963		34332201
KingLakeSeds	KCM-KENNYBCHPK						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.52360985	-122.2078184		75800170
KingLakeSeds	KCM-MAYCRKMTH						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.52794706	-122.2051395		66605054
KingLakeSeds	KCM-NEWCBCH-C1						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.56399596	-122.1897631		25985385
KingLakeSeds	KCM-NEWCBCH-C2						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.56471655	-122.190268		39768905
KingLakeSeds	KCM-NEWCBCH-C3						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5651885	-122.1909285		21412694
KingLakeSeds	KCM-NEWCBCH-N1						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5653736	-122.1915005		92354798
KingLakeSeds	KCM-NEWCBCH-N2						LEVEL 1: Informal or no QA documentation.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.56635893	-122.1916477		90608703
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		72580167
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		55410371
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		66354939
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		30659679
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		33911624
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		49426496
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		94561937

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Study_Name	Location_ID	Location_Name	Field_Collection_Type	Field_Collector	Field_Collection_Start_Date	Field_Collection_Start_Time	Field_Collection_Start_Date_Time	Field_Collection_End_Date	Field_Collection_End_Time	Field_Collection_End_Date_Time	Field_Collection_Comment
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	11/9/2006		11/9/2006 0:00	11/9/2006		11/9/2006 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	11/19/2007		11/19/2007 0:00	11/19/2007		11/19/2007 0:00	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	11/19/2007		11/19/2007 0:00	11/19/2007		11/19/2007 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	11/19/2007		11/19/2007 0:00	11/19/2007		11/19/2007 0:00	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	11/19/2007		11/19/2007 0:00	11/19/2007		11/19/2007 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	11/19/2007		11/19/2007 0:00	11/19/2007		11/19/2007 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	11/19/2007		11/19/2007 0:00	11/19/2007		11/19/2007 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	11/19/2007		11/19/2007 0:00	11/19/2007		11/19/2007 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	11/19/2007		11/19/2007 0:00	11/19/2007		11/19/2007 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	12/10/2008		12/10/2008 0:00	12/10/2008		12/10/2008 0:00	
KClake-1	'0540	King County Routine Major Lakes Ambient Monitoring	KCM-0540	LAKE UNION - 0540	Sample	Government, Misc Local	12/10/2008		12/10/2008 0:00	12/10/2008		12/10/2008 0:00	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	12/10/2008	12:27:00	12/10/2008 12:27	12/10/2008	12:27:00	12/10/2008 12:27	
KClake-1	'0852	King County Routine Major Lakes Ambient Monitoring	KCM-0852	LAKE WASHINGTON - 0852	Sample	Government, Misc Local	12/10/2008	12:27:00	12/10/2008 12:27	12/10/2008	12:27:00	12/10/2008 12:27	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	12/10/2008	13:15:00	12/10/2008 13:15	12/10/2008	13:15:00	12/10/2008 13:15	
KClake-1	4903	King County Routine Major Lakes Ambient Monitoring	KCM-4903	LAKE WASHINGTON - 4903	Sample	Government, Misc Local	12/10/2008	13:15:00	12/10/2008 13:15	12/10/2008	13:15:00	12/10/2008 13:15	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	12/10/2008	14:10:00	12/10/2008 14:10	12/10/2008	14:10:00	12/10/2008 14:10	
KClake-1	'0834	King County Routine Major Lakes Ambient Monitoring	KCM-0834	LAKE WASHINGTON - 0834	Sample	Government, Misc Local	12/10/2008	14:10:00	12/10/2008 14:10	12/10/2008	14:10:00	12/10/2008 14:10	
LUUCSO00	544	King County Lake Union University Regulator CSO	LUUCSO00544	LUUCSO00	Sample	Government, Misc State	4/10/2000		4/10/2000 0:00	4/10/2000		4/10/2000 0:00	
LUUCSO97	544	University Regulator Post CSO Separat'n	LUUCSO97544	LUUCSO97	Sample	Government, Misc State	4/29/1997		4/29/1997 0:00	4/29/1997		4/29/1997 0:00	
LUUMON95	534	King County Lake Union Sediment Monitoring 1995	LUUMON95534	LUUMON95	Sample	Government, Misc State	7/26/1995		7/26/1995 0:00	7/26/1995		7/26/1995 0:00	
LUUMON95	544	King County Lake Union Sediment Monitoring 1995	LUUMON95544	LUUMON95	Sample	Government, Misc State	7/27/1995		7/27/1995 0:00	7/27/1995		7/27/1995 0:00	
LKWA00	0801A	Lake Washington Baseline Sed Study 2000	LKWA000801A	LKWA00	Sample	Government, Misc State	8/7/2000		8/7/2000 0:00	8/7/2000		8/7/2000 0:00	
LKWA00	804	Lake Washington Baseline Sed Study 2000	LKWA00804	LKWA00	Sample	Government, Misc State	8/7/2000		8/7/2000 0:00	8/7/2000		8/7/2000 0:00	
LKWA00	826	Lake Washington Baseline Sed Study 2000	LKWA00826	LKWA00	Sample	Government, Misc State	8/7/2000		8/7/2000 0:00	8/7/2000		8/7/2000 0:00	
LKWA00	852	Lake Washington Baseline Sed Study 2000	LKWA00852	LKWA00	Sample	Government, Misc State	8/7/2000		8/7/2000 0:00	8/7/2000		8/7/2000 0:00	
LKWA00	861	Lake Washington Baseline Sed Study 2000	LKWA00861	LKWA00	Sample	Government, Misc State	8/7/2000		8/7/2000 0:00	8/7/2000		8/7/2000 0:00	
LKWA00	861	Lake Washington Baseline Sed Study 2000	LKWA00861	LKWA00	Sample	Government, Misc State	8/7/2000		8/7/2000 0:00	8/7/2000		8/7/2000 0:00	
LKWA00	840	Lake Washington Baseline Sed Study 2000	LKWA00840	LKWA00	Sample	Government, Misc State	8/8/2000		8/8/2000 0:00	8/8/2000		8/8/2000 0:00	
LKWA00	890	Lake Washington Baseline Sed Study 2000	LKWA00890	LKWA00	Sample	Government, Misc State	8/8/2000		8/8/2000 0:00	8/8/2000		8/8/2000 0:00	
LKWA00	890	Lake Washington Baseline Sed Study 2000	LKWA00890	LKWA00	Sample	Government, Misc State	8/8/2000		8/8/2000 0:00	8/8/2000		8/8/2000 0:00	
LKWA00	831	Lake Washington Baseline Sed Study 2000	LKWA00831	LKWA00	Sample	Government, Misc State	8/8/2000		8/8/2000 0:00	8/8/2000		8/8/2000 0:00	
LKWA00	S0025	Lake Washington Baseline Sed Study 2000	LKWA00S0025	LKWA00	Sample	Government, Misc State	8/21/2000		8/21/2000 0:00	8/21/2000		8/21/2000 0:00	
LKWA00	0814B	Lake Washington Baseline Sed Study 2000	LKWA000814B	LKWA00	Sample	Government, Misc State	8/21/2000		8/21/2000 0:00	8/21/2000		8/21/2000 0:00	
LKWA00	0425A	Lake Washington Baseline Sed Study 2000	LKWA000425A	LKWA00	Sample	Government, Misc State	8/21/2000		8/21/2000 0:00	8/21/2000		8/21/2000 0:00	
LKWA00	0817A	Lake Washington Baseline Sed Study 2000	LKWA000817A	LKWA00	Sample	Government, Misc State	8/21/2000		8/21/2000 0:00	8/21/2000		8/21/2000 0:00	
LKWA00	4901A	Lake Washington Baseline Sed Study 2000	LKWA004901A	LKWA00	Sample	Government, Misc State	8/21/2000		8/21/2000 0:00	8/21/2000		8/21/2000 0:00	
LKWA00	862	Lake Washington Baseline Sed Study 2000	LKWA00862	LKWA00	Sample	Government, Misc State	8/22/2000		8/22/2000 0:00	8/22/2000		8/22/2000 0:00	
LKWA00	0807A	Lake Washington Baseline Sed Study 2000	LKWA000807A	LKWA00	Sample	Government, Misc State	8/22/2000		8/22/2000 0:00	8/22/2000		8/22/2000 0:00	
LKWA00	862	Lake Washington Baseline Sed Study 2000	LKWA00862	LKWA00	Sample	Government, Misc State	8/22/2000		8/22/2000 0:00	8/22/2000		8/22/2000 0:00	
LKWA00	862	Lake Washington Baseline Sed Study 2000	LKWA00862	LKWA00	Sample	Government, Misc State	8/22/2000		8/22/2000 0:00	8/22/2000		8/22/2000 0:00	
LKWA00	A422A	Lake Washington Baseline Sed Study 2000	LKWA00A422A	LKWA00	Sample	Government, Misc State	8/22/2000		8/22/2000 0:00	8/22/2000		8/22/2000 0:00	
LUUCSO97	544	University Regulator Post CSO Separat'n	LUUCSO97544	LUUCSO97	Sample	Government, Misc State	8/26/1996		8/26/1996 0:00	8/26/1996		8/26/1996 0:00	
LKWA00	544	Lake Washington Baseline Sed Study 2000	LKWA00544	LKWA00	Sample	Government, Misc State	9/13/2000		9/13/2000 0:00	9/13/2000		9/13/2000 0:00	
LKWA00	560	Lake Washington Baseline Sed Study 2000	LKWA00560	LKWA00	Sample	Government, Misc State	9/13/2000		9/13/2000 0:00	9/13/2000		9/13/2000 0:00	
LKWA00	A422A	Lake Washington Baseline Sed Study 2000	LKWA00A422A	LKWA00	Sample	Government, Misc State	8/22/2000		8/22/2000 0:00	8/22/2000		8/22/2000 0:00	
LUUCSO97	544	University Regulator Post CSO Separat'n	LUUCSO97544	LUUCSO97	Sample	Government, Misc State	8/26/1996		8/26/1996 0:00	8/26/1996		8/26/1996 0:00	
LKWA00	544	Lake Washington Baseline Sed Study 2000	LKWA00544	LKWA00	Sample	Government, Misc State	9/13/2000		9/13/2000 0:00	9/13/2000		9/13/2000 0:00	
LKWA00	560	Lake Washington Baseline Sed Study 2000	LKWA00560	LKWA00	Sample	Government, Misc State	9/13/2000		9/13/2000 0:00	9/13/2000		9/13/2000 0:00	
LKWA00	834	Lake Washington Baseline Sed Study 2000	LKWA00834	LKWA00	Sample	Government, Misc State	9/13/2000		9/13/2000 0:00	9/13/2000		9/13/2000 0:00	
LKWA00	SD017A	Lake Washington Baseline Sed Study 2000	LKWA00SD017A	LKWA00	Sample	Government, Misc State	9/13/2000		9/13/2000 0:00	9/13/2000		9/13/2000 0:00	
LKWA00	832	Lake Washington Baseline Sed Study 2000	LKWA00832	LKWA00	Sample	Government, Misc State	9/13/2000		9/13/2000 0:00	9/13/2000		9/13/2000 0:00	
LKWA00	0829A	Lake Washington Baseline Sed Study 2000	LKWA000829A	LKWA00	Sample	Government, Misc State	9/13/2000		9/13/2000 0:00	9/13/2000		9/13/2000 0:00	
LUUCSO97	544	University Regulator Post CSO Separat'n	LUUCSO97544	LUUCSO97	Sample	Government, Misc State	9/17/1996		9/17/1996 0:00	9/17/1996		9/17/1996 0:00	
LKWA00	4903B	Lake Washington Baseline Sed Study 2000	LKWA004903B	LKWA00	Sample	Government, Misc State	9/25/2000		9/25/2000 0:00	9/25/2000		9/25/2000 0:00	
LKWA00	SD007A	Lake Washington Baseline Sed Study 2000	LKWA00SD007A	LKWA00	Sample	Government, Misc State	9/25/2000		9/25/2000 0:00	9/25/2000		9/25/2000 0:00	
LKWA00	0864B	Lake Washington Baseline Sed Study 2000	LKWA000864B	LKWA00	Sample	Government, Misc State	9/25/2000		9/25/2000 0:00	9/25/2000		9/25/2000 0:00	
LKWA00	0864A	Lake Washington Baseline Sed Study 2000	LKWA000864A	LKWA00	Sample	Government, Misc State	9/25/2000		9/25/2000 0:00	9/25/2000		9/25/2000 0:00	
LKWA00	SD007A	Lake Washington Baseline Sed Study 2000	LKWA00SD007A	LKWA00	Sample	Government, Misc State	9/25/2000		9/25/2000 0:00	9/25/2000		9/25/2000 0:00	
LKWA00	SD007A	Lake Washington Baseline Sed Study 2000	LKWA00SD007A	LKWA00	Sample	Government, Misc State	9/25/2000		9/25/2000 0:00	9/25/2000		9/25/2000 0:00	
LKWA00	4903A	Lake Washington Baseline Sed Study 2000	LKWA004903A	LKWA00	Sample	Government, Misc State	9/25/2000		9/25/2000 0:00	9/25/2000		9/25/2000 0:00	
LKWA00	4903A	Lake Washington Baseline Sed Study 2000	LKWA004903A	LKWA00	Sample	Government, Misc State	9/25/2000		9/25/2000 0:00	9/25/2000		9/25/2000 0:00	
LKWA00	4903A	Lake Washington Baseline Sed Study 2000	LKWA004903A	LKWA00	Sample	Government, Misc State	9/25/2000		9/25/2000 0:00	9/25/2000		9/25/2000 0:00	
LKWA00	SD007B	Lake Washington Baseline Sed Study 2000	LKWA00SD007B	LKWA00	Sample	Government, Misc State	9/25/2000		9/25/2000 0:00	9/25/2000		9/25/2000 0:00	
LUUCSO97	544	University Regulator Post CSO Separat'n	LUUCSO97544	LUUCSO97	Sample	Government, Misc State	10/30/1997		10/30/1997 0:00	10/30/1997		10/30/1997 0:00	
SBAYPH3	10A2	Salmon Bay Sediments Phase III - Chemistry and Bioassays	SBAY10A2	LAKE WASHINGTON OFF SHERIDAN BEACH	Sample	WA Dept of Ecology	5/19/1997		5/19/1997 0:00	5/19/1997		5/19/1997 0:00	

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Field_Collection_Area	Field_Collection_Area_Units	Field_Collection_Reference_Point	Field_Collection_Upper_Depth	Field_Collection_Lower_Depth	Field_Collection_Depth_Units	Upper_Depth_In_Feet	Lower_Depth_In_Feet	Well_Water_Level_Measuring_Point_Or_TOC_ID	Sample_ID	Sample_Field_Replicate_ID	Sample_Replicate_Flag	Sample_Sub_ID	Sample_Composite_Flag	Storm_Event_Qualifier	Sample_Matrix	Sample_Source	Sample_Use	Sample_Collection_Method	Sample_Collection_Method_Description	Sample_Preparation_Method
KClake-1	'0852				1	1	m	3.28084	3.28084		L40872-9		N		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L44405-11		N		U		Water	Fresh/Surface Water				
KClake-1	4903				1	1	m	3.28084	3.28084		L44405-11		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L44405-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0834				1	1	m	3.28084	3.28084		L44405-13		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L44405-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L44405-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L44405-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0852				1	1	m	3.28084	3.28084		L44405-9		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L46913-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0540				1	1	m	3.28084	3.28084		L46913-8		N		U		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L46913-9				N		Water	Fresh/Surface Water				
KClake-1	'0852			Water Surface	1	1	m	3.28084	3.28084		L46913-9				N		Water	Fresh/Surface Water				
KClake-1	4903			Water Surface	1	1	m	3.28084	3.28084		L46913-11				N		Water	Fresh/Surface Water				
KClake-1	4903			Water Surface	1	1	m	3.28084	3.28084		L46913-11				N		Water	Fresh/Surface Water				
KClake-1	'0834			Water Surface	1	1	m	3.28084	3.28084		L46913-13				N		Water	Fresh/Surface Water				
KClake-1	'0834			Water Surface	1	1	m	3.28084	3.28084		L46913-13				N		Water	Fresh/Surface Water				
LUUCSO00	544				0	2	cm	0	0.0656166		L17656-3		U		N		Solid/Sediment	Freshwater Sediment	R	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LUUCSO97	544										L10962-3		U		Y		Solid/Sediment	Freshwater Sediment	T			
LUUMON95	534										L6612-1		U		Y		Solid/Sediment	Freshwater Sediment	T			
LUUMON95	544										L6586-15		U		Y		Solid/Sediment	Freshwater Sediment	T			
LKWA00	0801A				0	10	cm	0	0.328083		L18493-1		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	804				0	10	cm	0	0.328083		L18493-2		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	826				0	10	cm	0	0.328083		L18493-3		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	852				0	10	cm	0	0.328083		L18493-4		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	861				0	10	cm	0	0.328083		L18493-5	FR01	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	861				0	10	cm	0	0.328083		L18493-6	FR02	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	840				0	10	cm	0	0.328083		L18493-10		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	890				0	10	cm	0	0.328083		L18493-7	FR01	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	890				0	10	cm	0	0.328083		L18493-8	FR02	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	831				0	10	cm	0	0.328083		L18493-9		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	S0025				0	10	cm	0	0.328083		L18656-1		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	0814B				0	10	cm	0	0.328083		L18656-10		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	0425A				0	10	cm	0	0.328083		L18656-2		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	0817A				0	10	cm	0	0.328083		L18656-3		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	4901A				0	10	cm	0	0.328083		L18656-4		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	862				0	8	cm	0	0.2624664		L18656-8	FR03	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	0807A				0	10	cm	0	0.328083		L18656-5		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	862				0	10	cm	0	0.328083		L18656-6	FR01	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	862				0	10	cm	0	0.328083		L18656-7	FR02	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	A422A				0	10	cm	0	0.328083		L18656-9		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LUUCSO97	544										L9347-3		U		Y		Solid/Sediment	Freshwater Sediment	T			
LKWA00	544				0	10	cm	0	0.328083		L18812-1		U		N		Solid/Sediment	Freshwater Sediment	R	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	560				0	10	cm	0	0.328083		L18812-2		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	834				0	10	cm	0	0.328083		L18812-3		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	SD017A				0	10	cm	0	0.328083		L18812-4		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	832				0	10	cm	0	0.328083		L18812-5		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	0829A				0	10	cm	0	0.328083		L18812-6		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LUUCSO97	544										L9496-3		U		Y		Solid/Sediment	Freshwater Sediment	T			
LKWA00	4903B				0	8	cm	0	0.2624664		L18862-8		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	SD007A				0	10	cm	0	0.328083		L18862-1	FR01	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	0864B				0	10	cm	0	0.328083		L18862-10		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	0864A				0	10	cm	0	0.328083		L18862-2		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	SD007A				0	10	cm	0	0.328083		L18862-3	FR02	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	SD007A				0	10	cm	0	0.328083		L18862-4	FR03	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	4903A				0	10	cm	0	0.328083		L18862-5	FR01	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	4903A				0	10	cm	0	0.328083		L18862-6	FR02	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	4903A				0	10	cm	0	0.328083		L18862-7	FR03	Y		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LKWA00	SD007B				0	10	cm	0	0.328083		L18862-9		U		N		Solid/Sediment	Freshwater Sediment	T	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	
LUUCSO97	544										L12109-3		U		Y		Solid/Sediment	Freshwater Sediment	T			
SBAYPH3	10A2			Sediment Surface	0	0.24384	m	0	0.800000026		97218310		N		U		Solid/Sediment	Freshwater Sediment	R	VANVEEN.10	Grab sampler, Van Veen, 0.10 m2	

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Sample_Preparation_Method_Description	Sample_Method_Other	Sample_Method_Other_Type	Sample_Method_Other_Description	Sample_Taxon_Name	Sample_Taxon_Common_Name	Sample_Taxon_TSN	Sample_Tissue_Type	Sample_Percent_Sorted	Result_Parameter_Name	Result_Parameter_CAS_Number	Lab_Analysis_Date	Lab_Analysis_Date_Accuracy	Lab_Analysis_Time	Result_Value	Result_Value_Units	Result_Reporting_Limit	Result_Reporting_Limit_Type	Result_Detection_Limit	Result_Detection_Limit_Type
KClake-1	'0852										Selenium	7782-49-2	1/16/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	11/27/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	12/7/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	11/27/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	12/7/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	11/27/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	12/7/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	11/27/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	12/7/2007	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	1/13/2009	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0540										Selenium	7782-49-2	2/20/2009	D		0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	1/13/2009		16:03:00	0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0852										Selenium	7782-49-2	2/20/2009		13:24:00	0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	1/13/2009		16:14:00	0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	4903										Selenium	7782-49-2	2/20/2009		13:38:00	0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	1/13/2009		16:36:00	0.5	ug/L	2.5	PQL	0.5	MDL
KClake-1	'0834										Selenium	7782-49-2	2/20/2009		13:51:00	0.5	ug/L	2.5	PQL	0.5	MDL
LUUCSO00	544										Selenium	7782-49-2	4/10/2000	D		1.9	ppm				
LUUCSO97	544										Selenium	7782-49-2	4/29/1997	D		1.8	ppm				
LUUMON95	534										Selenium	7782-49-2	7/26/1995	D		3.8	ppm				
LUUMON95	544										Selenium	7782-49-2	7/27/1995	D		0.35	ppm				
LKWA00	0801A										Selenium	7782-49-2	8/7/2000	D		1.1	ppm				
LKWA00	804										Selenium	7782-49-2	8/7/2000	D		1.2	ppm				
LKWA00	826										Selenium	7782-49-2	8/7/2000	D		1.9	ppm				
LKWA00	852										Selenium	7782-49-2	8/7/2000	D		2.1	ppm				
LKWA00	861										Selenium	7782-49-2	8/7/2000	D		2	ppm				
LKWA00	861										Selenium	7782-49-2	8/7/2000	D		1.9	ppm				
LKWA00	840										Selenium	7782-49-2	8/8/2000	D		1.5	ppm				
LKWA00	890										Selenium	7782-49-2	8/8/2000	D		1.9	ppm				
LKWA00	890										Selenium	7782-49-2	8/8/2000	D		1.9	ppm				
LKWA00	831										Selenium	7782-49-2	8/8/2000	D		1.1	ppm				
LKWA00	S0025										Selenium	7782-49-2	8/21/2000	D		0.78	ppm				
LKWA00	0814B										Selenium	7782-49-2	8/21/2000	D		1.5	ppm				
LKWA00	0425A										Selenium	7782-49-2	8/21/2000	D		0.82	ppm				
LKWA00	0817A										Selenium	7782-49-2	8/21/2000	D		1	ppm				
LKWA00	4901A										Selenium	7782-49-2	8/21/2000	D		0.92	ppm				
LKWA00	862										Selenium	7782-49-2	8/22/2000	D		0.51	ppm				
LKWA00	0807A										Selenium	7782-49-2	8/22/2000	D		0.9	ppm				
LKWA00	862										Selenium	7782-49-2	8/22/2000	D		0.52	ppm				
LKWA00	862										Selenium	7782-49-2	8/22/2000	D		0.49	ppm				
LKWA00	A422A										Selenium	7782-49-2	8/22/2000	D		1.3	ppm				
LUUCSO97	544										Selenium	7782-49-2	8/26/1996	D		0.63	ppm				
LKWA00	544										Selenium	7782-49-2	9/13/2000	D		0.62	ppm				
LKWA00	560										Selenium	7782-49-2	9/13/2000	D		0.81	ppm				
LKWA00	834										Selenium	7782-49-2	9/13/2000	D		2	ppm				
LKWA00	SD017A										Selenium	7782-49-2	9/13/2000	D		0.9	ppm				
LKWA00	832										Selenium	7782-49-2	9/13/2000	D		0.82	ppm				
LKWA00	0829A										Selenium	7782-49-2	9/13/2000	D		0.85	ppm				
LUUCSO97	544										Selenium	7782-49-2	9/17/1996	D		1.4	ppm				
LKWA00	4903B										Selenium	7782-49-2	9/25/2000	D		1.2	ppm				
LKWA00	SD007A										Selenium	7782-49-2	9/25/2000	D		0.66	ppm				
LKWA00	0864B										Selenium	7782-49-2	9/25/2000	D		0.84	ppm				
LKWA00	0864A										Selenium	7782-49-2	9/25/2000	D		0.9	ppm				
LKWA00	SD007A										Selenium	7782-49-2	9/25/2000	D		0.75	ppm				
LKWA00	SD007A										Selenium	7782-49-2	9/25/2000	D		0.72	ppm				
LKWA00	4903A										Selenium	7782-49-2	9/25/2000	D		0.88	ppm				
LKWA00	4903A										Selenium	7782-49-2	9/25/2000	D		0.86	ppm				
LKWA00	4903A										Selenium	7782-49-2	9/25/2000	D		0.88	ppm				
LKWA00	SD007B										Selenium	7782-49-2	9/25/2000	D		0.75	ppm				
LUUCSO97	544										Selenium	7782-49-2	10/30/1997	D		1	ppm				
SBAYPH3	10A2										Selenium	7782-49-2	6/16/1997		0:00:00	4	mg/Kg				

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Data_Qualifier	Result_Data_Qualifier_Description	Result_Suspect_or_Rejected_Flag	Result_Suspect_Code	Result_Suspect_Description	Fraction_Analyzed	Field_Filtered_Flag	Result_Basis	Digestion_Method	Water_Level_Accuracy	Result_Method
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Dissolved					EPA200.8
KClake-1	'0540	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Dissolved	U				EPA200.8
KClake-1	'0852	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Dissolved	U				EPA200.8
KClake-1	4903	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Dissolved	U				EPA200.8
KClake-1	'0834	U	Analyte was not detected at or above the reported result.				Total					EPA200.8
LUUCSO00	544	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LUUCSO97	544	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LUUMON95	534	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LUUMON95	544	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	0801A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	804	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	826	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	852	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	861	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	861	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	840	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	890	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	890	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	831	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	S0025	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	0814B	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	0425A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	0817A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	4901A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	862	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	0807A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	862	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	862	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	A422A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LUUCSO97	544	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	544	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	560	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	A422A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LUUCSO97	544	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	544	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	560	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	834	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	SD017A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	832	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	0829A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LUUCSO97	544	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	4903B	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	SD007A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	0864B	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	0864A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	SD007A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	SD007A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	4903A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	4903A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	4903A	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LKWA00	SD007B	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
LUUCSO97	544	U	Analyte was not detected at or above the reported result.				Unknown		dry			UNKNOWN-SQ
SBAYPH3	10A2	U	Analyte was not detected at or above the reported result.						DRY			EPA200.7

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Method_Description	Result_Comment	Result_Additional_Comment	Result_Lab_Replicate_ID	Result_Lab_Name	Result_Validation_Level	Result_Taxon_Name	Result_Taxon_Common_Name
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0540	Metals and Trace Elements in Waters by ICP-MS				King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0852	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	4903	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
KClake-1	'0834	Metals and Trace Elements in Waters by ICP-MS	KC Qual: <MDL			King County Environmental Laboratory, Seattle WA			
LUUCSO00	544	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
LUUCSO97	544	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
LUUMON95	534	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
LUUMON95	544	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	0801A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	804	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	826	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	852	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	861	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	861	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	840	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	890	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	890	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	831	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	S0025	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	0814B	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	0425A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	0817A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	4901A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	862	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	0807A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	862	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	862	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	A422A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LUUCSO97	544	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	544	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	560	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	A422A	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
LUUCSO97	544	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	544	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	560	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	834	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	SD017A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	832	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	0829A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LUUCSO97	544	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	4903B	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	SD007A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	0864B	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	0864A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	SD007A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	SD007A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	4903A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	4903A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	4903A	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LKWA00	SD007B	Unknown method - legacy data from SEDQUAL sediments database.	U		1	Unknown - legacy data from SEDQUAL sediments database	QA1		
LUUCSO97	544	Unknown method - legacy data from SEDQUAL sediments database.	U			Unknown - legacy data from SEDQUAL sediments database	QA1		
SBAYPH3	10A2	Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES)				Dept of Ecology Manchester Environmental Lab, Port Orchard WA			

Attachment H-1
EIM Output - Selenium Concentrations in Lake Washington Surface Sediment

Study_ID	Study_Specific_Location_ID	Result_Taxon_Alias_Other	Result_Taxon_TSN	Result_Taxon_Parent_TSN	Result_Taxon_Unidentified_Species	Result_Taxon_Life_Stage	Study_QA_Planning_Level	Study_QA_Assessment_Level	Study_Type	EIM_Data_Entry_Review_Status	Calculated_Latitude_Decimal_Degrees_NAD83HARN	Calculated_Longitude_Decimal_Degrees_NAD83HARN	Record_Created_On	Result_System_ID
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		81631902
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		99094520
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904		25171570
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		46916575
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072		36348414
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		45189775
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		54147928
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		33094901
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634		46745925
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		87320299
KClake-1	'0540						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.6472979	-122.3052493		66636868
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634	1/21/2014 11:26	200275914
KClake-1	'0852						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.63649546	-122.2686634	1/21/2014 11:26	200275915
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904	1/21/2014 11:26	200275824
KClake-1	4903						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.52294148	-122.2619904	1/21/2014 11:26	200275825
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072	1/21/2014 11:26	200275869
KClake-1	'0834						LEVEL 3: QAPP, SAP, or Equivalent.	Level 3: Data Verified and Assessed for Usability	Routine ambient monitoring	Not Reviewed	47.61024646	-122.2119072	1/21/2014 11:26	200275870
LUUCSO00	544						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Monitoring for NPDES permit requirements	Not Reviewed	47.6463357	-122.2782293		81582421
LUUCSO97	544						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Monitoring for NPDES permit requirements	Not Reviewed	47.64667708	-122.2759849		75498816
LUUMON95	534						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Monitoring for NPDES permit requirements	Not Reviewed	47.65043687	-122.2908194		72448345
LUUMON95	544						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Monitoring for NPDES permit requirements	Not Reviewed	47.64667708	-122.2759849		52067250
LKWA00	0801A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.75600085	-122.2653983		98956679
LKWA00	804						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.74676365	-122.2712369		73791468
LKWA00	826						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.68676202	-122.235333		42919091
LKWA00	852						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.63649546	-122.2686634		28742659
LKWA00	861						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.61429861	-122.2580229		8707825
LKWA00	861						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.61429861	-122.2580229		44100788
LKWA00	840						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5387112	-122.2063299		4100888
LKWA00	890						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5754354	-122.2672963		77537347
LKWA00	890						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.5754354	-122.2672963		79780163
LKWA00	831						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.51585045	-122.21908		84700852
LKWA00	S0025						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.71593158	-122.2767906		76659126
LKWA00	0814B						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.65335217	-122.2105585		19277609
LKWA00	0425A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.70665801	-122.2527975		72731330
LKWA00	0817A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.6944851	-122.2680197		76614514
LKWA00	4901A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.68924814	-122.259266		84535849
LKWA00	862						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.67865031	-122.2449679		30944502
LKWA00	0807A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.69628485	-122.2223376		59255063
LKWA00	862						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.67865031	-122.2449679		89711253
LKWA00	862						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.67865031	-122.2449679		56438838
LKWA00	A422A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.67135747	-122.2090464		88259944
LUUCSO97	544						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Monitoring for NPDES permit requirements	Not Reviewed	47.64667708	-122.2759849		26900269
LKWA00	544						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.64667708	-122.2759849		95089127
LKWA00	560						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.66287732	-122.2648465		46927592
LKWA00	834						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.61024646	-122.2119072		80310826
LKWA00	SD017A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.59395762	-122.2358288		72098456
LKWA00	832						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57422833	-122.192558		28760102
LKWA00	0829A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.50451335	-122.2133847		61543183
LUUCSO97	544						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Monitoring for NPDES permit requirements	Not Reviewed	47.64667708	-122.2759849		47427526
LKWA00	4903B						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.52321626	-122.2628156		90251923
LKWA00	SD007A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.61401988	-122.2801153		60714634
LKWA00	0864B						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57156421	-122.2763629		61478859
LKWA00	0864A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.57112599	-122.2754594		89447151
LKWA00	SD007A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.61401988	-122.2801153		17916609
LKWA00	SD007A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.61401988	-122.2801153		1582018
LKWA00	4903A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.52332965	-122.2616489		16199326
LKWA00	4903A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.52332965	-122.2616489		51265562
LKWA00	4903A						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.52332965	-122.2616489		53049201
LKWA00	SD007B						LEVEL 3: QAPP, SAP, or Equivalent.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	General environmental study	Not Reviewed	47.6149396	-122.2798084		18577780
LUUCSO97	544						LEVEL 4: Approved QAPP or SAP.	See Result Validation Level in Results and/or Bioassay QA Level in Bioassay	Monitoring for NPDES permit requirements	Not Reviewed	47.64667708	-122.2759849		88112830
SBAYPH3	10A2						LEVEL 3: QAPP, SAP, or Equivalent.	Level 5: Data Verified and Assessed for Usability in a Peer-Reviewed Study Report	General environmental study	Reviewed	47.74684181	-122.2751024		3250110

ATTACHMENT H-2
PROUCL OUTPUT

Attachment H-2
ProUCL Output - Descriptive Statistics

General Statistics on Uncensored Data

Date/Time of Computation ProUCL 5.2 3/24/2023 11:26:03 AM

User Selected Options

From File Input_Dataset RIFS AppH_03242023.xls

Full Precision OFF

From File: Input_Dataset RIFS AppG_03242023.xls

General Statistics for Censored Datasets (with NDs) using Kaplan Meier Method

Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
Lake Washington	95	0	13	82	86.32%	0.237	5.379	0.34	0.0442	0.21	0.618
Barbee Mill	29	0	16	13	44.83%	0.2	1.2	0.678	0.22	0.469	0.691

General Statistics for Raw Dataset using Detected Data Only

Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
Lake Washington	13	0	0.32	1.024	0.726	0.829	0.0556	0.236	0.192	-0.627	0.325
Barbee Mill	16	0	0.27	1.86	0.986	1.045	0.179	0.423	0.245	-0.062	0.43

Percentiles using all Detects (Ds) and Non-Detects (NDs)

Variable	NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Lake Washington	95	0	0.31	0.341	0.367	0.717	0.88	1	2	2.03	5.038
Barbee Mill	29	0	0.336	0.356	0.41	0.86	1.09	1.12	1.242	1.416	1.737

APPENDIX I

Soil, Groundwater, and Porewater Tables

Attachments

Table I-1 – Summary of Analytical Data - All Analytes

I1 – Independent Remedial Action Plan, Upland Areas, Hart Crowser, 2000b

I2 – Barbee Mill Baseline Sediment Characterization, Anchor Environmental, 2002

I3 – Completion Report, Independent Remedial Action, Barbee Mill Sediment Cleanup Project, Anchor Environmental, 2003

I4 – Summary of Site Geochemical Data, Aspect, 2006a

I5 – Summary of Subsurface Characterization Data, Area Specific Results for Former Pan Abode Area, Aspect, 2006c

I6 – Summary of Characterization Results, Shoreline Restoration Project, Aspect, 2006d

I7 – Construction Report, Barbee Mill Arsenic Remediation, Aspect, 2006e

I8 – Construction Report, Barbee Mill TPH and PCP Remediation, Aspect, 2006f

I9 – Engineering Design Report, Barbee Mill Groundwater Remediation, Aspect, 2006g

I10 – Passive Attenuation Zone Pilot Test Results, Barbee Mill Arsenic Remediation Project, Aspect, 2006h

I11 – Data Gaps Report, Aspect, 2018

I12 – Remedial Investigation Data Gaps Report, Aspect and Geosyntec, 2023

I13 – Annual Progress Report and Performance Monitoring Report, Aspect, 2023

TABLE I-1

Summary of Analytical Data - All Analytes

Table I-1. Summary of Analytical Data - All Analytes

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Total Number of Samples Analyzed	Total Number of Detected Samples	Maximum Detected Concentration
Soil			
BTEX			
Benzene	25	0	--
Toluene	25	1	0.03 mg/kg
Ethylbenzene	25	3	0.1 mg/kg
Total Xylenes	25	2	0.31 mg/kg
Conventionals			
Sulfide	5	2	0.5 mg/kg
Total Organic Carbon	5	4	7.09 %
Total Solids	5	5	87.2 mg/kg
Chromium Reducible Sulfide	5	5	62.6 mg/kg
Metals			
Aluminum	5	3	22500 mg/kg
Antimony	12	5	10 mg/kg
Arsenic	571	494	260 mg/kg
Barium	3	3	40.9 mg/kg
Beryllium	12	12	0.3 mg/kg
Cadmium	30	7	0.5 mg/kg
Chromium	30	30	79 mg/kg
Copper	27	27	33 mg/kg
Iron	5	5	23900 mg/kg
Lead	30	28	48 mg/kg
Manganese	5	5	411 mg/kg
Mercury	27	8	1.6 mg/kg
Nickel	27	27	60 mg/kg
Selenium	15	4	13 mg/kg
Silver	30	0	--
Thallium	12	0	--
Zinc	117	117	1000 mg/kg
Other SVOCs			
2,3,4-Trichlorophenol	12	0	--
2,3,4,5-Tetrachlorophenol	12	1	0.0032 mg/kg
2,3,5,6-Tetrachlorophenol	12	0	--
2,3,6-Trichlorophenol	12	0	--
2,4-Dichlorophenol	12	0	--
2,4,5-Trichlorophenol	24	0	--
2,4,6-Trichlorophenol	24	0	--
Dibenzofuran	12	1	0.35 mg/kg
Pentachlorophenol	50	16	2.4 mg/kg
Phenol	4	0	--
Total Tetrachlorophenols	12	3	0.15 mg/kg
PAHs			
1-Methylnaphthalene	22	5	0.1 mg/kg
2-Methylnaphthalene	34	5	0.18 mg/kg

Table I-1. Summary of Analytical Data - All Analytes

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Total Number of Samples Analyzed	Total Number of Detected Samples	Maximum Detected Concentration
Soil (continued)			
Acenaphthene	37	6	0.49 mg/kg
Acenaphthylene	37	0	--
Anthracene	37	5	0.34 mg/kg
Benzo(g,h,i)perylene	37	17	0.12 mg/kg
Fluoranthene	37	18	1.2 mg/kg
Fluorene	37	9	0.61 mg/kg
Naphthalene	37	8	0.2 mg/kg
Phenanthrene	37	21	3 mg/kg
Pyrene	37	25	0.57 mg/kg
Benz(a)anthracene	37	15	0.12 mg/kg
Benzo(a)pyrene	37	28	0.17 mg/kg
Benzo(b)fluoranthene	37	22	0.24 mg/kg
Benzo(k)fluoranthene	37	10	1.2 mg/kg
Chrysene	37	25	0.4 mg/kg
Dibenzo(a,h)anthracene	37	5	0.024 mg/kg
Indeno(1,2,3-cd)pyrene	37	10	0.084 mg/kg
Total PAHs	39	33	6.94 mg/kg
Total cPAHs TEQ (ND = 1/2 RDL)	38	30	0.2879 mg/kg
Total cPAHs TEQ (ND multiplier Unknown)	1	1	0.09429 mg/kg
PCBAro			
Aroclor 1016	15	0	--
Aroclor 1221	3	0	--
Aroclor 1232	3	0	--
Aroclor 1242	15	0	--
Aroclor 1248	15	0	--
Aroclor 1254	15	0	--
Aroclor 1260	15	0	--
Aroclor 1262	1	0	--
Total PCBs (Sum of Aroclors)	15	0	--
TPHs			
Gasoline Range Organics	27	2	51 mg/kg
Diesel Range Organics	48	10	690 mg/kg
Motor Oil Range Organics	49	13	530 mg/kg
Diesel and Oil Extended Range Organics	49	15	1200 mg/kg
VOCs			
m,p-Xylenes	25	2	0.31 mg/kg
o-Xylene	15	1	0.029 mg/kg
Groundwater			
BTEX			
Benzene	13	0	--
Toluene	13	1	1.1 ug/L
Ethylbenzene	13	0	--
Total Xylenes	13	2	1.8 ug/L

Table I-1. Summary of Analytical Data - All Analytes

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Total Number of Samples Analyzed	Total Number of Detected Samples	Maximum Detected Concentration
Groundwater (continued)			
Conventionals			
Alkalinity, Total	22	22	865 mg/L
Biochemical Oxygen Demand	8	5	7 mg/L
Chloride	8	8	14000 ug/L
Nitrate as Nitrogen	8	8	700 ug/L
Nitrite as Nitrogen	8	3	10 ug/L
OrthoPhosphate	8	8	950 ug/L
Sulfate	8	1	5400 ug/L
Sulfide	8	7	40 ug/L
Total Organic Carbon	8	8	65900 ug/L
Metals			
Antimony (Dissolved)	13	0	--
Antimony (Total)	13	0	--
Arsenic (Dissolved)	798	759	52000 ug/L
Arsenic (Total)	42	35	2680 ug/L
Barium (Dissovled)	8	3	39 ug/L
Barium (Total)	8	6	44 ug/L
Beryllium (Dissolved)	5	0	--
Beryllium (Total)	5	0	--
Cadmium (Dissolved)	16	0	--
Cadmium (Total)	5	0	--
Calcium (Dissolved)	9	9	155000 ug/L
Chromium (Dissolved)	16	0	--
Chromium (Total)	5	3	13 ug/L
Copper (Dissolved)	69	3	9.9 ug/L
Copper (Total)	5	3	15 ug/L
Iron (Dissolved)	540	529	140000 ug/L
Iron (Total)	16	15	91000 ug/L
Lead (Dissolved)	65	1	1.4 ug/L
Lead (Total)	5	0	--
Magnesium (Dissolved)	9	9	84800 ug/L
Manganese (Dissolved)	17	17	9780 ug/L
Mercury (Dissolved)	24	0	--
Mercury (Total)	13	0	--
Nickel (Dissolved)	16	4	14 ug/L
Nickel (Total)	5	3	30 ug/L
Potassium (Dissolved)	9	8	5910 ug/L
Selenium (Dissolved)	13	1	60 ug/L
Selenium (Total)	13	2	90 ug/L
Silicon (Dissolved)	9	9	29800 ug/L
Silver (Dissolved)	16	0	--
Silver (Total)	5	0	--
Sodium (Dissolved)	9	9	48900 ug/L

Table I-1. Summary of Analytical Data - All Analytes

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Total Number of Samples Analyzed	Total Number of Detected Samples	Maximum Detected Concentration
Groundwater (continued)			
Thallium (Dissolved)	5	0	--
Thallium (Total)	5	0	--
Zinc (Dissolved)	58	13	150 ug/L
Zinc (Total)	5	5	31 ug/L
Arsenic III	8	8	35100 ug/L
Arsenic, Inorganic	8	8	37035 ug/L
Other SVOCs			
2,3,4-Trichlorophenol	5	0	--
2,3,4,5-Tetrachlorophenol	5	0	--
2,3,5,6-Tetrachlorophenol	5	0	--
2,3,6-Trichlorophenol	5	0	--
2,4-Dichlorophenol	6	0	--
2,4,5-Trichlorophenol	11	0	--
2,4,6-Trichlorophenol	11	0	--
Dibenzofuran	5	0	--
Hexachlorobutadiene	7	0	--
Pentachlorophenol	12	1	0.06 ug/L
Total Tetrachlorophenols	6	0	--
PAHs			
1-Methylnaphthalene	8	0	--
2-Methylnaphthalene	13	0	--
Acenaphthene	14	2	0.33 ug/L
Acenaphthylene	14	0	--
Anthracene	14	1	0.14 ug/L
Benzo(g,h,i)perylene	14	0	--
Fluoranthene	14	2	0.37 ug/L
Fluorene	14	1	0.16 ug/L
Naphthalene	16	0	--
Phenanthrene	14	1	0.51 ug/L
Pyrene	14	2	0.42 ug/L
Benz(a)anthracene	14	1	0.037 ug/L
Benzo(a)pyrene	14	0	--
Benzo(b)fluoranthene	14	1	0.012 ug/L
Benzo(j,k)fluoranthene	8	0	--
Benzo(k)fluoranthene	6	0	--
Chrysene	14	1	0.032 ug/L
Dibenzo(a,h)anthracene	14	0	--
Indeno(1,2,3-cd)pyrene	14	0	--
Total cPAHs TEQ (ND = 1/2 RDL)	14	1	0.01237 ug/L
PCB Aroclors			
Aroclor 1016	1	0	--
Aroclor 1221	1	0	--
Aroclor 1232	1	0	--

Table I-1. Summary of Analytical Data - All Analytes

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Total Number of Samples Analyzed	Total Number of Detected Samples	Maximum Detected Concentration
Groundwater (continued)			
Aroclor 1242	1	0	--
Aroclor 1248	1	0	--
Aroclor 1254	1	0	--
Aroclor 1260	1	0	--
Total PCBs (Sum of Aroclors)	1	0	--
TPHs			
Gasoline Range Organics	13	2	320 ug/L
Diesel Range Organics	32	4	1600 ug/L
Motor Oil Range Organics	30	0	--
Diesel and Oil Extended Range Organics	36	4	1600 ug/L
VOCs			
1,1-Dichloroethane	7	0	--
1,1-Dichloroethene	7	0	--
1,1-Dichloropropene	5	0	--
1,1,1-Trichloroethane	7	0	--
1,1,1,2-Tetrachloroethane	7	0	--
1,1,2-Trichloroethane	7	0	--
1,1,2 - Trichlorotrifluoroethane	5	0	--
1,1,2,2-Tetrachloroethane	7	0	--
1,2-Dibromo-3-chloropropane	7	0	--
1,2-Dibromoethane (EDB) (8260)	7	0	--
1,2-Dichlorobenzene	7	0	--
1,2-Dichloroethane (EDC)	7	0	--
1,2-Dichloropropane	7	0	--
1,2,3-Trichlorobenzene	7	0	--
1,2,3-Trichloropropane	7	0	--
1,2,4-Trichlorobenzene	7	0	--
1,2,4-Trimethylbenzene	7	1	1.1 ug/L
1,3-Dichlorobenzene	7	0	--
1,3-Dichloropropane	7	0	--
1,3,5-Trimethylbenzene	7	1	1.6 ug/L
1,4-Dichloro-2-Butene	5	0	--
1,4-Dichlorobenzene	7	0	--
2-Butanone	7	3	42 ug/L
2-Chloroethyl Vinyl Ether	5	0	--
2-Chlorotoluene	7	0	--
2-Hexanone	7	0	--
2,2-Dichloropropane	7	0	--
4-Chlorotoluene	7	0	--
4-Methyl-2-pentanone	7	0	--
Acetone	7	3	15 ug/L
Acrolein	5	0	--
Acrylonitrile	5	0	--

Table I-1. Summary of Analytical Data - All Analytes

Project No. 050004, Barbee Mill Site, Renton, WA

Analyte	Total Number of Samples Analyzed	Total Number of Detected Samples	Maximum Detected Concentration
Groundwater (continued)			
Bromobenzene	7	0	--
Bromochloromethane	7	0	--
Bromodichloromethane	7	0	--
Bromoethane	5	0	--
Bromoform	7	0	--
Bromomethane	7	0	--
Carbon Disulfide	7	0	--
Carbon Tetrachloride	7	0	--
Chlorobenzene	7	0	--
Chloroethane	7	0	--
Chloroform	7	0	--
Chloromethane	7	0	--
cis-1,2-Dichloroethene (DCE)	7	0	--
cis-1,3-Dichloropropene	7	0	--
Dibromochloromethane	7	0	--
Dibromomethane	7	0	--
Dichlorodifluoromethane	2	0	--
Isopropylbenzene	7	1	3.8 ug/L
m,p-Xylenes	13	2	1.8 ug/L
Methylene Chloride	7	0	--
Methyliodide	5	0	--
n-Butylbenzene	7	0	--
n-Propylbenzene	7	1	5 ug/L
o-Xylene	13	0	--
p-Isopropyltoluene	7	0	--
sec-Butylbenzene	7	0	--
Styrene	7	0	--
tert-Butylbenzene	7	0	--
Tetrachloroethene (PCE)	7	0	--
trans-1,2-Dichloroethene	7	0	--
trans-1,3-Dichloropropene	7	0	--
Trichloroethene (TCE)	7	0	--
Trichlorofluoromethane	7	0	--
Vinyl Acetate	2	0	--
Vinyl Chloride	7	0	--
Porewater			
Metals			
Arsenic (Dissolved)	28	19	1400 ug/L
Iron (Dissolved)	24	13	26000 ug/L
Manganese (Dissolved)	2	2	65 ug/L

Notes:
Total cPAHs calculated based on benzo(a)pyrene toxicity equivalency factors
Excavated and stockpile characterization samples not included in summary table

ATTACHMENT I1

Data from Independent Remedial Action Plan, Upland Areas, Hart Crowser, 2000b

Table 7 - Total Petroleum Hydrocarbons Concentrations in Soil and Groundwater Samples

Sample ID	Sampling Date	Diesel	Gasoline	Motor Oil
Soil Concentrations in mg/kg				
HC-39/0-3	6/10/1999		5.6 U	
HC-39/6-9	6/10/1999		5.8 U	
HC-49/0-3	6/10/1999	110	5.5 U	350
HC-49/6-9	6/10/1999	13 U	6.5 U	63
HC-50/0-3	6/11/1999	18	5.7 U	140
HC-50/3-6	6/11/1999	21	7.3 U	170
HC-51/3-6	6/11/1999	15	7.1 U	91
HC-51/6-9	6/11/1999	13 U	6.5 U	65
HC-52/0-3	6/11/1999	53	5.5 U	830
HC-52/3-6	6/11/1999	36	6.9 U	290
HC-52/6-9	6/11/1999	18	6.3 U	130
HC-53/0-3	6/11/1999	20	5.4 U	180
HC-53/3-6	6/11/1999	18	5.4 U	120
HC-54/0-3	6/11/1999	13	5.5 U	55
HC-54/3-6	6/11/1999	19	5.5 U	120
HC-55/0-3	6/11/1999	16	5.5 U	84
HC-55/3-6	6/11/1999	19	6.2 U	76
HC-55/6-9	6/11/1999	12 U	6.1 U	49 U
Local sewer	6/16/1999	400	8.7 U	4000
Outfall 001	6/16/1999	1700	30 U	4100
Outfall 002	6/16/1999	140	7.7 U	510
Proposed Cleanup Level in mg/kg		2000	30	2000
Water Concentrations in mg/L				
HC-39	6/10/1999	0.25 U	0.1 U	0.74 U
HC-39D	6/10/1999	0.25 U	0.1 U	0.75 U
HC-40	6/10/1999	0.24 U	0.1 U	0.71 U
HC-41	6/10/1999	0.24 U	0.1 U	0.72 U
HC-45	6/10/1999	0.24 U	0.1 U	0.71 U
HC-49	6/10/1999	0.38	0.1 U	0.75 U
RMW04	6/11/1999	1.6	0.29	0.71 U
RMW05	6/11/1999	0.24 U	0.1 U	0.72 U
Proposed Cleanup Level in mg/L		1	1	1

Boxed result indicates exceedence of screening criteria.
U = Not detected at detection limit indicated.
Blank indicates sample not analyzed for specific analyte.

494610/IRAP.xls - Table7

Table 8 - BETX Concentrations in Soil and Groundwater Samples

Sample ID	Sampling Date	Benzene	Ethylbenzene	Toluene	M,p-xylene	O-xylene	Total Xylenes
Soil Concentrations in mg/kg							
HC-39/0-3	6/10/1999	0.028 U	0.049	0.028 U	0.053	0.028 U	0.053
HC-39/6-9	6/10/1999	0.029 U	0.029 U	0.029 U	0.029 U	0.029 U	0.029 U
HC-49/0-3	6/10/1999	0.028 U	0.039	0.028 U	0.079	0.029	0.11
HC-49/6-9	6/10/1999	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U
Local sewer	6/16/1999	0.044 U	0.044 U	0.1	0.083	0.044 U	0.083
Outfall 001	6/16/1999	0.15 U	0.15 U	0.34	0.31	0.15 U	0.31
Outfall 002	6/16/1999	0.039 U	0.039 U	0.079	0.078	0.039 U	0.078
Proposed Cleanup Level in mg/kg		34.5	6	7	NA	NA	9
Water Concentrations in µg/L							
HC-39	6/10/1999	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
HC-39D	6/10/1999	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
HC-40	6/10/1999	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
HC-41	6/10/1999	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
HC-45	6/10/1999	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
HC-49	6/10/1999	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
RMW04	6/11/1999	0.5 U	0.5 U	0.5 U	1.2	0.5 U	1.2
RMW05	6/11/1999	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Proposed Cleanup Level in µg/L		43	6910	48500	NA	NA	16000

Notes:
NA = Not Applicable.
U = Not detected at detection limit indicated.

Table 9 - Arsenic Concentrations in Soil Samples

Location	Depth Range in Feet	Arsenic in mg/kg (MAS)	Arsenic in mg/kg (TEG)	TCLP Arsenic in mg/L	SPLP Arsenic in mg/L
HC-1	2 - 4	28			
	5.5 - 6.5	65			
	7.5 - 9.5	220		0.14	
	12 - 13	4.4			
HC-2	1.5 -3.5	9.7			
	5 - 6	120		0.11	
	6.2 - 7	13			
	10 - 11	2.9			
HC-3	2 - 3.5	16			
	3.5 - 4	1.9			
	5 - 6	8.7			
	10 - 12	2.1			
HC-4	2 - 4	17			
	4 - 6	12			
	9 - 9.5	4.4			
HC-5	1 - 3	72			
	4.5 - 6	260		1.2	
	7 - 10	34			
HC-6	2 - 4	1.9			
	5.5 - 7	2.1			
	10.5 - 12	2.7			
HC-7	1 - 4	650		0.22	
	7 - 10	34			
	10 - 12	14			
HC-8	3 - 4	1.5			
	6 - 7	0.96			
	10.5 - 12	2.1			
HC-9	2.5 - 5	4.3			
	6 - 7	0.78			
	9.5 - 10	2.5			
HC-11	1 - 4	3.1			
	4 - 7	72			
HC-12	1 - 1.5		5 U		
	1.5 - 5	100	86		0.25
	5.5 - 7.5		5 U		
	7.5 - 8.5		5 U		
	9 - 11.5		5 U		
	11.5 - 13		5 U		
HC-13	1 - 3	10	5 U		0.1 U
	4 - 5.5		5 U		
	5.5 - 7		5 U		
HC-14	1 - 4		92		
	7 - 8		17		
	8 - 10		5 U		

Table 9 - Arsenic Concentrations in Soil Samples

Location	Depth Range in Feet	Arsenic in mg/kg (MAS)	Arsenic in mg/kg (TEG)	TCLP Arsenic in mg/L	SPLP Arsenic in mg/L
HC-15	1 - 4	250	242		0.83
	4 - 6.5		150		0.25
	6.5 - 7		41		0.11
	7.5 - 9		5 U		
	9 - 10		5 U		
HC-16	1 - 4		8.7		
	5 - 7		67		0.22
	8 - 10		22		
	11.5 - 14		64		
HC-17	1 - 4		47		
	4 - 7		5 U		
	9 - 10		5 U		
	11 - 12.5		5 U		
HC-18	1 - 3		5 U		
	6 - 7		41		0.1 U
	9 - 10		5 U		
HC-19	1 - 2		5 U		
	2 - 4		5 U		
	8 - 10		5 U		
HC-20	1 - 4		5 U		
	4 - 6.5		5 U		
	6.5 - 7.5	2.5	5 U		
	7.5 - 10		5 U		
HC-21	1 - 3.5		5 U		
	4 - 7		5 U		
	7 - 9.5		5 U		
HC-21	10.5 - 12		5 U		
HC-22	1 - 2.5	3	5 U		
	2.5 - 5.5		8.6		
	6 - 10		5 U		
HC-23	15 - 17		5 U		
	19 - 21		5 U		
HC-25	1 - 4		74		0.1 U
	4.5 - 6.5		8.1		
	6.5 - 9		5 U		
	11.5 - 13		5 U		
HC-27	1.5 - 3		5 U		
	3.5 - 6		13		0.1 U
	6 - 7.5		5 U		
HC-28	1.5 - 2.5		5 U		
	3 - 5.5	6.5	5 U		
	5.5 - 7.5		5 U		
HC-29	1 - 3.5		5 U		
	3.5 - 7		5 U		
	8 - 10		5 U		
HC-30	4 - 7				0.91

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Table 9 - Arsenic Concentrations in Soil Samples

Location	Depth Range in Feet	Arsenic in mg/kg (MAS)	Arsenic in mg/kg (TEG)	TCLP Arsenic in mg/L	SPLP Arsenic in mg/L
HC-31	1 - 3.5		5 U		0.1 U
	3.5 - 5.5		6		
	5.5 - 10		5 U		
HC-34	3 - 6.5	4.3			
	6.5 - 9	7			0.012
HC-35	1.75 - 3.5	2.9			
	6 - 8	2.2			0.0026
HC-37	5.5 - 7	1.1			
	7 - 9	3.9			0.0027
HC-38	4.5 - 6	4.3			
	7.5 - 8	0.67			
HC-39	0 - 3	79			
	6 - 9	17			
HC-41	0 - 3	2.9 J			
	6 - 9	18			
HC-42	0 - 3	3.3			
	6 - 9	1.8			
HC-43	0 - 3	4.5 J			
	6 - 9	3.1			
HC-44	0 - 3	2.3 J			
	6 - 9	2.5			
HC-46	0 - 3	22			
	6 - 9	120			
HC-47	0 - 3	2.6			
	6 - 9	1			
HC-48	0 - 3	3			
	6 - 9	3.5			
HC-49	0 - 3	3.8 S			
	6 - 9	0.9			
HC-50	0 - 3	170		0.41	
	3 - 6	270		1.5	
HC-51	3 - 6	91		0.53	
	6 - 9	27		0.1 U	
HC-52	0 - 3	140		0.42	
	3 - 6	110		0.39	
	6 - 9	54		0.16	
HC-53	0 - 3	830		0.37	
	3 - 6	180		0.1 U	
HC-54	0 - 3	140		0.22	
	3 - 6	310		0.1 U	
HC-55	0 - 3	6.5		0.1 U	
	3 - 6	170		0.35	
	6 - 9	33		0.34	
HC-56	0 - 3	2			
	3 - 6	5.1			

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Table 9 - Arsenic Concentrations in Soil Samples

Location	Depth Range in Feet	Arsenic in mg/kg (MAS)	Arsenic in mg/kg (TEG)	TCLP Arsenic in mg/L	SPLP Arsenic in mg/L
HC-57	0 - 3	2.2			
	3 - 6	14			
Local sewer		5.8			
Outfall 001		10 J			
Outfall 002		32 J			
RSB-01	0 - 1.5		6 U		
	2.5 - 4		6 U		
RSB-02	0 - 1.5		6 U		
	7.5 - 9		10 U		
RSB-03	0 - 1.5		5 U		
	2.5 - 4		6 U		
RSB-04	0 - 1.5		12		
	2.5 - 4		20		
RSB-05	0 - 1.5		5 U		
	2.5 - 4		5 U		
RSB-06	0 - 1.5		6 U		
	2.5 - 4		6 U		
RSB-07	0 - 1.5		5 U		
	2.5 - 4		6 U		
RSB-08	0 - 1.5		6 U		
	2.5 - 4		5 U		
TP-1		48 S			
TP-1-S1		38			
TP-1-S2		260			
TP-2		60			
TP-2-S2		96 S			
TP-2-S3		16			
TP-3-S1		14			
TP-3-S2		8.2			
TP-4-S1		37			
TP-4-S2		76			
TP-4-S3		4.9			
TP-5-S1		35			
TP-5-S2		17			
TP-6-S1		3			
TP-6-S2		100			
TP-7-S1		6.2			
TP-7-S2		3			
Proposed Cleanup Level in mg/kg		20	20		

Boxed result indicates exceedence of screening criteria.
MAS is MultiChem Analytic Services
TEG is Transglobal Environmental Geosciences
U = Not detected at detection limit indicated.
Blank indicates sample not analyzed for specific analyte.

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Table 10 - Dissolved Metals Concentrations in Groundwater Samples

Location	Sampling Date	Concentration in mg/L Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc
Monitoring Wells										
RMW-01	7/1/1996	0.05 U								
RMW-01	3/1/1998	0.045								
RMW-01	9/1/1998	0.081								
RMW-02	7/1/1996	0.05 U								
RMW-03	7/1/1996	2.68								
RMW-03	3/1/1998	5.6								
RMW-03	9/1/1998	16								
RMW-04	7/1/1996	0.05 U								
RMW-05	7/1/1996	0.05 U								
BH-17A	3/1/1998	0.0068								
BH-17B	3/1/1998	0.0062								
BH-26A	3/1/1998	0.0044								
BH-26B	3/1/1998	0.02								
HC-MW-1D	9/1/1998	0.03								
HC-MW-1D	6/11/1999	0.12			0.001 U					
HC-MW-1D		0.025								
HC-MW-1S	9/1/1998	2.1								
HC-MW-1S	6/11/1999	1			0.001 U					
HC-MW-1S		2.4								
HC-MW-2	9/1/1998	52								
HC-MW-2	6/11/1999	40			0.001 U					
HC-MW-2 Dup	9/1/1998	61								
HC-MW-2		43								
HC-MW-3		0.24								
HC-MW-4		19								
HC-MW-5D		0.0086								
HC-MW-5S		0.011								
HC-WP-04	9/1/1998	0.016								
Strataprobe Explorations										
HC-2	Mar-98	0.45								
HC-3	Mar-98	0.18								
HC-6	Mar-98	0.016								
HC-7	Mar-98	0.38								
HC-9	Mar-98	0.033								
HC-10	Mar-98	0.017								
HC-11	Mar-98	29								
HC-12	Jun-98	0.11								
HC-13	Jun-98	0.019								
HC-15	Jun-98	3.1								
HC-16	Jun-98	9								
HC-17	Jun-98	14								
HC-18	Jun-98	28								

Table 10 - Dissolved Metals Concentrations in Groundwater Samples

Location	Sampling Date	Concentration in mg/L								
		Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc
HC-19	Jun-98	0.43								
HC-19 Dup	Jun-98	0.43								
HC-20	Jun-98	0.18								
HC-21	Jun-98	0.0059								
HC-22	Jun-98	3.3								
HC-26 Deep	Jun-98	3.2								
HC-32	Sep-98	0.011								
HC-33	Sep-98	0.011								
HC-34	Sep-98	3.6								
HC-34 Dup	Sep-98	3.1								
HC-35	Sep-98	0.025								
HC-36	Sep-98	0.072								
HC-37	Sep-98	0.12								
HC-38	Sep-98	0.096								
WP-01	Sep-98	0.82								
WP-02	Sep-98	0.029								
WP-03	Sep-98	0.0068								
HC-39	6/10/1999	0.1	0.005 U	0.01 U	0.0071	0.001 U	0.0002 U	0.01 U	0.01 U	0.15 J
HC-40	6/10/1999	0.033	0.005 U	0.01 U	0.001 U	0.001 U	0.0002 U	0.014	0.01 U	0.01 UJ
HC-41	6/10/1999	0.22	0.005 U	0.01 U	0.001 U	0.001 U	0.0002 U	0.01 U	0.01 U	0.01 UJ
HC-42	6/10/1999	0.065	0.005 U	0.01 U	0.001 U	0.001 U	0.0002 U	0.01 U	0.01 U	0.01 UJ
HC-43	6/10/1999	0.01	0.005 U	0.01 U	0.001 U	0.001 U	0.0002 U	0.01 U	0.01 U	0.012 J
HC-44	6/10/1999	0.095	0.005 U	0.01 U	0.001 U	0.001 U	0.0002 U	0.014	0.01 U	0.01 UJ
HC-45	6/10/1999	0.018	0.005 U	0.01 U	0.001 U	0.001 U	0.0002 U	0.01 U	0.01 U	0.01 UJ
HC-46	6/10/1999	20	0.005 U	0.01 U	0.0099	0.001 U	0.0002 U	0.01 U	0.01 U	0.092 J
HC-47	6/10/1999	0.15	0.005 U	0.01 U	0.001 U	0.001 U	0.0002 U	0.01 U	0.01 U	0.11 J
HC-48	6/10/1999	0.1	0.005 U	0.01 U	0.001 U	0.001 U	0.0002 U	0.01	0.01 U	0.01 UJ
HC-49	6/10/1999	0.0034	0.005 U	0.01 U	0.001 U	0.001 U	0.0002 U	0.01 U	0.01 U	0.01 UJ
Proposed Cleanup Level in mg/L		0.008	NA	0.178	0.011	0.0025	NA	0.157	NA	0.105

Boxed result indicates exceedence of screening criteria.
NA = Not Applicable.
U = Not detected at detection limit indicated.
J = Estimated Value.
Blank indicates sample not analyzed for specific analyte.

Table 11 - Metals Concentrations in Soil Samples (Excluding Arsenic)

Location	Depth Range in Feet	Concentrations in mg/kg									
		Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
HC-39	0 - 3		0.31 U	24	93	5.9 J	0.11 U	24		0.62 U	210
	6 - 9		0.29 U	16	33	1.9 J	0.11 U	16		0.58 U	160
HC-41	0 - 3		0.36	17	15	4.4 J	0.15	22		0.58 U	28
	6 - 9		0.31 U	18	9	1.9 J	0.12 U	16		0.62 U	21
HC-42	0 - 3		0.31 U	18 J	23 J	12	1.6	19 J		0.62 U	60 J
	6 - 9		0.33 U	19 J	12 J	3.8	0.14	23 J		0.66 U	50 J
HC-43	0 - 3		0.5	15	21	20 J	0.11 U	18		0.61 U	82
	6 - 9		0.44	18	22	16 J	0.3	20		0.64 U	490
HC-44	0 - 3		0.28 U	15	9.8	4.2 J	0.11 U	18		0.57 U	22
	6 - 9		0.34 U	15	7.7	8.1 J	0.12 U	16		0.68 U	19
HC-46	0 - 3		0.3	14	24	9 J	0.14	14		0.56 U	56
	6 - 9		0.33 U	23	130	2.8 J	0.12 U	20		0.66 U	99
HC-47	0 - 3		0.28 U	22 J	15 J	3.9	0.11 U	27 J		0.55 U	28 J
	6 - 9		0.3 U	17 J	8.1 J	1.8 U	0.12 U	18 J		0.61 U	31 J
HC-48	0 - 3		0.4	79 J	26 J	48	0.12 U	60 J		0.59 U	81 J
	6 - 9		0.35 U	21 J	16 J	18	0.13 U	26 J		0.7 U	53 J
HC-49	0 - 3		0.41	20	16	5 J	0.12	24		0.56 U	31
	6 - 9		0.35 U	22	8.2	2.9 J	0.13 U	20		0.7 U	24
HC-50	0 - 3	29	0.3 U	17 J	280 J	3.2	0.11 U	18 J	0.6 U	0.6 U	130 J
	3 - 6	83	0.4 U	30 J	130 J	3.8	0.14 U	29 J	0.75 U	0.79 U	110 J
HC-51	3 - 6	68	0.38 U	29 J	140 J	7.1	0.14 U	30 J	0.79 U	0.77 U	300 J
	6 - 9	35	0.34 U	20 J	10 J	2.1 U	0.13 U	19 J	0.68 U	0.69 U	28 J
HC-52	0 - 3	39	0.29 U	18 J	210 J	5.5	0.11	22 J	0.58 U	0.58 U	100 J
	3 - 6	60	0.36 U	26 J	56 J	7.2	0.13 U	23 J	0.72 U	0.71 U	55 J
	6 - 9	39	0.34 U	24 J	21 J	2.3	0.12 U	20 J	0.7 U	0.68 U	34 J
HC-53	0 - 3	38	28 U	22 J	450 J	4	0.1 U	21 J	0.57 U	0.56 U	120 J
	3 - 6	34	0.28 U	19 J	270 J	3	0.11 U	20 J	0.57 U	0.57 U	130 J
HC-54	0 - 3	50	0.42	33 J	140 J	20	0.11 U	21 J	0.59 U	0.6 U	170 J
	3 - 6	48	0.3 U	18 J	250 J	2.1	0.11 U	18 J	0.59 U	0.61 U	120 J
HC-55	0 - 3	42	0.29 U	23 J	14 J	5	0.11 U	20 J	0.56 U	0.57 U	47 J
	3 - 6	48	0.32 U	21 J	97 J	4	0.12 U	21 J	0.69 U	0.64 U	180 J
	6 - 9	39	0.33 U	20 J	33 J	2 U	0.12 U	21 J	0.63 U	0.67 U	280 J
Local sewer			0.48 U	10	12	5 J	0.28	16		0.95 U	47
Outfall 001			1.6 U	22	36	21 J	0.6 U	16		3.3 U	180
Outfall 002			0.39 U	18	22	9.7 J	0.15 U	21		0.78 U	75
Proposed Cleanup Level in mg/kg		NA	NA	2000	2960	250	NA	1600	NA	NA	130

Boxed result indicates exceedence of screening criteria.
See Table 9 for arsenic results.
NA = Not Applicable.
U = Not detected at detection limit indicated.
J = Estimated Value.
Blank indicates sample not analyzed for specific analyte.

Table 12 - Chlorinated Phenols Concentrations in Soil and Groundwater Samples

Sample ID	Sampling Date	2,4-Dichlorophenol	Pentachlorophenol	Tetrachlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol
Soil Concentration in mg/kg						
HC-41/0-3	6/10/1999	0.044 U	0.0022 U	0.011 U	0.011 U	0.011 U
HC-41/6-9	6/10/1999	0.048 U	0.0024 U	0.012 U	0.012 U	0.012 U
HC-42/0-3	6/11/1999	0.049 U	0.076	0.15	0.012 U	0.012 U
HC-42/6-9	6/11/1999	0.049 U	0.0043	0.012 U	0.012 U	0.012 U
HC-43/0-3	6/10/1999	0.044 U	0.0022 U	0.011 U	0.011 U	0.011 U
HC-43/6-9	6/10/1999	0.051 U	0.0025 U	0.013 U	0.013 U	0.013 U
HC-44/0-3	6/10/1999	0.044 U	0.019	0.016	0.011 U	0.011 U
HC-44/6-9	6/10/1999	0.05 U	0.028	0.012 U	0.012 U	0.012 U
HC-47/0-3	6/11/1999	0.044 U	0.016	0.035	0.011 U	0.011 U
HC-47/6-9	6/11/1999	0.048 U	0.0024 U	0.012 U	0.012 U	0.012 U
HC-48/0-3	6/11/1999	0.047 U	0.0023 U	0.012 U	0.012 U	0.012 U
HC-48/6-9	6/11/1999	0.052 U	0.0026 U	0.013 U	0.013 U	0.013 U
Local sewer	6/16/1999	0.07 U	0.0035 U	0.018 U	0.018 U	0.018 U
Outfall 001	6/16/1999	0.24 U	0.53	0.059 U	0.059 U	0.059 U
Outfall 002	6/16/1999	0.062 U	0.0031 U	0.015 U	0.015 U	0.015 U
Water Concentration in µg/L						
HC-41	6/10/1999	0.24 U	0.024 U	0.096 U	0.096 U	0.096 U
HC-42	6/10/1999	0.24 U	0.06	0.097 U	0.097 U	0.097 U
HC-43	6/10/1999	0.24 U	0.024 U	0.094 U	0.094 U	0.094 U
HC-44	6/10/1999	0.24 U	0.024 U	0.097 U	0.097 U	0.097 U
HC-47	6/10/1999	0.24 U	0.024 U	0.097 U	0.097 U	0.097 U
HC-48	6/10/1999	0.25 U	0.025 U	0.1 U	0.1 U	0.1 U

U = Not detected at detection limit indicated.

Table 13 - PCB Concentrations in Soil and Groundwater Samples

Sample ID	Sampling Date	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
Soil Concentrations in mg/kg									
HC-43/0-3	6/10/1999	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U
HC-43/6-9	6/10/1999	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U
Water Concentrations in µg/L									
HC-43	6/10/1999	0.02 UJ	0.05 UJ	0.05 UJ	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ	0.05 UJ

U = Not detected at detection limit indicated.
J = Estimated Value.

Table 14 - Volatile Organic Concentrations in Groundwater Samples

Location	HC-40	HC-45
Sampling Date	6/10/99	6/10/99
Volatiles in µg/L		
1,1,1,2-Tetrachloroethane	1 U	1 U
1,1,1-Trichloroethane	1 U	1 U
1,1,2,2-Tetrachloroethane	1 U	1 U
1,1,2-Trichloroethane	1 U	1 U
1,1-Dichloroethane	1 U	1 U
1,1-Dichloroethene	1 U	1 U
1,2,3-Trichlorobenzene	5 U	5 U
1,2,3-Trichloropropane	1 U	1 U
1,2,4-Trichlorobenzene	5 U	5 U
1,2,4-Trimethylbenzene	1 U	1 U
1,2-Dibromo-3-Chloropropane	3 U	3 U
1,2-Dibromoethane	1 U	1 U
1,2-Dichlorobenzene	2 U	2 U
1,2-Dichloroethane	1 U	1 U
1,2-Dichloropropane	1 U	1 U
1,2-Dichloropropene	1 U	1 U
1,3,5-Trimethylbenzene	1 U	1 U
1,3-Dichlorobenzene	2 U	2 U
1,3-Dichloropropane	1 U	1 U
1,4-Dichlorobenzene	2 U	2 U
2,2-Dichloropropane	1 U	1 U
2-Butanone	10 U	10 U
2-Chlorotoluene	1 U	1 U
2-Hexanone	10 U	10 U
4-Chlorotoluene	1 U	1 U
4-Methyl-2-Pentanone	10 U	10 U
Acetone	10 U	10 U
Benzene	1 U	1 U
Bromobenzene	1 U	1 U
Bromochloromethane	1 U	1 U
Bromodichloromethane	1 U	1 U
Bromoform	3 U	3 U
Bromomethane	1 U	1 U
Carbon Disulfide	10 U	10 U
Carbon Tetrachloride	1 U	1 U
Chlorobenzene	1 U	1 U
Chlorodibromomethane	2 U	2 U
Chloroethane	1 U	1 U
Chloroform	1 U	1 U
Chloromethane	5 U	5 U

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Table 14 - Volatile Organic Concentrations in Groundwater Samples

Location Sampling Date	HC-40 6/10/99	HC-45 6/10/99
Cis-1,2-Dichloroethene	1 U	1 U
Cis-1,3-Dichloropropene	3 U	3 U
Dibromomethane	1 U	1 U
Dichlorodifluoromethane	1 U	1 U
Ethylbenzene	1 U	1 U
Hexachlorobutadiene	3 U	3 U
Isopropylbenzene	1 U	1 U
Methylene Chloride	5 U	5 U
N-Butylbenzene	1 U	1 U
N-Propylbenzene	1 U	1 U
Naphthalene	5 U	5 U
P-Isopropyltoluene	2 U	2 U
Sec-Butylbenzene	1 U	1 U
Styrene	1 U	1 U
Tert-Butylbenzene	1 U	1 U
Tetrachloroethene	1 U	1 U
Toluene	1 U	1 U
Trans-1,2-Dichloroethene	1 U	1 U
Trans-1,3-Dichloropropene	3 U	3 U
Trichloroethane	1 U	1 U
Trichlorofluoromethane	1 U	1 U
Vinyl Acetate	10 U	10 U
Vinyl Chloride	1 U	1 U
m,p-xylene	0.5 U	0.5 U
o-xylene	0.5 U	0.5 U
Total Xylenes	0.5 U	0.5 U

U = Not detected at detection limit indicated.

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SUMMARY OF BARBEE MILL
SOIL SAMPLING DATA

Constituent / Boring ID / Depth (ft bgs)	RSB-01 0-1.5	RSB-01 2.5-4.0	RSB-02 0-1.5	RSB-02 7.5-9.0	RSB-03 0-1.5	RSB-03 2.5-4.0	RSB-04 0-1.5	RSB-04 2.5-4.0
BTEX (EPA 8020)								
Benzene	< 0.067	< 0.063	< 0.065	< 0.081	< 0.055	< 0.062	< 0.056	< 0.079
Toluene	< 0.067	< 0.063	< 0.065	< 0.081	< 0.055	< 0.062	< 0.056	< 0.079
Ethylbenzene	< 0.067	< 0.063	0.086	< 0.081	< 0.055	< 0.062	< 0.056	< 0.079
m,p-Xylene	< 0.067	< 0.063	< 0.065	< 0.081	< 0.055	< 0.062	< 0.056	< 0.079
o-Xylene	< 0.067	< 0.063	< 0.065	< 0.081	< 0.055	< 0.062	< 0.056	< 0.079
Gasoline Hydrocarbons (WTPH-g)	< 6.7	< 6.3	51	< 8.1	< 5.5	< 6.2	< 5.6	< 7.9
TPH (WTPH-d extended)								
Diesel Hydrocarbons	8.5	< 6.1	290	120	7.4	< 6.0	< 6	< 8
Oil Hydrocarbons	63	39	400	530	46	< 12	20	< 16
Total Diesel and Oil	71.5	39	690	650	53	ND	20	ND
TPH (WTPH-d ext., with Silica Gel Cleanup)								
Diesel Hydrocarbons	6.4	< 6.1	210	110	6.3	< 6.0	< 5.5	< 7.8
Oil Hydrocarbons	41	25	260	460	39	< 12	14	< 16
Total Diesel and Oil	47	25	470	570	45.3	ND	14	ND
Percent Reduction in TPH by Silica Gel Cleanup								
Diesel Hydrocarbons	25%	NC	28%	8%	15%	NC	NC	NC
Oil Hydrocarbons	35%	36%	35%	13%	15%	NC	30%	NC
Total Diesel and Oil	34%	36%	32%	12%	15%	NC	30%	NC
Chlorophenols (EPA 8260)								
Pentachlorophenol	< 0.0078	< 0.0076	< 0.0081	< 0.011	< 0.0066	< 0.0075	< 0.0068	< 0.0096
2,4,6-Trichlorophenol	< 0.0078	< 0.0076	< 0.0081	< 0.011	< 0.0066	< 0.0075	< 0.0068	< 0.0096
2,3,6-Trichlorophenol	< 0.0078	< 0.0076	< 0.0081	< 0.011	< 0.0066	< 0.0075	< 0.0068	< 0.0096
2,4,5-Trichlorophenol	< 0.0078	< 0.0076	< 0.0081	< 0.011	< 0.0066	< 0.0075	< 0.0068	< 0.0096
2,3,4-Trichlorophenol	< 0.0078	< 0.0076	< 0.0081	< 0.011	< 0.0066	< 0.0075	< 0.0068	< 0.0096
2,3,5,6-Tetrachlorophenol	< 0.0078	< 0.0076	< 0.0081	< 0.011	< 0.0066	< 0.0075	< 0.0068	< 0.0096
2,3,4,5-Tetrachlorophenol	< 0.0078	< 0.0076	< 0.0081	< 0.011	< 0.0066	< 0.0075	< 0.0068	< 0.0096
Priority Pollutant Metals								
Antimony	7	< 6	< 6	< 10	< 5	< 6	< 5	< 7
Arsenic	< 6	< 6	< 6	< 10	< 5	< 6	12	20
Beryllium	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.2
Cadmium	< 0.2	< 0.2	< 0.2	0.4	< 0.2	< 0.3	< 0.2	< 0.3
Chromium	38.4	32.2	32.1	41.4	27.6	30.3	28.5	37.8
Copper	17.9	13.9	17.6	29	20	22.2	10.9	14
Lead	9	9	13	16	7	5	6	4
Mercury	< 0.06	0.08	< 0.06	0.08	< 0.05	< 0.06	< 0.05	< 0.06
Nickel	34	30	31	36	27	33	29	35
Selenium	< 6	8	< 6	13	< 5	< 6	< 5	< 7
Silver	< 0.4	< 0.4	< 0.4	< 0.6	< 0.3	< 0.4	< 0.3	< 0.04
Thallium	< 6	< 6	< 6	< 10	< 5	< 6	< 5	< 7
Zinc	36.7	36.4	48.1	58.8	40.4	43.8	123	38.1
PAH (EPA 8270/SIM)								
Naphthalene	< 0.085	< 0.082	0.19	0.20	< 0.071	< 0.079	< 0.073	< 0.10
2-Methylnaphthalene	< 0.085	< 0.082	0.18	< 0.11	< 0.071	< 0.079	< 0.073	< 0.10
Acenaphthylene	< 0.085	< 0.082	< 0.086	< 0.11	< 0.071	< 0.079	< 0.073	< 0.10
Acenaphthene	< 0.085	< 0.082	0.49	< 0.11	< 0.071	< 0.079	< 0.073	< 0.10
Fluorene	< 0.085	< 0.082	0.61	< 0.11	< 0.071	< 0.079	< 0.073	< 0.10
Phenanthrene	0.12	0.18	3.0	0.29	< 0.071	< 0.079	< 0.073	< 0.10
Anthracene	< 0.085	< 0.082	0.34	< 0.11	< 0.071	< 0.079	< 0.073	< 0.10
Fluoranthene	0.13	0.15	1.2	0.24	< 0.071	0.13	< 0.073	< 0.10
Pyrene	0.18	0.3	0.57	0.21	< 0.071	0.14	< 0.073	< 0.10
Benzo (a) anthracene * 0.1	< 0.085	0.091 M	0.12	< 0.11	< 0.071	< 0.079	< 0.073	< 0.10
Chrysene * 0.01	0.1	0.13	0.14	0.14	< 0.071	< 0.079	< 0.073	< 0.10
Benzo (b) fluoranthene * 0.1	< 0.085	0.15	0.1	0.24	< 0.071	< 0.079	< 0.073	< 0.10
Benzo (k) fluoranthene * 0.1	< 0.085	0.2	< 0.086	< 0.11	< 0.071	< 0.079	< 0.073	< 0.10
Benzo (a) pyrene * 1	0.088	0.13	< 0.086	0.17	< 0.071	< 0.079	< 0.073	< 0.10
Indeno (1,2,3-cd) pyrene * 0.1	< 0.085	0.084 M	< 0.086	< 0.11	< 0.071	< 0.079	< 0.073	< 0.10
Dibenz (a, h) anthracene * 0.4	< 0.085	< 0.082	< 0.086	< 0.11	< 0.071	< 0.079	< 0.073	< 0.10
Benzo (g, h, I) perylene	< 0.085	0.1	< 0.086	0.12 M	< 0.071	< 0.079	< 0.073	< 0.10
Dibenzofuran	< 0.085	< 0.082	0.35	< 0.11	< 0.071	< 0.079	< 0.073	< 0.10
Total PAH [1]	0.62	1.52	7.29	1.61	ND	0.27	ND	ND
Total Carcinogenic PAH [1]	0.188	0.785	0.36	0.55	ND	ND	ND	ND
Total PAH [2]	1.72	2.17	7.81	2.71	1.28	1.53	1.31	1.80
Total Carcinogenic PAH [2]	0.53	0.78	0.58	0.88	0.43	0.47	0.44	0.60
B [a] P	0.12	0.20	0.092	0.23				
PCBs (EPA 8080)								
Aroclor 1016	< 0.042	< 0.041	< 0.043	< 0.057	< 0.036	< 0.040	< 0.036	< 0.052
Aroclor 1242	< 0.042	< 0.041	< 0.043	< 0.057	< 0.036	< 0.040	< 0.036	< 0.052
Aroclor 1248	< 0.042	< 0.041	< 0.043	< 0.057	< 0.036	< 0.040	< 0.036	< 0.052
Aroclor 1254	< 0.042	< 0.041	< 0.043	< 0.057	< 0.036	< 0.040	< 0.036	< 0.052
Aroclor 1260	< 0.042	< 0.041	< 0.043	< 0.057	< 0.036	< 0.040	< 0.036	< 0.052

Notes:

All data are expressed as mg/kg.

1. PAH totals as calculated assuming that the concentration of non-detect compounds is zero.
2. PAH totals as calculated assuming that the concentrations of non-detect compounds are equal to the reported detection limits.

SUMMARY OF BARBEE MILL
SOIL SAMPLING DATA

Boring ID / Depth (ft bgs) / Constituent	RSB-05 0-1.5	RSB-05 2.5-4.0	RSB-06 0-1.5	RSB-06 2.5-4.0	RSB-07 0-1.5	RSB-07 2.5-4.0	RSB-08 0-1.5	RSB-08 2.5-4.0
BTEX (EPA 8020)								
Benzene	< 0.056	< 0.052	< 0.055	< 0.060	< 0.056	< 0.059	< 0.056	< 0.058
Toluene	< 0.056	< 0.052	< 0.055	< 0.060	< 0.056	< 0.059	< 0.056	< 0.058
Ethylbenzene	< 0.056	< 0.052	< 0.055	< 0.060	< 0.056	< 0.059	< 0.056	< 0.058
m,p-Xylene	< 0.056	< 0.052	< 0.055	< 0.060	< 0.056	< 0.059	< 0.056	< 0.058
o-Xylene	< 0.056	< 0.052	< 0.055	< 0.060	< 0.056	< 0.059	< 0.056	< 0.058
Gasoline Hydrocarbons (WTPH-g)	< 5.6	< 5.2	< 5.5	< 6.0	< 5.6	< 5.9	< 5.6	< 5.8
TPH (WTPH-d extended)								
Diesel Hydrocarbons	< 5.6	< 5.2	110	< 6	18	< 6	24	< 6
Oil Hydrocarbons	< 11	< 10	290	< 11	88	< 13	120	23
Total Diesel and Oil	ND	ND	400	ND	106	ND	144	23
TPH (WTPH-d ext., with Silica Gel Cleanup)								
Diesel Hydrocarbons	< 5.6	< 5.2	100	< 5.7	16	< 6	26	< 5.6
Oil Hydrocarbons	< 11	< 10	240	< 11	74	< 13	120	22
Total Diesel and Oil	ND	ND	340	ND	90	ND	146	22
Percent Reduction in TPH by Silica Gel Cleanup								
Diesel Hydrocarbons	NC	NC	9%	NC	11%	NC	0%	NC
Oil Hydrocarbons	NC	NC	17%	NC	16%	NC	0%	4%
Total Diesel and Oil	NC	NC	15%	NC	15%	NC	0%	4%
Chlorophenols (EPA 8260)								
Pentachlorophenol	< 0.0070	< 0.0063	< 0.0067	< 0.0070	< 0.0075	< 0.0077	0.033	< 0.0068
2,4,6-Trichlorophenol	< 0.0070	< 0.0063	< 0.0067	< 0.0070	< 0.0075	< 0.0077	< 0.0066	< 0.0068
2,3,6-Trichlorophenol	< 0.0070	< 0.0063	< 0.0067	< 0.0070	< 0.0075	< 0.0077	< 0.0066	< 0.0068
2,4,5-Trichlorophenol	< 0.0070	< 0.0063	< 0.0067	< 0.0070	< 0.0075	< 0.0077	< 0.0066	< 0.0068
2,3,4-Trichlorophenol	< 0.0070	< 0.0063	< 0.0067	< 0.0070	< 0.0075	< 0.0077	< 0.0066	< 0.0068
2,3,5,6-Tetrachlorophenol	< 0.0070	< 0.0063	< 0.0067	< 0.0070	< 0.0075	< 0.0077	< 0.0066	< 0.0068
2,3,4,5-Tetrachlorophenol	< 0.0070	< 0.0063	< 0.0067	< 0.0070	< 0.0075	< 0.0077	0.0032 J	< 0.0068
Priority Pollutant Metals								
Antimony	9	< 5	< 6	< 6	< 5	< 6	< 6	6
Arsenic	< 5	< 5	< 6	< 6	< 5	< 6	< 6	< 5
Beryllium	0.3	0.2	0.2	0.1	0.3	0.1	0.2	0.3
Cadmium	0.3	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	50.3	27	26.3	26.4	22.6	32.9	21.1	23.7
Copper	26	10.7	21.7	8.9	19.6	6.6	21.8	22.2
Lead	8	4	25	5	6	3	9	7
Mercury	< 0.05	< 0.05	< 0.05	< 0.04	0.08	< 0.05	< 0.05	< 0.05
Nickel	55	28	27	26	28	26	26	28
Selenium	6	< 5	< 6	< 6	< 5	6	< 6	< 5
Silver	< 0.3	< 0.3	< 0.3	< 0.4	< 0.3	< 0.3	< 0.3	< 0.3
Thallium	< 5	< 5	< 6	< 6	< 5	< 6	< 6	< 5
Zinc	71.4	36	46.4	30.1	46.8	23.1	45.8	44.1
PAH (EPA 8270/SIM)								
Naphthalene	< 0.075	< 0.068	< 0.073	0.080	< 0.083	< 0.083	< 0.071	< 0.074
2-Methylnaphthalene	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Acenaphthylene	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Acenaphthene	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Fluorene	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Phenanthrene	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Anthracene	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Fluoranthene	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Pyrene	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	0.083	< 0.074
Benzo (a) anthracene *	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Chrysene *	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Benzo (b) fluoranthene *	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Benzo (k) fluoranthene *	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Benzo (a) pyrene *	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Indeno (1,2,3-cd) pyrene *	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Dibenz (a, h) anthracene *	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Benzo (g, h, i) perylene	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Dibenzofuran	< 0.075	< 0.068	< 0.073	< 0.075	< 0.083	< 0.083	< 0.071	< 0.074
Total PAH [1]	ND	ND	ND	0.080	ND	ND	0.083	ND
Total Carcinogenic PAH [1]	ND	ND	ND	ND	ND	ND	ND	ND
Total PAH [2]	1.35	1.22	1.31	1.36	1.49	1.49	1.29	1.33
Total Carcinogenic PAH [2]	0.45	0.41	0.44	0.45	0.50	0.50	0.43	0.44
PCBs (EPA 8080)								
Aroclor 1016	< 0.037	< 0.034	< 0.036	< 0.038	< 0.041	< 0.042	< 0.036	< 0.037
Aroclor 1242	< 0.037	< 0.034	< 0.036	< 0.038	< 0.041	< 0.042	< 0.036	< 0.037
Aroclor 1248	< 0.037	< 0.034	< 0.036	< 0.038	< 0.041	< 0.042	< 0.036	< 0.037
Aroclor 1254	< 0.037	< 0.034	< 0.036	< 0.038	< 0.041	< 0.042	< 0.036	< 0.037
Aroclor 1260	< 0.037	< 0.034	< 0.036	< 0.038	< 0.041	< 0.042	< 0.036	< 0.037

Notes:

All data are expressed as mg/kg.

1. PAH totals as calculated assuming that the concentration of non-detect compounds is zero.
2. PAH totals as calculated assuming that the concentrations of non-detect compounds are equal to the reported detection limits.

SAMPLING DATA FOR
BARBEE MILL CATCH BASIN SEDIMENT COMPOSITES

Constituent / Composite #		#1		#2		#3		#4		#5
Metals										
Antimony		43	<	10	<	7	<	9		20
Arsenic	<	8	<	10	<	7		10	<	10
Beryllium		0.2	<	0.2		0.2	<	0.2	<	0.2
Cadmium		1.1		0.8		1		0.5		18.5
Chromium		33.4		45		31.7		34.7		130
Copper		85.2		54.5		55.3		54.3		1,940
Lead		913		87		59		50		414
Mercury		0.18		0.2		0.11		0.11		0.1
Nickel		36		45		28		26		46
Selenium	<	8	<	10	<	7		10		10
Silver	<	0.5	<	0.7	<	0.4	<	0.6		0.8
Thallium	<	8	<	10	<	7	<	9	<	10
Zinc		279		518		389		499		1,490
Chlorophenols (EPA 8040)										
Pentachlorophenol		0.010		0.0067 J		0.024		0.042		0.068
2,4,6-Trichlorophenol	<	0.0080	<	0.011	<	0.0092	<	0.010	<	0.013
2,3,6-Trichlorophenol	<	0.0080	<	0.011	<	0.0092	<	0.010	<	0.021 Y
2,4,5-Trichlorophenol	<	0.0080	<	0.011	<	0.0092	<	0.010 Y	<	0.016 Y
2,3,4-Trichlorophenol	<	0.0080	<	0.011	<	0.0092	<	0.010	<	0.013
2,3,5,6-Tetrachlorophenol	<	0.0080	<	0.011	<	0.019 Y	<	0.019 Y	<	0.025 Y
2,3,4,5-Tetrachlorophenol	<	0.0080	<	0.011		0.0081 J	<	0.010	<	0.051 Y
PAH (EPA 8270/SIM)										
Naphthalene	<	0.13		0.27	<	0.10	<	0.16	<	0.85
2-Methylnaphthalene	<	0.13		0.33	<	0.10	<	0.16		1.0
Acenaphthylene	<	0.13	<	0.11	<	0.10	<	0.16	<	0.85
Acenaphthene	<	0.13	<	0.11	<	0.10	<	0.16	<	0.85
Fluorene	<	0.13	<	0.11	<	0.10	<	0.16	<	0.85
Phenanthrene		0.21		0.12		0.19		0.20		3.0
Anthracene	<	0.13	<	0.11	<	0.10	<	0.16	<	0.85
Fluoranthene	<	0.13		0.14		0.26		0.16		3.3
Pyrene		0.19		0.34		0.65		0.54	<	0.85
Benzo (a) anthracene *	<	0.13	<	0.11	<	0.10	<	0.16	<	0.85
Chrysene *	<	0.13		0.19		0.41		0.27	<	0.85
Benzo (b) fluoranthene *	<	0.13	<	0.11		0.24	<	0.16	<	0.85
Benzo (k) fluoranthene *	<	0.13	<	0.11		0.18	<	0.16	<	0.85
Benzo (a) pyrene *	<	0.13	<	0.11		0.18	<	0.16	<	0.85
Indeno (1,2,3-cd) pyrene *	<	0.13	<	0.11		0.17	<	0.16	<	0.85
Dibenz (a, h) anthraene *	<	0.13	<	0.11	<	0.10	<	0.16	<	0.85
Benzo (g, h, i) perylene	<	0.13		0.20		0.52		0.22	<	0.85
Dibenzofuran	<	0.13	<	0.11	<	0.10	<	0.16	<	0.85
Total PAH [1]		0.40		1.59		1.71		1.37		7.3
Total Carcinogenic PAH [1]		ND		0.19		0.19		0.19		ND
Total PAH [2]		2.48		2.80		3.70		3.47		20.1
Total Carcinogenic PAH [2]		0.91		0.85		1.38		1.23		5.95
PCBs (EPA 8080)										
Aroclor 1016	<	0.044	<	0.055	<	0.050	<	0.052	<	0.070
Aroclor 1242	<	0.044	<	0.055	<	0.050	<	0.052	<	0.070
Aroclor 1248	<	0.044	<	0.055	<	0.050	<	0.052	<	0.070
Aroclor 1254	<	0.044	<	0.055	<	0.050	<	0.052	<	0.070
Aroclor 1260	<	0.044	<	0.055	<	0.050	<	0.052	<	0.070
Total Organic Carbon		88,000		120,000		100,000		130,000		240,000

Notes:

All data are reported as mg/kg dry weight.

J: Compound was detected below the calculated method detection limit.

SIM: Specific ion monitoring.

Y: Raised detection limit due to matrix interference.

1. PAH total as calculated assuming that compounds which were not detected had a concentration of zero.
2. PAH total as calculated assuming that compounds which were not detected were present at a concentration equal to the reported detection limit.

SUMMARY OF BARBEE MILL GROUNDWATER DATA

Location / Date / Constituent	RMW-01 07/12/96	RMW-02 07/12/96	RMW-03 7/12/96	RMW-04 7/12/96	RMW-05 07/12/96
Petroleum Hydrocarbons (WTPH-g)					
Gasoline Hydrocarbons	< 0.25	< 0.25	< 0.25	0.32	< 0.25
Petroleum Hydrocarbons (WTPH-d)					
Diesel Hydrocarbons	< 0.25	0.30	< 0.25	0.60	< 0.25
Motor Oil Hydrocarbons	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total WTPH-d Hydrocarbons	ND	0.30	ND	0.60	ND
Unfiltered Metals					
Antimony	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Arsenic	< 0.05	< 0.05	2.68	< 0.05	< 0.05
Beryllium	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Chromium	0.013	< 0.005	0.013	< 0.005	0.007
Copper	0.012	< 0.002	0.015	< 0.002	0.005
Lead	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mercury	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel	0.03	0.02	0.02	< 0.01	< 0.01
Selenium	0.09	0.05	< 0.05	< 0.05	< 0.05
Silver	< 0.003	< 0.003	< 0.003	< 0.0003	< 0.003
Thallium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Zinc	0.023	0.031	0.023	0.007	0.011
Filtered Metals					
Antimony	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Arsenic	< 0.05	< 0.05	2.98	< 0.05	< 0.05
Beryllium	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0001
Cadmium	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Chromium	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Copper	< 0.002	< 0.002	0.006	< 0.002	< 0.002
Lead	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mercury	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel	0.01	0.01	0.01	< 0.01	< 0.01
Selenium	0.06	< 0.05	< 0.05	< 0.05	< 0.05
Silver	< 0.003	< 0.0003	< 0.003	< 0.003	< 0.003
Thallium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Zinc	0.009	0.028	0.006	0.004	0.005
PAH (EPA 8270)					
Naphthalene	< 0.001	0.0024	< 0.001	< 0.001	< 0.001
2-Methylnaphthalene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Acenaphthylene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Acenaphthene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Fluorene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Phenanthrene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Anthracene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Fluoranthene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Pyrene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzo (a) anthracene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chrysene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzo (b) fluoranthene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzo (k) fluoranthene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzo (a) pyrene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Indeno (1,2,3-cd) pyrene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dibenz (a, h) anthraene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzo (g, h, i) perylene	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dibenzofuran	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chlorophenols (EPA 8040)					
Pentachlorophenol	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
2,4,6-Trichlorophenol	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
2,3,6-Trichlorophenol	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
2,4,5-Trichlorophenol	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
2,3,4-Trichlorophenol	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
2,3,5,6-Tetrachlorophenol	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
2,3,4,5-Tetrachlorophenol	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025

Notes:

All data are expressed as mg/L.

SUMMARY OF BARBEE MILL GROUNDWATER DATA

Location	RMW-01	RMW-02	RMW-03	RMW-04	RMW-05
Date	07/12/96	07/12/96	7/12/96	7/12/96	07/12/96
Constituent					
Volatile Organics (EPA 8260)					
Chloromethane	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Bromomethane	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Vinyl Chloride	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Chloroethane	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Methylene Chloride	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Acetone	**0.0095**	< 0.0050	**0.0150**	**0.0077**	< 0.0050
Carbon Disulfide	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,1-Dichloroethene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,1-Dichloroethane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-1,2-Dichloroethene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-1,2-Dichloroethene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Chloroform	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,2-Dichloroethane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2-Butanone	< 0.0050	< 0.0050	**0.0099**	**0.0420**	**0.0062**
1,1,1-Trichloroethane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Carbon Tetrachloride	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Bromodichloromethane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,2-Dichloropropane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-1,3-Dichloropropene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Trichloroethene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dibromochloromethane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,1,2-Trichloroethane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Benzene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-1,3-Dichloropropene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2-Chloroethylvinylether	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Bromoform	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
4-Methyl-2-Pentanone (MIBK)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
2-Hexanone	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Tetrachloroethene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,1,2,2-Tetrachloroethane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Toluene	< 0.0010	< 0.0010	< 0.0010	**0.0018**	**0.0011**
Chlorobenzene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Ethylbenzene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Styrene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Trichlorofluoromethane	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
1,1,2-Trichlorotrifluoroethane	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
m,p-Xylene	< 0.0010	< 0.0010	< 0.0010	**0.0018**	< 0.0010
O-Xylene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,2-Dichlorobenzene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,3-Dichlorobenzene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,4-Dichlorobenzene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Acrolein	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Methyl Iodide	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Bromoethane	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Acrylonitrile	< 0.0050	< 0.0050	< 0.0050	< 0.0010	< 0.0050
1,1-Dichloropropene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dibromomethane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,1,1,2-Tetrachloroethane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,2-Dibromo-3-chloropropane	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
1,2,3-Trichloropropane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-1,4-Dichloro-2-butene	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
1,3,5-Trimethylbenzene	< 0.0010	< 0.0010	< 0.0010	**0.0016**	< 0.0010
1,2,4-Trimethylbenzene	< 0.0010	< 0.0010	< 0.0010	**0.0011**	< 0.0010
Hexachlorobutadiene	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Ethylene Dibromide	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Bromochloromethane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,2-Dichloropropane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,3-Dichloropropane	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Isopropylbenzene	< 0.0010	< 0.0010	< 0.0010	**0.0038**	< 0.0010
n-Propylbenzene	< 0.0010	< 0.0010	< 0.0010	**0.0050**	< 0.0010
Bromobenzene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2-Chlorotoluene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
4-Chlorotoluene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
tert-Butylbenzene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
sec-Butylbenzene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
4-Isopropyltoluene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
n-Butylbenzene	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,2,4-Trichlorobenzene	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Napthalene	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
1,2,3-Trichlorobenzene	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050

Notes:

All data are expressed as mg/L.

Location Name	MTCA TEF	VB-1	VB-1	VB-2	VB-2	VB-3	VB-3
Sample ID		14_VB-1-01/24/97-0-35SD	14_VB-1-01/24/97-35-65SD	14_VB-2-01/24/97-0-10SD	14_VB-2-01/24/97-10-19SD	14_VB-3-01/24/97-0-9SD	14_VB-3-01/24/97-9-39SD
Sample Date		1/24/1997	1/24/1997	1/24/1997	1/24/1997	1/24/1997	1/24/1997
Depth		0 - 35 cm	35 - 65 cm	0 - 10 cm	10 - 19 cm	0 - 9 cm	9 - 39 cm
Sample Type		N	N	N	N	N	N
X		1661262	1661262	1661026	1661026	1661328	1661328
Y		195946.9	195946.9	196095.9	196095.9	196231.9	196231.9
Conventional Parameters (pct)							
Total organic carbon		**7.4**	**3.4**	**5**	**3.7**	**24**	**5**
Total solids		**32.2**	**49.6**	**26.5**	**43.3**	**28.2**	**55.1**
Metals (mg/kg)							
Antimony		20 UJ	10 UJ	20 UJ	10 UJ	20 UJ	10 UJ
Arsenic		20 U	10 U	20 U	10 U	20 U	10 U
Beryllium		0.3 U	**0.3**	0.4 U	0.2 U	0.3 U	0.3 U
Cadmium		0.7 U	0.4 U	0.8 U	0.5 U	0.6 U	0.5 U
Chromium		**34**	**40**	**36**	**41**	**10**	**29**
Copper		**27.3**	**26.9**	**36.1**	**27.3**	**11.9**	**16.6**
Lead		**27**	**16**	**46**	**23**	**13**	**12**
Mercury		0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U
Nickel		**28**	**32**	**31**	**33**	**10**	**22**
Selenium		20 U	10 U	20 U	10 U	20 U	10 U
Silver		1 U	0.6 U	1 U	0.7 U	1 U	0.8 U
Thallium		20 U	10 U	20 U	10 U	20 U	10 U
Zinc		**75**	**57.4**	**142**	**70.2**	**55**	**52**
Aromatic Hydrocarbons (µg/kg)							
2-Methylnaphthalene		220 U	140 U	240 U	160 U	220 U	160 U
Acenaphthene		220 U	140 U	240 U	160 U	220 U	160 U
Acenaphthylene		220 U	140 U	240 U	160 U	220 U	160 U
Anthracene		220 U	140 U	240 U	160 U	220 U	160 U
Benzo(a)anthracene	0.1	220 U	140 U	240 U	160 U	220 U	160 U
Benzo(a)pyrene	1	220 U	140 U	240 U	**230**	220 U	160 U
Benzo(b)fluoranthene	0.1	220 U	140 U	240 U	**170**	220 U	160 U
Benzo(g,h,i)perylene		220 U	140 U	240 U	**220**	220 U	160 U
Benzo(k)fluoranthene	0.1	220 U	140 U	240 U	160 U	220 U	160 U
Chrysene	0.01	220 U	140 U	240 U	**160**	220 U	160 U
Dibenzo(a,h)anthracene	0.1	220 U	140 U	240 U	160 U	220 U	160 U
Fluoranthene		220 U	**290**	240 U	160 U	220 U	**160**
Fluorene		220 U	140 U	240 U	160 U	220 U	160 U
Indeno(1,2,3-c,d)pyrene	0.1	220 U	140 U	240 U	**180**	220 U	160 U
Naphthalene		220 U	140 U	240 U	160 U	220 U	160 U
Phenanthrene		220 U	**600**	240 U	160 U	220 U	**200**
Pyrene		220 U	**440**	240 U	**230**	220 U	**510**
cPAH (U=0; OC-normalized; mg/kg OC)		3 U	4 U	5 U	**7**	1 U	3 U
Semivolatile Organics (µg/kg)							
1,2-Dichlorobenzene		220 U	140 U	240 U	160 U	220 U	160 U
1,2,4-Trichlorobenzene		220 U	140 U	240 U	160 U	220 U	160 U
1,3-Dichlorobenzene		220 U	140 U	240 U	160 U	220 U	160 U
1,4-Dichlorobenzene		220 U	140 U	240 U	160 U	220 U	160 U
2-Chloronaphthalene		220 U	140 U	240 U	160 U	220 U	160 U
2-Chlorophenol		220 U	140 U	240 U	160 U	220 U	160 U
2-Methylphenol (o-Cresol)		440 U	290 U	470 U	320 U	440 U	310 U
2-Nitroaniline		1100 U	720 U	1200 U	800 U	1100 U	780 U
2-Nitrophenol		1100 U	720 U	1200 U	800 U	1100 U	780 U
2,2'-Oxybis (1-chloropropane)		220 U	140 U	240 U	160 U	220 U	160 U
2,4-Dichlorophenol		660 U	430 U	710 U	480 U	660 U	470 U
2,4-Dimethylphenol		660 U	430 U	710 U	480 U	660 U	470 U
2,4-Dinitrophenol		2200 U	1400 U	2400 U	1600 U	2200 U	1600 U
2,4-Dinitrotoluene		1100 U	720 U	1200 U	800 U	1100 U	780 U
2,4,5-Trichlorophenol		1100 U	720 U	1200 U	800 U	1100 U	780 U
2,4,6-Trichlorophenol		1100 U	720 U	1200 U	800 U	1100 U	780 U
2,6-Dinitrotoluene		1100 U	720 U	1200 U	800 U	1100 U	780 U
3-Nitroaniline		1300 U	860 U	1400 U	960 U	1300 U	940 U
3,3'-Dichlorobenzidine		1100 U	720 U	1200 U	800 U	1100 U	780 U
4-Bromophenyl-phenyl ether		220 U	140 U	240 U	160 U	220 U	160 U
4-Chloro-3-methylphenol		440 U	290 U	470 U	320 U	440 U	310 U
4-Chloroaniline		660 U	430 U	710 U	480 U	660 U	470 U
4-Chlorophenyl phenyl ether		220 U	140 U	240 U	160 U	220 U	160 U
4-Methylphenol (p-Cresol)		220 U	140 U	240 U	160 U	220 U	160 U
4-Nitroaniline		1100 U	720 U	1200 U	800 U	1100 U	780 U
4-Nitrophenol		1100 U	720 U	1200 U	800 U	1100 U	780 U
Benzoic acid		2200 U	1400 U	2400 U	1600 U	2200 U	1600 U
Benzyl alcohol		1100 U	720 U	1200 U	800 U	1100 U	780 U
bis(2-Chloroethoxy)methane		220 U	140 U	240 U	160 U	220 U	160 U
bis(2-Chloroethyl)ether		440 U	290 U	470 U	320 U	440 U	310 U
Bis(2-ethylhexyl) phthalate		**260**	140 U	240 U	160 U	220 U	160 U
Butylbenzyl phthalate		220 U	140 U	240 U	160 U	220 U	160 U
Carbazole		220 U	140 U	240 U	160 U	220 U	160 U
Dibenzofuran		220 U	140 U	240 U	160 U	220 U	160 U
Diethyl phthalate		220 U	140 U	240 U	160 U	220 U	160 U
Dimethyl phthalate		220 U	140 U	240 U	160 U	220 U	160 U
Di-n-butyl phthalate		220 U	140 U	240 U	160 U	220 U	160 U
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)		2200 U	1400 U	2400 U	1600 U	2200 U	1600 U
Di-n-octyl phthalate		220 U	140 U	240 U	160 U	220 U	160 U
Hexachlorobenzene		220 U	140 U	240 U	160 U	220 U	160 U
Hexachlorobutadiene		440 U	290 U	470 U	320 U	440 U	310 U
Hexachlorocyclopentadiene		1100 U	720 U	1200 U	800 U	1100 U	780 U
Hexachloroethane		440 U	290 U	470 U	320 U	440 U	310 U
Isophorone		220 U	140 U	240 U	160 U	220 U	160 U
Nitrobenzene		220 U	140 U	240 U	160 U	220 U	160 U
N-Nitrosodi-N-propylamine		440 U	290 U	470 U	320 U	440 U	310 U
N-Nitrosodiphenylamine		220 U	140 U	240 U	160 U	220 U	160 U
Pentachlorophenol		1100 U	720 U	1200 U	800 U	1100 U	780 U
Phenol		440 U	290 U	470 U	320 U	440 U	310 U
PCB Aroclors (µg/kg)							
Aroclor 1016		160 U	71 U	120 U	79 U	110 U	78 U
Aroclor 1242		160 U	71 U	120 U	79 U	110 U	78 U
Aroclor 1248		160 U	71 U	120 U	79 U	110 U	78 U
Aroclor 1254		110 U	71 U	120 U	79 U	110 U	78 U
Aroclor 1260		110 U	71 U	120 U	79 U	110 U	78 U
Total PCB Aroclors (U = 1/2)		160 U	71 U	120 U	79 U	110 U	78 U
Total PCB Aroclors (U = 0)		160 U	71 U	120 U	79 U	110 U	78 U

Notes:

Bold = Detected result

U = Compound analyzed, but not detected above detection limit
UJ = Compound analyzed, but not detected above estimated detection limit

Location Name	MTCA TEF	VB-4	VB-4	VB-5	VB-8
Sample ID		14_VB-4-01/24/97-0-10SD	14_VB-4-01/24/97-10-20SD	14_VB-5-01/24/97-0-10SD	14_VB-8-01/24/97-0-45SD
Sample Date		1/24/1997	1/24/1997	1/24/1997	1/24/1997
Depth		0 - 10 cm	10 - 20 cm	0 - 10 cm	0 - 45 cm
Sample Type		N	N	N	N
X		1661237	1661237	1661032	1661336
Y		196516.9	196516.9	196710.9	196811.9
Conventional Parameters (pct)					
Total organic carbon		**5.1**	**1.3**	**2.7**	**14**
Total solids		**26.4**	**69.2**	**68.9**	**35.1**
Metals (mg/kg)					
Antimony		20 UJ	8 UJ	7 UJ	10 UJ
Arsenic		20 U	8 U	7 U	10 U
Beryllium		0.3 U	**0.2**	**0.2**	0.3 U
Cadmium		**2.7**	0.3 U	0.3 U	0.6 U
Chromium		**43**	**30.4**	**24.3**	**19**
Copper		**33.7**	**12.5**	**12.5**	**19.5**
Lead		**43**	**8**	**10**	**13**
Mercury		0.1 U	0.07 U	0.07 U	0.1 U
Nickel		**32**	**26**	**18**	**17**
Selenium		20 U	8 U	7 U	10 U
Silver		1 U	0.5 U	0.4 U	0.8 U
Thallium		20 U	8 U	7 U	10 U
Zinc		**1580**	**111**	**34**	**75**
Aromatic Hydrocarbons (µg/kg)					
2-Methylnaphthalene		250 U	97 U	99 U	200 U
Acenaphthene		250 U	97 U	99 U	200 U
Acenaphthylene		250 U	97 U	99 U	200 U
Anthracene		250 U	97 U	99 U	**470**
Benzo(a)anthracene	0.1	**280**	97 U	99 U	**850**
Benzo(a)pyrene	1	**730**	**130**	**210**	**900**
Benzo(b)fluoranthene	0.1	**700**	97 U	**160**	**470**
Benzo(g,h,i)perylene		**690**	**110**	**190**	**560**
Benzo(k)fluoranthene	0.1	**410**	97 U	**120**	**560**
Chrysene	0.01	**510**	97 U	**130**	**760**
Dibenzo(a,h)anthracene	0.1	250 U	97 U	99 U	200 U
Fluoranthene		250 U	97 U	99 U	**780**
Fluorene		250 U	97 U	99 U	200 U
Indeno(1,2,3-c,d)pyrene	0.1	**500**	97 U	**140**	**480**
Naphthalene		250 U	97 U	99 U	**260**
Phenanthrene		250 U	97 U	99 U	**1400**
Pyrene		**530**	**120**	99 U	**2400**
cPAH (U=0; OC-normalized; mg/kg OC)		**18**	**10**	**9**	**8**
Semivolatile Organics (µg/kg)					
1,2-Dichlorobenzene		250 U	97 U	99 U	200 U
1,2,4-Trichlorobenzene		250 U	97 U	99 U	200 U
1,3-Dichlorobenzene		250 U	97 U	99 U	200 U
1,4-Dichlorobenzene		250 U	97 U	99 U	200 U
2-Chloronaphthalene		250 U	97 U	99 U	200 U
2-Chlorophenol		250 U	97 U	99 U	200 U
2-Methylphenol (o-Cresol)		500 U	190 U	200 U	400 U
2-Nitroaniline		1200 U	480 U	490 U	1000 U
2-Nitrophenol		1200 U	480 U	490 U	1000 U
2,2'-Oxybis (1-chloropropane)		250 U	97 U	99 U	200 U
2,4-Dichlorophenol		740 U	290 U	300 U	600 U
2,4-Dimethylphenol		740 U	290 U	300 U	600 U
2,4-Dinitrophenol		2500 U	970 U	990 U	2000 U
2,4-Dinitrotoluene		1200 U	480 U	490 U	1000 U
2,4,5-Trichlorophenol		1200 U	480 U	490 U	1000 U
2,4,6-Trichlorophenol		1200 U	480 U	490 U	1000 U
2,6-Dinitrotoluene		1200 U	480 U	490 U	1000 U
3-Nitroaniline		1500 U	580 U	590 U	1200 U
3,3'-Dichlorobenzidine		1200 U	480 U	490 U	1000 U
4-Bromophenyl-phenyl ether		250 U	97 U	99 U	200 U
4-Chloro-3-methylphenol		500 U	190 U	200 U	400 U
4-Chloroaniline		740 U	290 U	300 U	600 U
4-Chlorophenyl phenyl ether		250 U	97 U	99 U	200 U
4-Methylphenol (p-Cresol)		250 U	97 U	99 U	200 U
4-Nitroaniline		1200 U	480 U	490 U	1000 U
4-Nitrophenol		1200 U	480 U	490 U	1000 U
Benzoic acid		2500 U	970 U	990 U	2000 U
Benzyl alcohol		1200 U	480 U	490 U	1000 U
bis(2-Chloroethoxy)methane		250 U	97 U	99 U	200 U
bis(2-Chloroethyl)ether		500 U	190 U	200 U	400 U
Bis(2-ethylhexyl) phthalate		250 U	97 U	99 U	200 U
Butylbenzyl phthalate		250 U	97 U	99 U	200 U
Carbazole		250 U	97 U	99 U	200 U
Dibenzofuran		250 U	97 U	99 U	200 U
Diethyl phthalate		250 U	97 U	99 U	200 U
Dimethyl phthalate		250 U	97 U	99 U	**310**
Di-n-butyl phthalate		250 U	97 U	99 U	200 U
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)		2500 U	970 U	990 U	2000 U
Di-n-octyl phthalate		250 U	97 U	99 U	200 U
Hexachlorobenzene		250 U	97 U	99 U	200 U
Hexachlorobutadiene		500 U	190 U	200 U	400 U
Hexachlorocyclopentadiene		1200 U	480 U	490 U	1000 U
Hexachloroethane		500 U	190 U	200 U	400 U
Isophorone		250 U	97 U	99 U	200 U
Nitrobenzene		250 U	97 U	99 U	200 U
N-Nitrosodi-N-propylamine		500 U	190 U	200 U	400 U
N-Nitrosodiphenylamine		250 U	97 U	99 U	200 U
Pentachlorophenol		1200 U	480 U	490 U	1000 U
Phenol		500 U	190 U	200 U	400 U
PCB Aroclors (µg/kg)					
Aroclor 1016		120 U	49 U	49 U	100 U
Aroclor 1242		120 U	49 U	49 U	100 U
Aroclor 1248		120 U	49 U	49 U	100 U
Aroclor 1254		120 U	49 U	49 U	100 U
Aroclor 1260		120 U	49 U	49 U	100 U
Total PCB Aroclors (U = 1/2)		120 U	49 U	49 U	100 U
Total PCB Aroclors (U = 0)		120 U	49 U	49 U	100 U

Notes:

Bold = Detected result

U = Compound analyzed, but not detected above detection limit
UJ = Compound analyzed, but not detected above estimated detection limit

ATTACHMENT I2

Data from Barbee Mill Baseline Sediment Characterization, Anchor Environmental, 2002

Table 1. Summary of Chemical Analysis Results, Barbee Mill

Station ID	Wash. State Plane NAD 27 N. Northing	Easting	Date Sampled	Time Sampled	Water Depth (ft)	Penetration Depth (cm)	Sample Interval (cm)	Zinc (mg/kg)[a]	TOC (%)	Volume Wood (%)[b]	Ammonia (mg/kg)	Sulfide (mg/kg)
Ecology's Site-Specific Sediment Cleanup Standard								**410.0**	**13.5**	**50**		
Ecology's Site-Specific Sediment Minimum Action Level								**512.5**	**16.9**	**75**		
ANBM-1	196841.117	1661139.141	5/1/02	1030	17.4	14	0-10	123.0	20.9	30	22.6 J	119 J
ANBM-2	196841.117	1661264.141	5/1/02	1135	11.1	12	0-10	55.3	12.6	80	15.5 J	8.9 J
ANBM-3	196841.117	1661264.141	5/1/02	1205	17.4	16	0-10	158.0	15.3	60	69 J	124 J
ANBM-4	196716.117	1661139.141	5/1/02	1230	16.5	18	0-10	166.0	16.8	60	103 J	161 J
ANBM-5	196591.117	1661014.141	5/1/02	1315	20.8	19	0-10	145.0	10.1	20	67.1 J	106 J
ANBM-6	196591.117	1661139.141	5/1/02	NA	16.3	0	0	NA	NA	>80	NA	NA
ANBM-7	196591.117	1661264.141	5/1/02	1405	11.2	19	0-10	194.0	18.1	70	52.3 J	98.2 J
ANBM-8	196466.117	1661014.141	5/1/02	1430	19.5	15	0-10	155.0	13.8	35	53.2 J	83.3 J
ANBM-9	196466.117	1661139.141	5/1/02	NA	13.8	0	0	NA	NA	>80	NA	NA
ANBM-10	196466.117	1661264.141	5/1/02	1545	8.9	6	0-5[b]	81.7	46.0	90	3.62 J	8 J
ANBM-11	196341.117	1661014.141	5/1/02	1600	18.8	16	0-10	150.0	18.8	10	73.7 J	40.9 J
ANBM-11S[c]	196341.117	1661014.141	5/1/02	1600	18.8	16	0-10	170.0	18.0	10	78.2 J	109 J
ANBM-12	196341.117	1661139.141	5/2/02	NA	12.2	0	0	NA	NA	>80	NA	NA
ANBM-13	196341.117	1661264.141	5/2/02	NA	7.9	0	0	NA	NA	>90	NA	NA
ANBM-14	196216.117	1661014.141	5/2/02	915	8.6	12	0-10	201.0	18.7	60	58.2 J	79.2 J
ANBM-15	196216.117	1661139.141	5/2/02	NA	13.6	0	0	NA	NA	>80	NA	NA
ANBM-16	196216.117	1661264.141	5/2/02	NA	10.7	0	0	NA	NA	>80	NA	NA
ANBM-17	196216.117	1661389.141	5/2/02	NA	10.0	0	0	NA	NA	>80	NA	NA
ANBM-18	196091.117	1661139.141	5/2/02	1130	19.3	16	0-10	88.1	12.4	25	30.9 J	66.7 J
ANBM-18D[d]	196091.117	1661139.141	5/2/02	1140	19.2	14	0-10	105.0	8.9	15	28.7 J	78.7 J
ANBM-19	196091.117	1661139.141	5/2/02	NA	10.8	0	0	NA	NA	>80	NA	NA
ANBM-20	196093.320	1661376.160	5/2/02	1230	12.5	19	0-10	104.0	21.3	50	62.4 J	56.9 J
ANBM-21	195966.117	1661389.141	5/2/02	1300	14.2	20	0-10	93.4	20.0	30	18.8 J	73.6 J

Notes:

[a]- The zinc, ammonia, and sulfide concentrations are on a dry weight basis.

[b]- Volumetric wood percentage based on visual estimation following homogenization of the upper 10 cm of the surface sample. All sample stations were designated with >75% wood when four successive surface grabs at a station were unacceptable due to clogging of the van Veen with wood debris.

[c]- Field quality assurance sample. Sample taken from homogenized material collected at ANBM-11 (i.e., split sample)

[d]- Field quality assurance sample. Sample collected in location coincident to ANBM-18 (i.e., duplicate sample)

"J" denotes an estimated concentration, qualified based on observed variability between split and duplicate samples.

ATTACHMENT I3

Data from Completion Report, Independent Remedial Action, Barbee Mill Sediment Cleanup Project, Anchor Environmental, 2003

Table 2
Summary of Post-Dredge Performance Monitoring Results

Station ID	Wash. State Plane NAD 27 N. Northing	Easting	Date Sampled	Time Sampled	Water Depth (ft)	Penetration Depth (cm)	Sample Interval (cm)	TOC (%)	Volume Wood (%)[a]
Site-Specific Sediment Cleanup Standard (average concentration)								**13.5**	**50**
Maximum Allowable Concentration								**16.9**	**75**
BMPD-1	196,841.12	1,661,139.14	10/29/02	1100	18.0	17	0-10	6.3	<5
BMPD-2	196,841.12	1,661,264.14	10/29/02	1120	16.9	15	0-10	13.0	35
BMPD-6	196,591.12	1,661,139.14	10/29/02	1130	18.2	17	0-10	5.8	<5
BMPD-7	196,591.12	1,661,264.14	10/29/02	1200	12.7	19	0-10	4.9	10
BMPD-9	196,466.12	1,661,139.14	10/29/02	1245	14.5	18	0-10	5.7	10
BMPD-10	196,466.12	1,661,264.14	10/29/02	1300	12.5	17	0-10	6.4	10
BMPD-11	196,341.12	1,661,014.14	10/29/02	1345	19.1	19	0-10	3.5	5
BMPD-12	196,341.12	1,661,139.14	10/29/02	1355	14.0	17	0-10	5.0	25
BMPD-13	196,341.12	1,661,264.14	10/29/02	1414	12.3	18	0-10	7.3	25
BMPD-13R[b]	196,341.12	1,661,264.14	10/29/02	1430	12.1	17	0-10	6.8	25
BMPD-14	196,216.12	1,661,014.14	10/29/02	1450	18.8	19	0-10	6.0	10
BMPD-15	196,216.12	1,661,139.14	8/21/02	1100	NA	13	0-10	5.5	<5
BMPD-16	196,216.12	1,661,264.14	8/21/02	1110	NA	15	0-10	2.3	<5
BMPD-17[c]	196,216.12	1,661,389.14	8/21/02	NA	NA	0	0	NA	NA
BMPD-19	196,091.12	1,661,139.14	8/21/02	1250	NA	15	0-10	6.2	<5
BMPD-20	196,093.32	1,661,376.16	8/21/02	1255	NA	13	0-10	7.7	15
BMPD-21	195,966.12	1,661,389.14	8/21/02	1135	NA	16	0-10	4.1	<5
BMPD-22	196,341.12	1,660,889.14	10/29/02	1330	22.0	17	0-10	7.3	25
BMPD-23	196,216.12	1,660,889.14	10/29/02	1440	22.8	16	0-10	5.6	<5

Notes:

[a] - Volumetric wood percentage based on visual estimation following homogenization of the upper 10 cm of the surface sample.

[b] - Field quality assurance sample. Sample collected in location coincident to ANBM-13 (i.e., replicate sample)

[c] - Sample could not be collected due to insufficient sediment retrieval from the sampler following several attempts.

ATTACHMENT I4

Data from Summary of Site Geochemical Data, Aspect, 2006a

Table 1 - Summary of Analytical Results for Soil Samples

				Concentration in Percent		Concentration in mg/kg					
Sample	Depth Interval in Feet	Collocated Monitoring Well	Material Type	Total Solids in Percent	Total Organic Carbon	Sulfur - Chromium Reducible	Sulfide - Acid Volatile	Aluminum	Arsenic	Iron	Manganese
AP-1 3-8	3 to 8	HCMW-01S	medium-to-fine Sand	84.6	3.9	15.3	0.5 U	9,290	12	14,100	203
AP-1 15-20	15 to 20	HCMW-01D	medium-to-fine Sand	80.8	0.26	1.9	0.5 U	7,920	2.43	11,500	169
AP-2 3-8	3 to 8	RMW-01	silty Sand	78.1	0.94	19.7	0.5 U	14,600	2.99	18,200	257
AP-3 3-8	3 to 8	HCMW-02	gravelly Sand	79.1	1.33	4.4	0.5 U	10,700	73.2	17,400	225
AP-3 10.5-12	10.5 to 12	Interval below HCMW-02	organic Silt	50.3	4.82	80	0.5 U	11,400	13.5	12,800	283
AP-4 8-13	8 to 13	HCMW-05S	medium Sand with organic silt	78.8	0.15	6.6	0.5 U	9,490	0.92	12,100	142
AP-4 16.5-18	16.5 to 18	Interval between HCMW-05S and -05D	organic Silt	48.9	7.09	62.6	1.4	22,500	9.07	23,900	411
AP-4 20-24	20 to 24	HCMW-05D	fine-to-medium Sand	87.2	0.02 U	8.8	0.5 U	12,300	1.27	21,500	267

Table 2 - Summary of Analytical Results for Groundwater Samples

Field Parameters

Well	Date	pH	Temp in Celsius	Conductivity in uS	Dissolved Oxygen in mg/L	Eh in mV
HCMW-1D	8/2/2005	7.25	13.79	571	0.8	-46.4
HCMW-1S	8/2/2005	6.9	19.16	523	0.73	-54.1
HCMW-2	8/2/2005	6.74	18.59	412	0.72	17.2
HCMW-3	8/2/2005	6.78	22.02	324	0.68	13.6
HCMW-5S	8/2/2005	6.59	15.04	261	0.98	-2.7
HCMW-5D	8/2/2005	7.09	13.61	307	0.87	-79.4
RMW-01	8/2/2005	7.16	20.65	1731	0.5	-111.8
RMW-04	8/2/2005	6.72	23.56	166	0.43	31.1
WP-1B	8/10/2005	6.67	21.18	606	0.86	-71.4
WP-5	8/10/2005	6.92	20.66	323	1.1	-30.4
Lake Washington [1]	8/10/2005	7.39	23.18	105	9.09	17.4

Conventional Parameters

		Concentration in mg/L								
Well	Date	Total Alkalinity [2]	BOD	Chloride	Sulfate	Nitrite [3]	Nitrate [3]	Ortho-phosphate [4]	Total Sulfide	TOC
HCMW-1D	8/2/2005	300	4 U	4.9	4.1	0.01 U	0.008 J	0.45	0.04 J	3.4
HCMW-1S	8/2/2005	215	6	3.1	0.2 U	0.01 U	0.09	0.007 J	0.04 J	14.3
HCMW-2	8/2/2005	155	6	2.8	0.2 U	0.01 U	0.06	0.1	0.007 J	19.4
HCMW-3	8/2/2005	118	1.8 J	2.9	0.2 U	0.01	0.08	0.5	0.03 J	10
HCMW-5D	8/2/2005	100	4 U	4.3	0.2 U	0.01 U	0.03 J	0.009 J	0.005 J	4.3
HCMW-5S	8/2/2005	138	4 U	1.3	5.4	0.01 U	0.7	0.006 J	0.007 J	4.1
RMW-01	8/2/2005	865	7	14	0.2 U	0.01 U	0.12	0.01	0.05 U	65.9
RMW-04	8/2/2005	57	2.8 J	2.3	0.2 U	0.007 J	0.04 J	0.95	0.03 J	11.1
WP-1B	8/10/2005	240	13	3.8	0.2 U	0.005 J	0.08	0.06	0.04 J	23.1

Metals

		Concentration in mg/L												
		Dissolved Arsenic Speciation					Dissolved Metals by EPA Method 6010B							
Well	Date	Inorganic Arsenic	Arsenic(III)	Arsenic(V) [5]	Arsenic (MMA)	Arsenic (DMA)	Total Arsenic [6]	Calcium	Iron	Magnesium	Manganese	Potassium	Silicon	Sodium
HCMW-1D	8/2/2005	0.0159	0.0131	0.0028	0.000008 U	0.000053 U	0.0159	58.6	1.34	23	2.1	4.59	22.5	30.8
HCMW-1S	8/2/2005	3.45	2.743	0.707	0.001 U	0.008 U	3.85	43.6	41.4	15.5	4.71	5.71	28.7	12.8
HCMW-2	8/2/2005	37.035	35.1	1.935	0.01 U	0.08 U	32.5	36.2	25.7	14	1.61	3.92	26.4	11.7
HCMW-3	8/2/2005	0.270	0.221	0.049	0.00008 U	0.00053 U	0.258	23.1	26.5	8.41	1.21	4.12	20	9.37
HCMW-5D	8/2/2005	0.0098	0.00633	0.00347	0.000006 U	0.00004 U	0.0087	27.8	9.03	11.2	1.07	4.64	20.8	10.9
HCMW-5S	8/2/2005	0.0090	0.00504	0.00396	0.000006 U	0.00004 U	0.0087	24.4	16	7.28	1.26	1 U	17.1	7.36
RMW-01	8/2/2005	0.096	0.06	0.036	0.00002 U	0.00016 U	0.0955	155	98.7	84.8	9.78	3.76	29.8	48.9
RMW-04	8/2/2005	0.015	0.0048	0.0102	0.000018 J	0.00004 U	0.009	11.3	10.4	3.25	0.641	2.94	15.8	5.14
WP-1B	8/10/2005	--	--	--	--	--	2.49	55.2	53.3	16.2	4.26	5.91	28.6	15.1
WP-5	8/10/2005	--	--	--	--	--	0.038	--	--	--	--	--	--	--

[1] measured 1 foot beneath surface next to WP-1B
[2] as calcium carbonate
[3] as nitrogen
[4] as phosphorus
[5] calculated by subtracting Arsenic(III) from Inorganic Arsenic
[6] by EPA Method 6020
TOC Total Organic Carbon
BOD Biochemical Oxygen Demand
U not detected at indicated reporting limit
J estimated value

Table 3 - Summary of Analytical Results for Porewater Samples

Location	Sample Name	Sample Depth in cm [1]	Date		Time Deployed in Hours	Dissolved Arsenic Concentration in mg/L [2]
			Sampler Deployed	Sampler Collected		
WP-1B	PW-WP1B-1	10	8/10/05	8/16/05	144	0.005 U
	WP1B - PW2	10	8/10/05	8/25/05	359	4.5
	WP1B - PW3	10	8/10/05	9/1/05	529	0.011
	WP1B - PW4	10	8/10/05	9/9/05	718	1.4
WP-5	PW-WP5-1	10	8/10/05	8/16/05	144	0.012
	WP5 - PW2	10	8/10/05	8/25/05	359	0.022
	WP5 - PW3	10	8/10/05	9/1/05	529	0.021

Notes:

[1] below mudline

[2] filtered by the laboratory

U not detected at indicated detection limit

Table 4 - Sequential Extraction Results for Arsenic

		Arsenic Concentration (mg/kg)				
Sample	**Replicate**	**Soluble**	**Exchangeable**	**Sulfide/Organic**	**Residual**	**Total**
AP 1-3-8	1	0.90	9.33	0.33	--	--
	2	0.70	12.1	0.41	8.55	21.8
AP 3-3-8	1	5.65	51.4	4.25	1.90	63.2
	2	6.07	42.1	3.22	6.00	57.4
AP 3-10.5-12	1	0.40	11.0	0.45	0.64	12.5
	2	0.76	10.9	0.48	--	--

-- Not analyzed due to autosampler failure during run. Total not calculated.
Analysis performed by Dimitri Vlassopoulos (S.S. Papadopolus & Associates) and Ben Perkins (Portland State University)
Sequential extraction procedure designed to release arsenic fractions according to their availability, as follows:

Soluble fraction extracted with 1 M $MgCl_2$, pH 8

Exchangeable (strongly absorbed) fraction extracted with 1 M NaH_2PO_5, pH 5

Sulfide/organic fraction extracted with 0.1 M NaOH

Residual fraction extracted with 16 N HNO_3 + 30% H_2O_2

Sequential extraction methods adapted from methods published by Wilkin and Ford (2002), Keon et.al. (2001), and Dhoum and Evans (1998)

ATTACHMENT I5

Data from Summary of Subsurface Characterization Data, Area Specific Results for Former Pan Abode Area, Aspect, 2006c

Table 1 - Summary of Analytical Results for Soil

			Concentration in mg/kg		
Sample Name	**Sample Date**	**Sample Depth in Feet**	**Pentachlorophenol**	**Diesel-Range Petroleum Hydrocarbons**	**Oil-Range Petroleum Hydrocarbons**
Y18-2	1/17/2006	2	0.001 U	28 U	30 U
Y18-4	1/17/2006	4	0.0011 U	30 U	60 U
Y16-2	1/17/2006	2	0.0011 U	29 U	58 U
Y16-6	1/17/2006	6	0.0012 U	140	260
PY16-13	1/25/2006	11 to 13	0.0022 U	58 U	120
Y14-2	1/17/2006	2	0.0011 U	29 U	58 U
Y14-5	1/17/2006	5	0.0015 U	180	350
AA17-2	1/17/2006	2	0.0011 U	29 U	58 U
AA17-5	1/17/2006	5	0.001 U	27 U	54 U
PAA17-13	1/25/2006	11 to 13	0.0016 U	42 U	85 U
AA15-2	1/17/2006	2	0.001 U	27 U	53 U
AA15-5	1/17/2006	5	0.0013 U	35 U	210
AA13-2	1/17/2006	2	0.0011 U	29 U	57 U
TP-PA6-2	1/17/2006	2	0.0011 U	30 U	60 U
TP-PA6-6	1/17/2006	6	0.0012 U	32 U	64 U

Notes:
Pentachlorophenol analyzed by EPA Method 8151A
Petroleum Hydrocarbons analyzed by Ecology Method NWTPH-Dx
U = analyte not detected at indicated detection limit

Table 2 - Summary of Analytical Results for Groundwater

		Concentration in µg/L		
Sample Name	**Sample Date**	**Pentachlorophenol**	**Diesel-Range Petroleum Hydrocarbons**	**Oil-Range Petroleum Hydrocarbons**
HCMW-1S	2/1/2006	0.0091 U	260 U	410 U

Notes:
Pentachlorophenol analyzed by EPA Method 8151A
Petroleum Hydrocarbons analyzed by Ecology Method NWTPH-Dx
U = analyte not detected at indicated detection limit

ATTACHMENT I6

Data from Summary of Characterization Results, Shoreline Restoration Project, Aspect, 2006d

Table 2 - Summary of Analytical Results for Shoreline Samples

	Concentration in mg/kg										
Sample Name	SH-1-4	SH-1-8	SH-2-3	SH-2-8	SH-3-5	SH-3-8	SH-4-4	SH-4-9.5	SH-5-4	SH-5-8	SH-6-4
Sample Date	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006
Sample Interval in Feet	0 to 4	4 to 8	0 to 3	3 to 8	0 to 5	5 to 8	0 to 4	4 to 9.5	0 to 4	4 to 8	0 to 4
PAHs by EPA Method 8270C/SIM											
Naphthalene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.0073 U	0.0082 U	0.014	0.011 U	0.0072 U
2-Methylnaphthalene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.0073 U	0.0082 U	0.022	0.011 U	0.0072 U
1-Methylnaphthalene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.0073 U	0.0082 U	0.025	0.011 U	0.0072 U
Acenaphthylene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.0073 U	0.0082 U	0.011 U	0.011 U	0.0072 U
Acenaphthene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.0073 U	0.0082 U	0.12	0.024	0.0072 U
Fluorene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.0073 U	0.0082 U	0.084	0.021	0.0072 U
Phenanthrene	0.0081 U	0.014	0.0075 U	0.01 U	0.010	0.0089 U	0.023	0.0082 U	0.35	0.14	0.015
Anthracene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.0073 U	0.0082 U	0.035	0.013	0.0081
Fluoranthene	0.013	0.0087 U	0.0075 U	0.01 U	0.012	0.0089 U	0.024	0.0082 U	0.34	0.1	0.0072 U
Pyrene	0.012	0.017	0.0085	0.01 U	0.015	0.0089 U	0.037	0.0082 U	0.24	0.077	0.011
Benz[a]anthracene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.015	0.0082 U	0.11	0.021	0.0072 U
Chrysene	0.02	0.03	0.015	0.01 U	0.019	0.0089 U	0.053	0.0082 U	0.23	0.038	0.029
Benzo[b]fluoranthene	0.017	0.0092	0.012	0.01 U	0.0098	0.0089 U	0.022	0.0082 U	0.087	0.021	0.014
Benzo[k]fluoranthene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.012	0.0082 U	0.031	0.011 U	0.0072 U
Benzo[a]pyrene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.017	0.0082 U	0.048	0.016	0.0089
Indeno[1,2,3-cd]pyrene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.0073 U	0.0082 U	0.019	0.011 U	0.0072 U
Dibenzo[a,h]anthracene	0.0081 U	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.0073 U	0.0082 U	0.011 U	0.011 U	0.0072 U
Benzo[g,h,i]perylene	0.0086	0.0087 U	0.0075 U	0.01 U	0.009 U	0.0089 U	0.019	0.0082 U	0.021	0.014	0.013
Total PAHs	0.12	0.13	0.092	0.09 U	0.124	0.08 U	0.25	0.07 U	1.79	0.52	0.14
Total cPAHs (See Note 1)	0.0088	0.0086	0.0077	0.009 U	0.0088	0.008 U	0.024	0.007 U	0.075	0.024	0.013

Notes:

U = Not Detected at Indicated Detection Limit

cPAHs (carcinogenic PAHs) are Benz[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Indeno[1,2,3-cd]pyrene, and Dibenzo[a,h]anthracene.

Total cPAH concentrations reported as Benzo[a]pyrene toxicity equivalents.

One-half the detection limit used for non-detected PAHs to calculate total PAHs and cPAHs.

TP-8

Table 2 - Summary of Analytical Results for Shoreline Samples

		Concentration in mg/kg									
Sample Name	SH-6-8	SH-7-4	SH-7-8	SH-8-3	SH-8-8	SH-9-4	SH-9-8	SH-10-3	SH-10-8	SH-11-4	SH-12-10
Sample Date	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	2/14/2006	3/6/2006	3/6/2006
Sample Interval in Feet	4 to 8	0 to 4	4 to 8	0 to 3	3 to 8	0 to 4	4 to 8	0 to 3	3 to 8	0 to 4	6 to 10
PAHs by EPA Method 8270C/SIM											
Naphthalene	0.010	0.0072 U	0.0076 U	0.0072 U	0.0079 U	0.0075 U	0.026	0.0077 U	0.008 U	0.04 U	0.056 U
2-Methylnaphthalene	0.0083 U	0.0072 U	0.0076 U	0.0072 U	0.0079 U	0.016	0.130	0.0091	0.008 U	0.04 U	0.056 U
1-Methylnaphthalene	0.0083 U	0.0072 U	0.0076 U	0.0072 U	0.0079 U	0.014	0.100	0.0089	0.0081	0.04 U	0.056 U
Acenaphthylene	0.0083 U	0.0072 U	0.0076 U	0.0072 U	0.0079 U	0.0075 U	0.0078 U	0.0077 U	0.008 U	0.008 U	0.011 U
Acenaphthene	0.0083 U	0.0072 U	0.0076 U	0.0072 U	0.0079 U	0.0075 U	0.019	0.0077 U	0.008 U	0.008 U	0.011 U
Fluorene	0.0083 U	0.0072 U	0.0088	0.0072 U	0.0079 U	0.012	0.0410	0.0079	0.008 U	0.008 U	0.011 U
Phenanthrene	0.018	0.017	0.0076 U	0.038	0.0079 U	0.077	0.160	0.056	0.020	0.030	0.019
Anthracene	0.0083 U	0.0072 U	0.0076 U	0.0072 U	0.0079 U	0.0075 U	0.0078 U	0.0077 U	0.008 U	0.008 U	0.011 U
Fluoranthene	0.031	0.0072 U	0.0076 U	0.011	0.0079 U	0.024	0.039	0.025	0.008 U	0.028	0.027
Pyrene	0.030	0.011	0.0076 U	0.026	0.0079 U	0.079	0.120	0.070	0.025	0.042	0.030
Benz[a]anthracene	0.012	0.0072 U	0.0076 U	0.016	0.0079 U	0.046	0.075	0.040	0.0083	0.015	0.012
Chrysene	0.018	0.028	0.0095	0.080	0.0079 U	0.25	0.40	0.22	0.092	0.026	0.027
Benzo[b]fluoranthene	0.022	0.013	0.0076 U	0.025	0.0079 U	0.047	0.069	0.042	0.030	0.024	0.044
Benzo[k]fluoranthene	0.0083 U	0.0072 U	0.0076 U	0.011	0.0079 U	0.019	0.034	0.026	0.016	0.0086	0.013
Benzo[a]pyrene	0.015	0.0081	0.0076 U	0.019	0.0079 U	0.036	0.044	0.036	0.021	0.023	0.031
Indeno[1,2,3-cd]pyrene	0.010	0.0072 U	0.0076 U	0.0073	0.0079 U	0.026	0.033	0.027	0.008 U	0.013	0.028
Dibenzo[a,h]anthracene	0.0083 U	0.0072 U	0.0076 U	0.0094	0.0079 U	0.020	0.024	0.015	0.010	0.008 U	0.011 U
Benzo[g,h,i]perylene	0.015	0.013	0.0076 U	0.024	0.0079 U	0.049	0.063	0.050	0.022	0.020	0.040
Total PAHs	0.21	0.13	0.079	0.292	0.07 U	0.73	1.38	0.65	0.28	0.31	0.38
Total cPAHs (See Note 1)	0.022	0.012	0.0069	0.029	0.007 U	0.060	0.079	0.058	0.032	0.031	0.043

Notes:

U = Not Detected at Indicated Detection Limit

cPAHs (carcinogenic PAHs) are Benz[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Indeno[1,2,3-cd]pyrene, and Dibenzo[a,h]anthracene.

Total cPAH concentrations reported as Benzo[a]pyrene toxicity equivalents.

One-half the detection limit used for non-detected PAHs to calculate total PAHs and cPAHs.

TP-8

Table 3 - Summary of Analytical Results for Soil Samples Collected by Others within 50 Feet of the Shoreline

	Concentration in mg/kg				
Sample Name	TP7-2.5	TP7-5	TP8-5	TP8S-2	TP8S-4
Sample Date	1/19/2006	1/19/2006	1/19/2006	1/19/2006	1/19/2006
Sample Depth in Feet	2.5	5	5	2	4
Petroleum Hydrocarbons by Ecology Method NWTPH-Dx					
Diesel-Range	50 U	50 U	50 U	140	50 U
Motor-Oil Range	250 U	250 U	250 U	510	250 U
PAHs by EPA Method 8270C					
Naphthalene	0.005 U	--	--	0.061	0.018
2-Methylnaphthalene	--	--	--	--	--
1-Methylnaphthalene	--	--	--	--	--
Acenaphthylene	0.005 U	--	--	0.05 U	0.005 U
Acenaphthene	0.005 U	--	--	0.073	0.015
Fluorene	0.005 U	--	--	0.055	0.012
Phenanthrene	0.005 U	--	--	0.2	0.040
Anthracene	0.005 U	--	--	0.05 U	0.0069
Fluoranthene	0.005 U	--	--	0.16	0.055
Pyrene	0.010	--	--	0.19	0.062
Benz[a]anthracene	0.005 U	--	--	0.054	0.015
Chrysene	0.015	--	--	0.089	0.023
Benzo[b]fluoranthene	0.005 U	--	--	0.060	0.039
Benzo[k]fluoranthene	0.005 U	--	--	0.05 U	0.005 U
Benzo[a]pyrene	0.005 U	--	--	0.067	0.023
Indeno[1,2,3-cd]pyrene	0.005 U	--	--	0.05 U	0.0091
Dibenzo[a,h]anthracene	0.005 U	--	--	0.05 U	0.005 U
Benzo[g,h,i]perylene	0.005 U	--	--	0.05 U	0.013
Total PAHs	0.06	--	--	1.16	0.34
Total cPAHs (See Note 1)	0.0092	--	--	0.094	0.031
Metals by EPA Method 6020					
Arsenic	1.99	1.82	--	--	--
Zinc	--	--	--	--	--

Notes:
U = Not Detected at Indicated Detection Limit
[1] cPAHs (carcinogenic PAHs) are Benz[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Indeno[1,2,3-cd]pyrene, and Dibenzo[a,h]anthracene.
Total cPAH concentrations reported as Benzo[a]pyrene toxicity equivalents.
One-half the detection limit used for non-detected PAHs to calculate total PAHs and cPAHs.

ATTACHMENT I7

Data from Construction Report, Barbee Mill Arsenic Remediation, Aspect, 2006e

Table 2 - Summary of Soil Analytical Results - Confirmation Samples (Soil Left in Place)
Barbee Mill Soil Remediation Project

			Concentration in mg/kg	
Sample Name	Sample Date	Depth Interval in Feet	Arsenic	Zinc
UU6-4	3/15/2006	2 to 4	3.3	--
VV5-8	2/28/2006	6 to 8	4.8	--
VV5E-4	3/15/2006	2 to 4	2.8	--
VV6-8	3/10/2006	6 to 8	7.2	--
VV6NE-4	4/25/2006	2 to 4	2.5	--
WW5-8	2/15/2006	6 to 8	2.9	27
WW5-12	2/15/2006	10 to 12	1.5	39
WW5S-4	3/15/2006	2 to 4	3.5	--
WW6-12	2/15/2006	10 to 12	2.2	50
WW6-9	2/28/2006	8.5 to 9	4.5	--
WW6S-8	3/4/2006	6 to 8	8.5	--
WW7-4	2/15/2006	2 to 4	1.7	39
WW7-8	2/15/2006	6 to 8	6.2	34
WW7-12	2/15/2006	10 to 12	1.6	40
XX3-8	2/17/2006	6 to 8	3.0	--
XX3W-4	3/10/2006	2 to 4	13	--
XX4-8	2/28/2006	6 to 8	3.4	--
XX4-4	3/4/2006	2 to 4	<6.6	--
XX4NW-12	2/15/2006	10 to 12	1.4	27
XX5-8	2/28/2006	6 to 8	7.6	--
XX5E-8	2/28/2006	6 to 8	3.9	--
XX5N-10	2/28/2006	9.5 to 10	0.86	--
XX6S-13	2/28/2006	12.5 to 13	2.9	--
XX7-8	2/28/2006	6 to 8	16	--
XX7N-4	3/15/2006	2 to 4	7.9	--
XX7SW-11	3/4/2006	10.5 to 11	<6.6	--
XX8-4	2/28/2006	2 to 4	12	--
XX8-8	2/28/2006	6 to 8	14	--
YY3N-6	2/28/2006	5.5 to 6	2.1	--
YY3S-4	2/17/2006	2 to 4	5.7	--
YY3S-8	2/17/2006	6 to 8	2.3	--
YY4-7	3/8/2006	5 to 7	4.4	--
YY4W-8	2/15/2006	6 to 8	12	30
YY4W-12	2/15/2006	10 to 12	1.4	36
YY8N-4	2/15/2006	2 to 4	12	56
YY8SE-4	2/28/2006	2 to 4	4.6	--
YY8SE-8	2/28/2006	6 to 8	10	--
ZZ2N-4	2/17/2006	2 to 4	2.2	--
ZZ2N-8	2/17/2006	6 to 8	2.4	--
ZZ3-4	3/7/2006	2 to 4	9.2	--
ZZ3NW-8	2/15/2006	6 to 8	1.3	26
ZZ3NW-12	2/15/2006	10 to 12	1.6	38
ZZ5-8	2/8/2006	6 to 8	5.6	39
ZZ5-12	2/8/2006	10 to 12	0.90	33
ZZ5NW-9	2/28/2006	8.5 to 9	9.0	--
ZZ7-12	2/8/2006	10 to 12	0.65	27
ZZ7N-9	2/28/2006	9	7.6	--
ZZ9-4	2/18/2006	2 to 4	18	--
ZZ9SE-4	2/18/2006	2 to 4	7.5	--
ZZ11W-4	2/17/2006	2 to 4	12	--
A3-6	3/7/2006	5.5 to 6	<5.7	--
A4-7	1/25/2006	5 to 7	6.5	24
A4-10	1/25/2006	8 to 10	3.1	35
A5-12	2/16/2006	10 to 12	2.1	--
A5-13	1/31/2006	11 to 13	1.2	41
A5SE-7	3/8/2006	5 to 7	8.9	--
A6-10	1/25/2006	8 to 10	11	66
A8-7	1/25/2006	5 to 7	2.4	26
A8-10	1/25/2006	8 to 10	9.0	40

			Concentration in mg/kg	
Sample Name	Sample Date	Depth Interval in Feet	Arsenic	Zinc
A9-8	2/3/2006	6 to 8	<8.1	34
A10-4	2/18/2006	2 to 4	8.4	--
A11-4	2/17/2006	2 to 4	5.1	--
A12-3	1/25/2006	1 to 3	3.2	34
B2-4	2/8/2006	2 to 4	13	120
B2-8	2/8/2006	6 to 8	3.1	62
B2-12	2/8/2006	10 to 12	1.8	31
B2N-4	3/10/2006	2 to 4	7.6	--
B6-15	3/1/2006	14.5 to 15	1.4	--
B7-12	2/22/2006	11.5 to 12	**33**	--
B7-14	2/22/2006	13.5 to 14	4.6	--
B8-13	2/5/2006	11 to 13	12	32
B8-15	2/5/2006	13 to 15	3.8	--
B9-8	2/3/2006	6 to 8	<6.5	25
B9NW-5	2/17/2006	4.5 to 5	10	--
B11N-4	2/10/2006	2 to 4	1.8	23
C3-8	2/16/2006	6 to 8	2.1	--
C4-13	1/31/2006	11 to 13	3	42
C4-14	2/16/2006	12 to 14	5	--
C4-7	3/8/2006	5 to 7	20	--
C5-15	2/5/2006	13 to 15	2.8	--
C6-13	2/3/2006	11 to 13	4.9	--
C8-13	2/3/2006	11 to 13	18	--
C11-7	1/17/2006	6 to 7	6.2	18
C11-10	1/17/2006	9 to 10	1.6	30
C11N-4	2/10/2006	2 to 4	4.1	33
D3E-4	3/7/2006	2 to 4	<5.2	--
D4S-7	3/16/2006	6.5 to 7	2.4	--
D4W-12	2/16/2006	10 to 12	2.8	--
D5-11	1/19/2006	10 to 11	4.6	41
D7-12	1/25/2006	11 to 12	5.0	39
D10-10	1/19/2006	9 to 10	8.0	29
D12N-8	2/13/2006	6 to 8	2.5	28
E3-8	2/15/2006	6 to 8	0.7	--
E3-7	3/21/2006	6.5 to 7	5.9	--
E4-8	2/15/2006	6 to 8	4.9	18
E4-12	2/15/2006	10 to 12	1.8	31
E5N-11	3/1/2006	10.5 to 11	9.4	--
E6-13	2/3/2006	11 to 13	1.7	--
E7-11	1/19/2006	10 to 11	8.2	280
E10-13	2/3/2006	11 to 13	14	--
E11-13	1/25/2006	11 to 13	5.5	27
E13-4	2/3/2006	2 to 4	<6.7	33
E14-8	1/25/2006	6 to 8	0.77	30
E14-12	1/25/2006	10 to 12	4.8	31
F2-12	1/25/2006	11 to 12	1.5	40
F2N-8	3/7/2006	6 to 8	<5.3	--
F2N-4	3/10/2006	2 to 4	6.4	--
F3-12	3/7/2006	10 to 12	<6.7	--
F3-15	3/7/2006	13 to 15	<6.7	--
F6-13	2/27/2006	11 to 13	6.4	--
F10-11	1/19/2006	10 to 11	20	30
F12-4	1/18/2006	3 to 4	1.3	39
F12-13	2/3/2006	11 to 13	<6.7	29
F13N-8	2/13/2006	6 to 8	1.2	32
G3-6	3/7/2006	5.5 to 6	<5.3	--
G4-11	2/3/2006	9 to 11	2.8	42
G5-9	3/1/2006	8.5 to 9	11	--
G6-11	2/3/2006	9 to 11	2.3	32
G7-14	2/22/2006	12 to 14	8.2	--
G12-14	2/10/2006	12 to 14	15	20

			Concentration in mg/kg	
Sample Name	Sample Date	Depth Interval in Feet	Arsenic	Zinc
G13-4	2/3/2006	2 to 4	<6.7	26
G13-8	2/3/2006	6 to 8	<6.5	22
G14-7	1/25/2006	5 to 7	0.59	23
G14-12	1/25/2006	10 to 12	0.94	32
H2-4	3/10/2006	2 to 4	8	--
H3N-7	3/15/2006	6.5 to 7	1.3	--
H4-9	3/7/2006	8.5 to 9	7.4	--
H4E-12	2/15/2006	10 to 12	1.1	--
H8-15	2/3/2006	13 to 15	18	--
H13N-8	2/15/2006	6 to 8	1.4	30
I1-4	2/16/2006	2 to 4	2.8	--
I1-8	2/16/2006	6 to 8	2.4	--
I1N-4	4/25/2006	2 to 4	1.8	--
I3-8	1/18/2006	7 to 8	3.4	37
I3-11	1/18/2006	10 to 11	1.0	28
I3-9	3/10/2006	8.5 to 9	4.6	--
I3SW-7	3/10/2006	6.5 to 7	3.8	--
I4-8	2/15/2006	6 to 8	3.1	--
I4-12	2/15/2006	10 to 12	7.4	--
I5W-9	3/1/2006	8.5 to 9	9.4	--
I6-16	3/4/2006	15.5 to 16	7.7	--
I13-4	2/3/2006	2 to 4	<6.1	26
I13-8	2/3/2006	6 to 8	<6.8	34
J2-4	2/16/2006	2 to 4	15	--
J2-8	2/16/2006	6 to 8	4.4	--
J3S-7	3/8/2006	5 to 7	1.5	--
J4-7	3/8/2006	5 to 7	11	--
J5N-11	3/7/2006	10.5 to 11	8.8	--
J7-12	2/27/2006	10 to 12	4.9	--
J10-16	2/9/2006	15.5 to 16	**75**	35
J13-3	1/18/2006	2 to 3	1.4	75
J13-8	1/18/2006	7 to 8	4.9	33
J13-11	1/18/2006	10 to 11	6.1	15
J13S-8	2/9/2006	6 to 8	13	9.0
J13N-4	2/15/2006	2 to 4	1.2	21
K3-4	2/16/2006	2 to 4	17	--
K5SE-12	2/16/2006	10 to 12	3.0	--
K6-16	3/1/2006	15.5 to 16	3.0	--
K13-4	2/3/2006	2 to 4	<6.5	31
K13-8	2/3/2006	6 to 8	<8.5	45
L3SW-4	2/16/2006	2 to 4	13	--
L3SW-8	2/16/2006	6 to 8	0.7	--
L4SE-12	2/16/2006	10 to 12	2.5	--
L4SE-9	3/7/2006	8.5 to 9	11	--
L6-8	2/22/2006	6 to 8	13	--
L7-12	2/27/2006	10 to 12	7.7	--
L13-4	2/9/2006	2 to 4	6.1	28
L13-8	2/9/2006	6 to 8	15	20
M3-4	2/21/2006	2 to 4	1.3	--
M3-8	2/21/2006	6 to 8	13	--
M3-12	2/21/2006	10 to 12	11	--
M3-4	4/19/2006	2 to 4	1.4	--
M4-13	3/28/2006	12.5 to 13	13	--
M4S-4	3/29/2006	2 to 4	1.7	--
M5-12	3/6/2006	10 to 12	17	--
M5-14	3/6/2006	12 to 14	11	--
M5NE-16	3/7/2006	15.5 to 16	11	--
M11SE-12	2/8/2006	11.5 to 12	19	22
M12-12	1/31/2006	10 to 12	7.2	51
M13-4	3/22/2006	2 to 4	4.0	--
M13-8	3/22/2006	6 to 8	15	--

			Concentration in mg/kg	
Sample Name	Sample Date	Depth Interval in Feet	Arsenic	Zinc
M13-7	3/28/2006	5 to 7	5.5	--
M13-9	3/28/2006	8.5 to 9	11	--
M14-4	2/3/2006	2 to 4	<6.1	42
M14-8	2/3/2006	6 to 8	<6.7	29
M14W-8	4/25/2006	6 to 8	8.8	--
N4-4	2/21/2006	2 to 4	3.0	--
N4-8	2/21/2006	6 to 8	11	--
N4-12	2/21/2006	10 to 12	6.0	--
N4SE-4	3/29/2006	2 to 4	2.0	--
N4SE-8	3/29/2006	6 to 8	20	--
N7-16	3/22/2006	15.5 to 16	12	--
N9-14	1/31/2006	12 to 14	1.1	--
N11-12	1/31/2006	10 to 12	16	22
O4E-4	3/29/2006	2 to 4	2.1	--
O4E-8	3/29/2006	6 to 8	4.0	--
O9NW-16	3/16/2006	15.5 to 16	6.1	--
O12-16	3/14/2006	15.5 to 16	**76**	--
O14-3	1/18/2006	2 to 3	3.9	29
O14-13	3/30/2006	12.5 to 13	11	--
O14N-4	3/22/2006	2 to 4	1.3	--
O14N-8	3/22/2006	6 to 8	7.4	--
O15-8	1/25/2006	6 to 8	1.5	23
O15-13	1/25/2006	11 to 13	3.3	42
P3-4	3/6/2006	2 to 4	<5.4	--
P3-8	3/6/2006	6 to 8	<6.3	--
P3-12	3/6/2006	10 to 12	8.7	--
P3-14	3/6/2006	12 to 14	<8.3	--
P3NE-7	4/6/2006	5 to 7	5.6	--
P4-12	2/21/2006	10 to 12	13	--
P6-14	3/6/2006	12 to 14	<7.4	--
P7-9	3/29/2006	8.5 to 9	16	--
P8-12	3/6/2006	10 to 12	15	--
P8-14	3/6/2006	12 to 14	15	--
P15-4	2/3/2006	2 to 4	1.5	24
P15-8	2/3/2006	6 to 8	4.6	28
P15NW-7	3/23/2006	5 to 7	2.2	--
Q4-13	4/11/2006	12.5 to 13	2.9	--
Q4SE-7	4/6/2006	5 to 7	4.5	--
Q5-13	4/4/2006	12.5 to 13	4.7	--
Q6-12	2/17/2006	10 to 12	13	--
Q6-10	4/4/2006	9.5 to 13	6.7	--
Q6E-8	3/31/2006	6 to 8	5.1	--
Q7-10	4/4/2006	9.5 to 10	3.8	--
Q8-12	2/17/2006	10 to 12	7.9	--
Q8-13	3/29/2006	12.5 to 13	11	--
Q8-10	4/6/2006	9.5 to 10	7.8	--
Q9-15	1/31/2006	13 to 15	<9.6	--
Q9-14	3/17/2006	13.5 to 14	4.4	--
Q12-15	1/31/2006	13 to 15	<7.9	--
Q14-16	3/8/2006	15.5 to 16	**56**	--
Q16-4	2/21/2006	2 to 4	2.7	--
Q16-8	2/21/2006	6 to 8	3.4	--
Q16-12	2/21/2006	10 to 12	8.8	--
Q16-9	3/23/2006	8.5 to 9	5.9	--
R4-4	3/7/2006	2 to 4	3	--
R4-8	3/7/2006	6 to 8	10	--
R4-12	3/7/2006	10 to 12	7	--
R4-9	4/6/2006	8.5 to 9	5.9	--
R4SE-7	4/6/2006	5 to 7	4.4	--
R5-13	4/13/2006	12.5 to 13	5.0	--
R6-10	4/5/2006	9.5 to 10	13	--

			Concentration in mg/kg	
Sample Name	Sample Date	Depth Interval in Feet	Arsenic	Zinc
R7-14	3/7/2006	12 to 14	3.3	--
R7N-16	4/10/2006	15.5 to 16	**26**	--
R9-13	3/17/2006	12.5 to 13	16	--
R10-14	3/6/2006	12 to 14	19	--
R11-16	3/14/2006	15.5 to 16	**25**	--
R16-9	3/28/2006	8.5 to 9	7.4	--
R17-4	2/21/2006	2 to 4	1.3	--
R17-8	2/21/2006	6 to 8	1.9	--
R17-12	2/21/2006	10 to 12	6.3	--
R17S-7	3/23/2006	5 to 7	11	--
S4-11	4/12/2006	9 to 11	3.4	--
S4-13	4/11/2006	12.5 to 13	8.8	--
S4SE-7	4/6/2006	5 to 7	3.9	--
S5-14	3/7/2006	12 to 14	5.9	--
S5-15	4/14/2006	14.5 to 15	1.8	--
S6-10	1/18/2006	9 to 10	5.1	25
S8-16	4/20/2006	15.5 to 16	6.7	--
S9-8	1/18/2006	7 to 8	2.4	20
S9S-8	3/28/2006	6 to 8	8.8	--
S9S-10	3/28/2006	8 to 10	13	--
S12-15	1/31/2006	13 to 15	<8.2	--
S13-16	3/14/2006	15.5 to 16	**88**	--
S16-12	2/21/2006	10 to 12	4.9	--
S15S-16	3/8/2006	15.5 to 16	**34**	--
S17N-7	3/23/2006	5 to 7	2.0	--
S17SE-9	3/23/2006	8.5 to 9	16	--
T4-4	2/21/2006	2 to 4	2.6	--
T4-8	2/21/2006	6 to 8	9.0	--
T4-12	2/21/2006	10 to 12	2.8	--
T6-12	2/21/2006	10 to 12	2.9	--
T7-9	4/13/2006	8.5 to 9	13	--
T8-14	2/21/2006	12 to 14	11	--
T8SW-16	4/20/2006	15.5 to 16	4.8	--
T9NE-8	3/28/2006	6 to 8	14	--
T9NE-10	3/28/2006	8 to 10	8.2	--
T9SE-8	4/18/2006	6 to 8	6.5	--
T10S-8	4/18/2006	6 to 8	5.1	--
T15-4	3/23/2006	2 to 4	2.5	--
T15-8	3/23/2006	6 to 8	2.5	--
T15W-8	3/29/2006	6 to 8	15	--
T17-12	2/21/2006	10 to 12	3.9	--
T18-14	3/7/2006	12 to 14	3.8	--
T18N-4	3/21/2006	2 to 4	1.1	--
T18N-8	3/21/2006	6 to 8	1.3	--
U5-4	2/21/2006	2 to 4	7.6	--
U5-8	2/21/2006	6 to 8	4.8	--
U5-12	2/21/2006	10 to 12	12	--
U5E-11	4/18/2006	9 to 11	10	--
U6W-7	4/20/2006	5 to 7	5.1	--
U7-8	3/7/2006	6 to 8	15	--
U7-12	3/7/2006	10 to 12	3.9	--
U8-9	4/18/2006	8.5 to 9	13	--
U9-13	4/18/2006	12.5 to 13	1.2	--
U12-13	3/17/2006	12.5 to 13	18	--
U13-14	3/7/2006	12 to 14	5.1	--
U14-13	3/17/2006	12.5 to 13	12	--
U15-4	3/7/2006	2 to 4	1.1	--
U15-8	3/7/2006	6 to 8	12	--
U15-12	3/7/2006	10 to 12	2.9	--
U15SE-4	3/23/2006	2 to 4	2.5	--
U15SE-8	3/23/2006	6 to 8	7.0	--

			Concentration in mg/kg	
Sample Name	Sample Date	Depth Interval in Feet	Arsenic	Zinc
U16NW-4	3/21/2006	2 to 4	2.2	--
U16NW-8	3/21/2006	6 to 8	5.6	--
U17-12	3/7/2006	10 to 12	7	--
U17N-4	3/21/2006	2 to 4	3.7	--
U17N-8	3/21/2006	6 to 8	15	--
U18E-4	3/21/2006	2 to 4	1.8	--
U18E-8	3/21/2006	6 to 8	1.3	--
V7-7	4/18/2006	5 to 7	10	--
V8-12	3/6/2006	10 to 12	10	--
V8-14	3/6/2006	12 to 14	<9.1	--
V8-9	4/18/2006	8.5 to 9	6.2	--
V8-7	4/20/2006	5 to 7	6.7	--
V9S-7	4/19/2006	5 to 7	12	--
V9S-11	4/19/2006	9 to 11	10	--
V10-14	3/6/2006	12 to 14	12	--
V12-14	3/6/2006	12 to 14	12	--
V14-14	3/7/2006	12 to 14	4.0	--
V15-7	4/7/2006	5 to 7	19	--
V15S-9	3/31/2006	8.5 to 9	12	--
V16-4	3/7/2006	2 to 4	2.4	--
V16-8	3/7/2006	6 to 8	7.5	--
V16-12	3/7/2006	10 to 12	5.9	--
V18-4	3/7/2006	2 to 4	5.9	--
V18-8	3/7/2006	6 to 8	3	--
V18-12	3/7/2006	10 to 12	2.5	--
W8-7	4/18/2006	5 to 7	12	--
W9NW-7	4/19/2006	5 to 7	9.1	--
W9NW-11	4/19/2006	9 to 11	11	--
W10S-13	4/19/2006	12.5 to 13	2.4	--
W11E-16	4/13/2006	15.5 to 16	15	--
W12-16	3/31/2006	15.5 to 16	16	--
W13W-16	4/7/2006	15.5 to 16	**22**	--
W15N-4	3/31/2006	2 to 4	6.3	--
W15N-8	3/31/2006	6 to 8	8.1	--
W17-4	3/7/2006	2 to 4	2.7	--
W17-8	3/7/2006	6 to 8	10	--
W17-12	3/7/2006	10 to 12	2	--
X10SW-7	4/21/2006	5 to 7	2.0	--
X10SW-11	4/21/2006	9 to 11	5.8	--
X11E-7	4/10/2006	5 to 7	4.6	--
X11E-11	4/10/2006	9 to 11	10	--
X11S-13	4/19/2006	12.5 to 13	1.7	--
X12-14	3/6/2006	12 to 14	11	--
X12SW-4	3/31/2006	2 to 4	3.3	--
X15S-11	4/7/2006	10.5 to 11	3.8	--
X16E-4	4/3/2006	2 to 4	1.9	--
X16E-8	4/3/2006	6 to 8	11	--
X16W-9	4/3/2006	8.5 to 9	1.9	--
Y9-4	3/7/2006	2 to 4	1.9	--
Y9-8	3/7/2006	6 to 8	3.4	--
Y9-12	3/7/2006	10 to 12	<6.9	--
Y12NW-4	3/31/2006	2 to 4	3.6	--
Y12NW-8	3/31/2006	6 to 8	18	--
Y14-16	4/12/2006	15.5 to 16	17	--
Y15SW-9	4/3/2006	8.5 to 9	6	--
Y16-2	1/17/2006	1.5 to 2	3.0	36
Y16-9	4/4/2006	8.5 to 9	2.3	--
Y17-9	4/4/2006	8.5 to 9	16	--
Y17-7	4/7/2006	5 to 7	9.8	--
Y18-2	1/17/2006	1.5 to 2	1.2	32
Y18-4	1/17/2006	3.5 to 4	2.1	37

			Concentration in mg/kg	
Sample Name	**Sample Date**	**Depth Interval in Feet**	**Arsenic**	**Zinc**
Y18W-7	4/4/2006	5 to 7	3.7	--
Z13S-7	4/7/2006	5 to 7	2.9	--
Z13S-9	4/7/2006	7 to 9	13	--
Z13S-11	4/7/2006	10.5 to 11	16	--
Z15-9	4/4/2006	8.5 to 9	0.93	--
Z17-12	3/6/2006	10 to 12	6.7	--
Z17-14	3/6/2006	12 to 14	<8.1	--
Z17W-7	4/4/2006	5 to 7	5.2	--
Z18-9	4/4/2006	8.5 to 9	12	--
Z18N-7	4/4/2006	5 to 7	3.3	--
AA13-2	1/17/2006	1.5 to 2	2.0	33
AA13-Peat	1/17/2006	5.5 to 6	2.4	1,000
AA16-12	3/6/2006	10 to 12	<9.1	--
AA16-14	3/6/2006	12 to 14	<8.2	--
AA17-2	1/17/2006	1.5 to 2	1.2	25
AA17-5	1/17/2006	4.5 to 5	16	25
AA18NW-7	4/12/2006	5 to 7	1.6	--
BB14E-9	4/19/2006	8.5 to 9	6.2	--
BB14W-7	4/21/2006	5 to 7	2.3	--
BB16E-7	4/12/2006	5 to 7	6.3	--

Total Number of Samples	352	90

ATTACHMENT I8

Data from Construction Report, Barbee Mill TPH and PCP Remediation, Aspect, 2006f

Table 1 - Summary of Analytical Results for East TPH Area Confirmation Samples

			Concentration in mg/kg							
Sample Name	**Sample Date**	**Sample Depth in Feet**	**Benzene**	**Toluene**	**Ethylbenzene**	**m,p-Xylene**	**o-Xylene**	**Gasoline-Range Petroleum Hydrocarbons**	**Diesel-Range Petroleum Hydrocarbons**	**Oil-Range Petroleum Hydrocarbons**
Test Pit Investigation Results by Others										
TP-3 UST BF	4/21/2006	2.5	0.02 U	0.03	0.1	0.31	(see note 2)	13	--	--
TP-3 SB	4/21/2006	5.5	0.02 U	0.02 U	0.02 U	0.06 U	(see note 2)	2 U	--	--
TP-3 7'	4/21/2006	7	0.02 U	0.02 U	0.02 U	0.06 U	(see note 2)	2 U	--	--
TP3-E 5'	4/21/2006	5	0.02 U	0.02 U	0.02 U	0.06 U	(see note 2)	2 U	--	--
TP3-E 8'	4/21/2006	8	0.02 U	0.02 U	0.02 U	0.06 U	(see note 2)	2 U	--	--
Confirmation Sample Results										
HSE-C-1	4/21/2006	4	0.02 U	0.039 U	0.039 U	0.039 U	0.039 U	3.9 U	27 U	54 U
HSE-C-2	4/21/2006	4	0.02 U	0.039 U	0.039 U	0.039 U	0.039 U	3.9 U	32 U	63 U
HSE-C-3	4/21/2006	4	0.02 U	0.043 U	0.043 U	0.043 U	0.043 U	4.3 U	31 U	62 U
HSE-C-4	4/21/2006	4	0.02 U	0.043 U	0.043 U	0.043 U	0.043 U	8.2 Z	27 U	54 U
HSE-C-5	4/21/2006	7	0.02 U	0.064 U	0.064 U	0.064 U	0.064 U	6.4 U	160	64 U
Site Cleanup Level (1)			*34.5 DC*	*7*	*6*	*9*	*9*	*30*	*2000*	*2000*

Notes:
Diesel- and oil-range petroleum hydrocarbons analyzed by Ecology Method NWTPH-Dx
Gasoline-range petroleum hydrocarbons analyzed by Ecology Method NWTPH-G
BTEX analyzed by EPA Method 8021B
U = analyte not detected at indicated detection limit
Z = signature not characteristic of gasoline - detection impacted by presence of diesel-range petroleum hydrocarbons
(1) Site Cleanup Level identified in IRAP (Hart Crowser 2000) based on MTCA Method A or B Cleanup Level for Unrestricted Use.
(2) total xylenes reported under m,p-Xylene
DC = cleanup level based on direct contact because no groundwater exceedences observed at site.

Table 2 - Summary of Analytical Results for West TPH Area Investigation and Confirmation Samples

			Concentration in mg/kg	
Sample Name	**Sample Date**	**Sample Depth in Feet**	**Diesel-Range Petroleum Hydrocarbons**	**Oil-Range Petroleum Hydrocarbons**
Test Pit Investigation Results by Others				
TP-1-3'	1/19/2006	3	4,800	250 U
TP-1-4'	1/19/2006	4	84	250 U
TP-1-6'	1/19/2006	6	50 U	250 U
Test Pit Investigation Results				
TP-1E-2	3/9/2006	2	29 U	59 U
TP-1E-4	3/9/2006	4	39 U	78 U
TP-1N-3	3/9/2006	3	28 U	56 U
TP-1S-3	3/9/2006	3	28 U	57 U
TP-1W-3	3/9/2006	3	30 U	60 U
Confirmation Sample Results				
HSE-A-1	4/18/2006	2 to 4	30 U	110
HSE-A-2	4/18/2006	2 to 4	28 U	56 U
HSE-A-3	4/18/2006	2 to 4	28 U	57 U
HSE-A-4	4/18/2006	2 to 4	28 U	57 U
HSE-A-5	4/18/2006	5	34 U	68 U
Site Cleanup Level (1)			*2000*	*2000*

Notes:
Petroleum hydrocarbons analyzed by Ecology Method NWTPH-Dx
U = analyte not detected at indicated detection limit
(1) Site Cleanup Level identified in IRAP (Hart Crowser 2000) based on MTCA Method A Cleanup Level for Unrestricted Use

Table 3 - Summary of Analytical Results for PCP Area Investigation and Confirmation Samples

			Concentration in mg/kg
Sample Name	**Sample Date**	**Sample Depth in Feet**	**Pentachlorophenol**
Test Pit Investigation Results (by Others)			
TP-4-3'	1/19/2006	3	1.2
TP-4-5'	1/19/2006	5	0.3 U
TP-4-SL	1/19/2006	1.5 to 2	17
Test Pit Investigation Results			
TP-4E-S-1	3/9/2006	1.5 to 2	0.0033
TP-4E-S-2	3/9/2006	1.5 to 2	0.0011 U
TP-4S-2	3/9/2006	1.5 to 2	0.21
TP-4S2-2	3/9/2006	1.5 to 2	0.0099
TP-4W-2	3/9/2006	1.5 to 2	0.0015 U
TP-4N-2	3/9/2006	1.5 to 2	0.0011 U
TP-4N2-2	3/9/2006	1.5 to 2	0.0011 U
Overexcavated Confirmation Sample Results			
HSE-B-1	4/18/2006	1.5 to 2.5	13
HSE-B-2	4/18/2006	1.5 to 2.5	34
HSE-B-7	4/24/2006	1.5 to 2.5	220
Confirmation Sample Results			
HSE-B-3	4/18/2006	1.5 to 2.5	0.19
HSE-B-4	4/18/2006	1.5 to 2.5	2.4
HSE-B-5	4/18/2006	3	2.3
HSE-B-6	4/24/2006	1.5 to 2.5	0.035
HSE-B-8	4/28/2006	1.5 to 2.5	0.0029
HSE-B-9	4/28/2006	4	0.0012 U
HSE-B-10	4/28/2006	1.5 to 2.5	1.4
Site Cleanup Level (1)			*8.3 DC*

Notes:
Pentachlorophenol analyzed by EPA Method 8151A
U = analyte not detected at indicated detection limit
(1) Site Cleanup Level identified in IRAP (Hart Crowser 2000) based on MTCA Method B Cleanup Level for Unrestri
DC = cleanup level based on direct contact because no groundwater exceedences observed at site.

ATTACHMENT I9

Data from Engineering Design Report, Barbee Mill Groundwater Remediation, Aspect, 2006g

Table 1 - Summary of Post-Excavation Groundwater Monitoring Results

Location	Sample Depth in feet	Sample Date	Dissolved Arsenic Concentration in mg/L [(1)]
Monitoring Wells			
HCMW-01S	3.5 to 8.5	5/18/06	0.55
		6/23/06	1.5
		7/3/06	5.2
		7/7/06	3.8
		7/9/06	1.1
		7/14/06	2.2
		7/19/06	4.3
HCMW-01D	15 to 20	5/18/06	0.091
		6/23/06	0.92
		7/7/06	0.70
		7/19/06	1.70
RMW-01	3 to 8	5/18/06	0.15
		6/23/06	0.14
		7/19/06	0.11
RMW-02	3 to 8	5/18/06	0.015
		6/23/06	0.016
RMW-05	3 to 8	5/18/06	0.0019
Direct-Push Borings - Wall Alignment			
AZ-1	6 to 9	6/29/06	0.0074
	11 to 14	6/6/06	0.006
AZ-2	5 to 8	6/29/06	0.14
	13 to 16	7/6/06	0.025
	18 to 21	6/29/06	0.0089
	27 to 30	6/29/06	0.015
AZ-3	7 to 10	5/23/06	0.12
	18 to 21	5/23/06	0.052
	24 to 27	5/23/06	0.011
	29 to 32	5/23/06	0.016
AZ-4	10 to 13	5/23/06	0.033
	18 to 21	5/23/06	0.0088
	25 to 28	5/23/06	0.0063
	32 to 35	5/23/06	0.0079
AZ-5	8 to 11	5/23/06	0.75
	19.5 to 22.5	5/23/06	0.0033
	27 to 30	5/23/06	0.0047
	33 to 36	5/23/06	0.0039
AZ-9	7 to 10	6/5/06	0.023
	19 to 22	6/6/06	0.0063
	25 to 28	6/6/06	0.015
	33 to 36	6/6/06	0.10
AZ-10	3 to 6	6/29/06	0.03
	12 to 15	6/6/06	0.007
	19 to 22	6/6/06	0.0061
	23 to 26	6/6/06	0.009
	29 to 32	6/6/06	0.006
AZ-11	5 to 8	6/23/06	2.9
	19 to 22	6/23/06	0.0048
AZ-12	6 to 9	6/29/06	0.0055
AZ-13	18 to 21	7/3/06	0.0067

Table 1 - Summary of Post-Excavation Groundwater Monitoring Results

Location	Sample Depth in feet	Sample Date	Dissolved Arsenic Concentration in mg/L [(1)]
AZ-14	5 to 8	6/29/06	0.12
	33 to 36	6/29/06	0.0051
AZ-15	18 to 21	7/3/06	0.02
AZ-16	5 to 8	7/19/06	0.031
AZ-17	5 to 8	7/3/06	0.0071
	13 to 16	7/3/06	0.025
AZ-18	18 to 21	7/19/06	0.25
AZ-19	18 to 21	7/19/06	0.025
AZ-20	5 to 8	7/19/06	0.27
AZ-21	5 to 8	7/19/06	0.0031
Direct-Push Borings - Upland			
EC-1	5 to 8	7/3/06	4.8
EC-2	5 to 8	7/3/06	32
EC-3	5 to 8	7/3/06	0.51
EC-4	5 to 8	7/3/06	3.8
EC-5	5 to 8	7/3/06	0.38
EC-6	5 to 8	7/3/06	0.23
EC-7	5 to 8	7/3/06	0.012
EC-8	5 to 8	7/19/06	0.075
EC-9	5 to 8	7/19/06	0.014
EC-10	5 to 8	7/19/06	0.0042
EC-11	9 to 12	7/19/06	0.53
EC-12	5 to 8	7/19/06	0.048
	11 to 14	7/19/06	15
Direct-Push Borings - Quendall Terminals			
AZ-6	10 to 13	6/5/06	2.0
	16.5 to 19.5	6/5/06	4.5
	23 to 26	6/5/06	0.0044
	28 to 31	6/5/06	0.0031
AZ-7	10 to 13	5/24/06	0.011
	18 to 21	5/24/06	0.018
	27 to 30	5/24/06	0.0071
	33 to 36	5/24/06	0.002
AZ-8	10 to 13	6/5/06	0.069
	19 to 22	6/5/06	0.0063
Pore Water Samples			
PW-N	0.3	7/3/06 to 7/19/06	0.0017
PW-M	0.3	7/3/06 to 7/19/06	0.0015
PW-S	0.3	7/3/06 to 7/19/06	0.02

Notes:

[(1)] field filtered with a 0.45-micron filter

U not detected at indicated detection limit

Samples analyzed for arsenic by EPA Method 6020

ATTACHMENT I10

Data from Passive Attenuation Zone Pilot Test Results, Barbee Mill Arsenic Remediation Project, Aspect, 2006h

Table 2 - Summary of Analytical Results for Groundwater and Porewater

Barbee Mill - Renton, Washington

		Field Parameters						Dissolved Metal Concentrations in ug/L			
Monitoring Point	Date	pH	Temp in Celsius	Conductivity in uS	Dissolved Oxygen in mg/L	Eh in mV	Alkalinity in mg/L	Arsenic	Iron	Copper	Lead
Pilot Well/PMW-3	9/29/2006	**6.3**	**19.5**	**296**	**1.10**	**-172**	**130**	**140**	**26,000**	**1 U**	**1 U**
	11/3/2006	6.5	17.8	249	0.67	-156	88	32	12,000	1 U	1 U
	12/1/2006	6.6	12.4	270	0.49	-- (1)	100	12	7,400	1 U	1 U
PMW-1	11/3/2006	6.8	16.7	333	0.97	-100	140	7.0	13,000	1 U	1 U
	12/1/2006	7.2	11.4	328	0.55	-- (1)	190	7.7	17,000	1 U	1 U
PMW-2	11/3/2006	6.8	17.7	405	0.48	-124	160	8.0	17,000	1 U	1 U
	12/1/2006	6.8	12.1	384	0.31	-- (1)	160	11	18,000	1 U	1 U
WP-7	10/6/2006	**6.0**	**16.9**	**287**	**0.22**	**-5**	**140**	**36**	**4,400**	--	--
	11/3/2006	6.2	12.7	282	0.94	-2	190	12	4,800	--	--
	12/1/2006	6.4	8.3	331	0.76	-- (1)	58	3	56 U	--	--
WP-6	9/29/2006	**6.3**	**18.6**	**312**	**0.65**	**-65**	**170**	**100**	**25,000**	**1 U**	**1 U**
	11/3/2006	6.4	14.5	366	0.91	-89	130	81	24,000	1 U	1 U
	12/1/2006	6.3	8.5	404	0.49	-- (1)	170	84	26,000	1 U	1 U
PW-WP-6	9/29/2006	--	--	--	--	--	--	**1.5**	**56 U**	--	--
PW-WP-6 (Dup)	9/29/2006	--	--	--	--	--	--	**3.1**	**59**	--	--
	11/3/2006	--	--	--	--	--	--	1 U	56 U	--	--
	12/1/2006	--	--	--	--	--	--	1 U	56 U	--	--

Notes:

U not detected at indicated reporting limit

-- not analyzed

(1) not reported because instrument did not pass calibration

bold indicates baseline sampling data

ATTACHMENT I11

Data from Data Gaps Report, Aspect, 2018

Table 1 - Summary of Soil Analytical Results

Project No. 050004-010-04, 4101 Lake Washington Blvd N, Renton, WA

Upland Boring	Depth (bgs)	Arsenic (mg/kg)
B-06	4 - 4.5 ft	**5.3**
B-06	7.5 - 8 ft	**1.9**
B-06	12 - 12.5 ft	**3.6**
B-06	16 - 16.5 ft	**1.4**
B-06	19.5 - 20 ft	**4.5**
B-06	24 - 24.5 ft	**2.7**
B-06	27.5 - 28 ft	**3.1**
B-07	3.5 - 4 ft	**2.4**
B-07	7.5 - 8 ft	**1.9**
B-07	12 - 12.5 ft	**2.5**
B-07	16.5 - 17 ft	**2.6**
B-07	21.5 - 22 ft	**2**
B-07	24 - 24.5 ft	**3.1**
B-07	27.5 - 28 ft	**3.3**
B-08	2.5 - 3 ft	**1.9**
B-08	7.5 - 8 ft	**4.3**
B-08	11.5 - 12 ft	**3.4**
B-08	16 - 16.5 ft	**3.7**
B-08	19.5 - 20 ft	**10**
B-08	23.5 - 24 ft	**5.7**
B-08	28 - 28.5 ft	**4**
B-09	4.5 - 5 ft	**2.3**
B-09	7.5 - 8 ft	**5.4**
B-09	11.5 - 12 ft	**4.8**
B-09	16 - 16.5 ft	**4.6**
B-09	19.5 - 20 ft	**4.2**
B-09	24 - 24.5 ft	**4.3**
B-09	29.5 - 30 ft	**2.5**
AB-10	4.5 - 5 ft	**2.8**
AB-10	7 - 7.5 ft	**7.8**
AB-10	11.5 - 12 ft	**4.6**
AB-10	14.5 - 15 ft	**4.5**
AB-10	19 - 20 ft	**2.7**
AB-10	24.5 - 25 ft	**1.1**
AB-10	28 - 28.5 ft	**2.5**
B-11	4 - 4.5 ft	**3.6**
B-11	7.5 - 8 ft	**4**
B-11	11.5 - 12 ft	**2.1**
B-11	16 - 16.5 ft	**3.3**
B-11	20 - 20.5 ft	**3.4**
B-11	24 - 24.5 ft	**1.4**
B-11	25.5 - 26 ft	**6.5**
B-11	28 - 28.5 ft	**3.1**
B-12	3.5 - 4 ft	**3.7**
B-12	7.5 - 8 ft	**5.7**
B-12	11.5 - 12 ft	**1.3**
B-12	16 - 16.5 ft	**1.5**
B-12	19.5 - 20 ft	**2.4**
B-12	23 - 23.5 ft	**3.7**
B-12	24.5 - 25 ft	**0.99**

Upland Boring	Depth (bgs)	Arsenic (mg/kg)
B-13	3.5 - 4 ft	**4.8**
B-13	7.5 - 8 ft	**3.2**
B-13	13 - 13.5 ft	**3.7**
B-13	16 - 16.5 ft	**3.8**
B-13	19.5 - 20 ft	**3.4**
B-13	23.5 - 24 ft	**2**
B-13	27 - 27.5 ft	**1.6**
B-14	4 - 4.5 ft	**1.2**
B-14	7.5 - 8 ft	**1.2**
B-14	12 - 12.5 ft	**2.3**
B-14	16.5 - 17 ft	**1.9**
B-14	20 - 20.5 ft	**2.7**
B-14	24 - 24.5 ft	**5.2**
B-14	27.5 - 28 ft	**2.2**
B-14	30 - 30.5 ft	**1.4**
B-15	4 - 4.5 ft	**6.2**
B-15	8.5 - 9 ft	**1.3**
B-15	12 - 12.5 ft	**1.1**
B-15	16 - 16.5 ft	**1.8**
B-15	20 - 20.5 ft	**4.8**
B-15	24 - 24.5 ft	**2.8**
B-15	28 - 28.5 ft	**2.5**
B-15	30.5 - 31 ft	**2**

Offshore Boring	Depth (bls)	Arsenic (mg/kg)
B-01	12 - 13 ft	**3.9**
B-01	19 - 20 ft	**2.7**
B-01	23 - 24 ft	**1.3**
B-02	21 - 22 ft	**1.8**
B-02	26 - 27 ft	**1.2**
B-03	8 - 9 ft	**2.3**
B-03	9 - 11 ft	**1.8**
B-03	25 - 26 ft	**1.6**
B-04	18 - 19 ft	**3.2**
B-04	20 - 21 ft	**5.1**
B-04	24 - 25 ft	**1.7**
B-05	16 - 17 ft	**4.3**
B-05	21 - 22 ft	**1.5**
B-05	26 - 26.5 ft	**1**

Notes:

Values shown are total arsenic results by EPA Method 6020B.

All units are mg/kg.

Bold values indicate arsenic detection.

Highlighted cells indicate exceedance of 20 mg/kg CUL.

bgs = below ground surface

bls = below lake surface

Table 2 - Summary of Temporary Groundwater Analytical Results

Project No. 050004-010-04, 4101 Lake Washington Blvd N, Renton, WA

	Onshore											
Depth (bgs)	B-06	B-07	B-08	B-09	AB-10	B-11	B-12	B-13	B-14	B-15	B-16	B-17
8 ft	3 U	**12**	NC	NC	**71**	NC	3 U	**4.8**	NC	**4.6**	NC	NC
12 ft	**27**	**68**	**160**	**17**	**97**	**10**	**14**	**13**	**64**	**5.4**	NC	**34**
16 ft	**46**	**43**	**150**	**32**	**210**	**14**	3 U	**28**	**60**	3 U	NC	**68**
20 ft	**78**	**24**	**150**	**170**	**220**	**24**	3 U	**19**	3 U	3 U	NC	**15**
24 ft	**6.7**	**3.5**	**180**	**700**	**40**	**19**	3 U	3 U	NC	**38**	NC	NC
28 ft	**3.7**	**8.1**	3 U	**22**	3 U	3 U	**31**	**3.6**	**9.4**	**78**	**20**	NC
32 ft	NC	NC	**7.9**	3 U	NC	**4.4**	NC	NC	**10**	**84**	**33**	NC
36 ft	NC	NC	NC	NC	NC	NC	NC	NC	NC	**41**	NC	NC
40 ft	NC	NC	NC	NC	NC	NC	NC	NC	NC	**36**	NC	NC

	Offshore				
Depth (bls)	B-01	B-02	B-03	B-04	B-05
18 ft	NC	NC	NC	NC	**8.5**
19 ft	**1.7**	**1.5**	1 U	**3.1**	NC
23 ft	**5.1**	1 U	**1.1**	**6.4**	**3.4**
27 ft	**4.4**	**2.6**	**4.4**	**6.2**	**1.8**

	Offshore Well Points	
Depth (bss)	TWP-1	TWP-2
4 ft	**49**	**26**

Notes:

Values shown are dissolved arsenic results by EPA Method 6020B.

All units are ug/L.

Bold values indicate arsenic detection.

Highlighted cells indicate exceedance of 20 ug/L CUL.

NC = not collected.

bgs = below ground surface

bls = below lake surface

bss = below sediment surface

U - Analyte was not detected at or above the reported result.

Depths shown are the bottom of a 4-5 ft screen.

Samples were collected midscreen.

ATTACHMENT I12

Data from Remedial Investigation Data Gaps Report, Aspect and Geosyntec, 2023

Table 1. March 2021 Groundwater Quality Data - RI Data Gaps

Project No. 050004, Barbee Mill, Renton, Washington

FINAL

				Location	CMW-1	CMW-2S	CMW-2D	CMW-3	CMW-4S	CMW-4D	CMW-5	CMW-6
				Date	03/18/2021	03/18/2021	03/18/2021	03/18/2021	03/18/2021	03/18/2021	03/19/2021	03/19/2021
				Sample	CMW-1-031821	CMW-2S-031821	CMW-2D-031821	CMW-3-031821	CMW-4S-031821	CMW-4D-031821	CMW-5-031921	CMW-6-031921
Analyte	**CAS_RN**	**Fraction**	**Unit**	**Preliminary Screening Levels (ug/L)**								
Total Metals	**Metals**	**Metals**										
Antimony	7440-36-0	T	ug/L	5.6	< 5.6 U	< 5.6 U	--	--	< 5.6 U	--	--	< 5.6 U
Arsenic	7440-38-2	T	ug/L	16	**72**	**3.6**	**220**	< 3.3 U	**68**	**250**	< 3.3 U	**140**
Barium	7440-39-3	T	ug/L	1000	**44**	**43**	--	--	< 28 U	--	--	**32**
Mercury	7439-97-6	T	ug/L	0.012	< 0.13 U	< 0.13 U	--	--	< 0.13 U	--	--	< 0.13 U
Selenium	7782-49-2	T	ug/L	5	< 3.3 U	< 3.3 U	--	--	< 3.3 U	--	--	< 3.3 U
Dissolved Metals	**Metals**	**Metals**										
Antimony	7440-36-0	D	ug/L	5.6	< 5.0 U	< 5.0 U	--	--	< 5.0 U	--	--	< 5.0 U
Arsenic	7440-38-2	D	ug/L	16	**64**	**3.3**	**220**	< 3.0 U	**62**	**260**	< 3.0 U	**140**
Barium	7440-39-3	D	ug/L	1000	**38**	**39**	--	--	< 25 U	--	--	**27**
Iron	7439-89-6	D	ug/L	300	**33000**	**65000**	**3200**	**33000**	**8800**	**9000**	**35000**	**14000**
Manganese	7439-96-5	D	ug/L	50	**1800**	**1400**	--	--	**800**	--	--	**1800**
Mercury	7439-97-6	D	ug/L	0.012	< 0.13 U	< 0.13 U	--	--	< 0.13 U	--	--	< 0.13 U
Selenium	7782-49-2	D	ug/L	5	< 3.3 U	< 3.3 U	--	--	< 3.3 U	--	--	< 3.3 U
Zinc	7440-66-6	D	ug/L	105	< 25 U	< 25 U	--	--	< 25 U	--	--	< 25 U
PAHs	**PAHs**	**PAHs**										
1-Methylnaphthalene	90-12-0	N	ug/L	1.51	< 0.10 U	< 0.10 U	--	--	< 0.10 U	--	--	< 0.10 U
2-Methylnaphthalene	91-57-6	N	ug/L	32	< 0.10 U	< 0.10 U	--	--	< 0.10 U	--	--	< 0.10 U
Acenaphthene	83-32-9	N	ug/L	20	< 0.10 U	< 0.10 U	--	--	< 0.10 U	--	--	< 0.10 U
Acenaphthylene	208-96-8	N	ug/L		< 0.10 U	< 0.10 U	--	--	< 0.10 U	--	--	< 0.10 U
Anthracene	120-12-7	N	ug/L	100	< 0.10 U	< 0.10 U	--	--	< 0.10 U	--	--	< 0.10 U
Benzo(g,h,i)perylene	191-24-2	N	ug/L		< 0.010 U	< 0.010 U	--	--	< 0.010 U	--	--	< 0.010 U
Fluoranthene	206-44-0	N	ug/L	0.020	< 0.10 U	< 0.10 U	--	--	< 0.10 U	--	--	< 0.10 U
Fluorene	86-73-7	N	ug/L	10	< 0.10 U	< 0.10 U	--	--	< 0.10 U	--	--	< 0.10 U
Naphthalene	91-20-3	N	ug/L	8.92	< 0.10 U	< 0.10 U	--	--	< 0.10 U	--	--	< 0.10 U
Phenanthrene	85-01-8	N	ug/L		< 0.10 U	< 0.10 U	--	--	< 0.10 U	--	--	< 0.10 U
Pyrene	129-00-0	N	ug/L	0.015	< 0.10 U	< 0.10 U	--	--	< 0.10 U	--	--	< 0.10 U
Benz(a)anthracene	56-55-3	N	ug/L	0.00016	< 0.010 U	< 0.010 U	--	--	< 0.010 U	--	--	< 0.010 U
Benzo(a)pyrene	50-32-8	N	ug/L	1.60E-05	< 0.010 U	< 0.010 U	--	--	< 0.010 U	--	--	< 0.010 U
Benzo(b)fluoranthene	205-99-2	N	ug/L	0.00016	< 0.010 U	< 0.010 U	--	--	< 0.010 U	--	--	< 0.010 U
Benzo(j,k)fluoranthene	Benz-jk-fluor	N	ug/L		< 0.010 U	< 0.010 U	--	--	< 0.010 U	--	--	< 0.010 U
Chrysene	218-01-9	N	ug/L	0.0045	< 0.010 U	< 0.010 U	--	--	< 0.010 U	--	--	< 0.010 U
Dibenzo(a,h)anthracene	53-70-3	N	ug/L	1.60E-05	< 0.010 U	< 0.010 U	--	--	< 0.010 U	--	--	< 0.010 U
Indeno(1,2,3-cd)pyrene	193-39-5	N	ug/L	0.00016	< 0.010 U	< 0.010 U	--	--	< 0.010 U	--	--	< 0.010 U
Total cPAHs TEQ (ND = 1/2 RDL)	T-cPAH-1/2U	N	ug/L	0.0043	< 0.00755 U	< 0.00755 U	--	--	< 0.00755 U	--	--	< 0.00755 U

Notes:

Highlighted orange cells indicate exceedance of screening levels

Highlighted blue cells indicate non-detect exceedance of screening levels

Table 1. March 2021 Groundwater Quality Data - RI Data Gaps

FINAL

Project No. 050004, Barbee Mill, Renton, Washington

				Location	EW-1	EW-2	EW-3	EW-4	EW-5	EW-6	EW-7	EW-8	WP-8	WP-1A	BH-29A
				Date	03/19/2021	03/19/2021	03/19/2021	03/19/2021	03/19/2021	03/19/2021	03/19/2021	03/19/2021	03/18/2021	03/18/2021	03/18/2021
				Sample	EW-1-031921	EW-2-031921	EW-3-031921	EW-4-031921	EW-5-031921	EW-6-031921	EW-7-031921	EW-8-031921	WP-8-031821	WP-1A-031821	BH-29A-031821
Analyte	**CAS_RN**	**Fraction**	**Unit**	**Preliminary Screening Levels (ug/L)**											
Total Metals	**Metals**	**Metals**													
Antimony	7440-36-0	T	ug/L	5.6	--	< 5.6 U	--	< 5.6 U	--	< 5.6 U	--	< 5.6 U	--	--	--
Arsenic	7440-38-2	T	ug/L	16	**130**	**200**	**210**	**130**	**58**	**100**	**12**	**450**	**240**	< 3.3 U	**140**
Barium	7440-39-3	T	ug/L	1000	--	**34**	--	**29**	--	< 28 U	--	**30**	--	--	--
Mercury	7439-97-6	T	ug/L	0.012	--	< 0.13 U	--	< 0.13 U	--	< 0.13 U	--	< 0.13 U	--	--	--
Selenium	7782-49-2	T	ug/L	5	--	< 3.3 U	--	< 3.3 U	--	< 3.3 U	--	< 3.3 U	--	--	--
Dissolved Metals	**Metals**	**Metals**													
Antimony	7440-36-0	D	ug/L	5.6	--	< 5.0 U	--	< 5.0 U	--	< 5.0 U	--	< 5.0 U	--	--	--
Arsenic	7440-38-2	D	ug/L	16	**100**	**170**	**190**	**110**	**37**	**56**	**4.7**	**380**	**240**	< 3.0 U	**150**
Barium	7440-39-3	D	ug/L	1000	--	< 25 U	--	< 25 U	--	< 25 U	--	< 25 U	--	--	--
Iron	7439-89-6	D	ug/L	300	**15000**	**23000**	**19000**	**8200**	**3400**	**6400**	**150**	**13000**	**12000**	**86**	**19000**
Manganese	7439-96-5	D	ug/L	50	--	**1200**	--	**1400**	--	**940**	--	**1700**	--	--	--
Mercury	7439-97-6	D	ug/L	0.012	--	< 0.13 U	--	< 0.13 U	--	< 0.13 U	--	< 0.13 U	--	--	--
Selenium	7782-49-2	D	ug/L	5	--	< 3.3 U	--	< 3.3 U	--	< 3.3 U	--	< 3.3 U	--	--	--
Zinc	7440-66-6	D	ug/L	105	--	< 25 U	--	< 25 U	--	< 25 U	--	< 25 U	--	--	--
PAHs	**PAHs**	**PAHs**													
1-Methylnaphthalene	90-12-0	N	ug/L	1.51	--	< 0.10 U	--	< 0.10 U	--	< 0.10 U	--	< 0.11 U	--	--	--
2-Methylnaphthalene	91-57-6	N	ug/L	32	--	< 0.10 U	--	< 0.10 U	--	< 0.10 U	--	< 0.11 U	--	--	--
Acenaphthene	83-32-9	N	ug/L	20	--	< 0.10 U	--	< 0.10 U	--	< 0.10 U	--	**0.33**	--	--	--
Acenaphthylene	208-96-8	N	ug/L		--	< 0.10 U	--	< 0.10 U	--	< 0.10 U	--	< 0.11 U	--	--	--
Anthracene	120-12-7	N	ug/L	100	--	< 0.10 U	--	< 0.10 U	--	< 0.10 U	--	**0.14**	--	--	--
Benzo(g,h,i)perylene	191-24-2	N	ug/L		--	< 0.010 U	--	< 0.010 U	--	< 0.010 U	--	< 0.011 U	--	--	--
Fluoranthene	206-44-0	N	ug/L	0.020	--	< 0.10 U	--	< 0.10 U	--	< 0.10 U	--	**0.37**	--	--	--
Fluorene	86-73-7	N	ug/L	10	--	< 0.10 U	--	< 0.10 U	--	< 0.10 U	--	**0.16**	--	--	--
Naphthalene	91-20-3	N	ug/L	8.92	--	< 0.10 U	--	< 0.10 U	--	< 0.10 U	--	< 0.11 U	--	--	--
Phenanthrene	85-01-8	N	ug/L		--	< 0.10 U	--	< 0.10 U	--	< 0.10 U	--	**0.51**	--	--	--
Pyrene	129-00-0	N	ug/L	0.015	--	< 0.10 U	--	< 0.10 U	--	< 0.10 U	--	**0.38**	--	--	--
Benz(a)anthracene	56-55-3	N	ug/L	0.00016	--	< 0.010 U	--	< 0.010 U	--	< 0.010 U	--	**0.037**	--	--	--
Benzo(a)pyrene	50-32-8	N	ug/L	1.60E-05	--	< 0.010 U	--	< 0.010 U	--	< 0.010 U	--	< 0.011 U	--	--	--
Benzo(b)fluoranthene	205-99-2	N	ug/L	0.00016	--	< 0.010 U	--	< 0.010 U	--	< 0.010 U	--	**0.012**	--	--	--
Benzo(j,k)fluoranthene	Benz-jk-fluor	N	ug/L		--	< 0.010 U	--	< 0.010 U	--	< 0.010 U	--	< 0.011 U	--	--	--
Chrysene	218-01-9	N	ug/L	0.0045	--	< 0.010 U	--	< 0.010 U	--	< 0.010 U	--	**0.032**	--	--	--
Dibenzo(a,h)anthracene	53-70-3	N	ug/L	1.60E-05	--	< 0.010 U	--	< 0.010 U	--	< 0.010 U	--	< 0.011 U	--	--	--
Indeno(1,2,3-cd)pyrene	193-39-5	N	ug/L	0.00016	--	< 0.010 U	--	< 0.010 U	--	< 0.010 U	--	< 0.011 U	--	--	--
Total cPAHs TEQ (ND = 1/2 RDL)	T-cPAH-1/2U	N	ug/L	0.0043	--	< 0.00755 U	--	< 0.00755 U	--	< 0.00755 U	--	**0.01237**	--	--	--

Notes:

Highlighted orange cells indicate exceedance of screening levels

Highlighted blue cells indicate non-detect exceedance of screening levels

ATTACHMENT I13

Data from Annual Progress Report and Performance Monitoring Report, Aspect, 2023

Table 1. Summary of Water Level and Chemical Data

Project No. 050004, Barbee Mill, Renton, WA

Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Concentration in µg/L						Concentration in mg/L
					Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
		Cleanup Level/Performance Standard (See Note 2)			*16*	*105*	*2.1*	*11*	*0.5*	*0.5*	*75*
Performance Monitoring Wells											
CMW-1	22.75	*7/19/2006*			*31*						26
		8/30/2007	4.63	18.12	33						27
		5/5/2009	3.58	19.17	37				0.27 U	0.43 U	42
		9/8/2009	4.61	18.14	53				0.25 U	0.41 U	41
		12/23/2009	5.36	17.39	39				0.26 U	0.41 U	39
		3/18/2010	4.45	18.30	49				0.26 U	0.41 U	48
		6/21/2010	3.55	19.20	40						58
		9/14/2010	4.57	18.18	45						42
		12/23/2010	4.99	17.76	48						33
		3/10/2011			43						32
		6/13/2011	3.53	19.22	47						34
		9/28/2011	4.73	18.02	56						31
		12/8/2011	5.19	17.56	51						31
		3/6/2012	4.79	17.96	46						32
		6/26/2012	3.36	19.39	40						33
		12/13/2012	4.88	17.87	47						29
		6/20/2013	3.74	19.01	47						42
		1/15/2014	5.16	17.59	45						31
		6/25/2014	3.41	19.34	48						36
		12/10/2014	4.78	17.97	54						36
		6/12/2015	4.02	18.73	47						33
		12/29/2015	4.93	17.82	58						45
		1/22/2016	4.66	18.09							
		6/8/2016	3.72	19.03	45						43
		12/29/2016	4.95	17.80	62						32
		12/28/2017	4.39	18.36	60						34
		12/27/2018	4.94	17.81	67						35
		12/30/2019	5.03	17.72	63						41
		3/18/2021	4.33	18.42	64	25 U					33
		1/6/2022	4.3	18.45	70						33
		1/5/2023	4.68	18.07	64						31
CMW-2S	22.27	*5/23/2006*			*120*						
		8/30/2007	4.32	17.95	4.1		1 U	1 U			1.4
		5/5/2009	3.28	18.99	1.7	5 U	1 U	1 U			0.63
		9/8/2009	4.52	17.75	2.1	6.3	1 U	1 U			1.9
		12/23/2009	5.11	17.16	2.1	5 U	1 U	1 U			3.1
		3/19/2010	4.10	18.17	2.6	5 U	1 U	1 U			1.8
		6/21/2010	3.28	18.99	2						1.8
		9/14/2010	4.42	17.85	2.1						1.4
		12/23/2010	4.95	17.32	1.6						2.4
		3/10/2011	4.29	17.98	1.3						7.3
		6/13/2011	3.24	19.03	3.2						14
		9/28/2011	4.65		2.3						8.7
		12/8/2011	5.08	17.19	1.9						12
		3/6/2012	4.75	17.52	1.6						20
		6/26/2012	3.12	19.15	2.3						32
		12/13/2012	5.01	17.26	2.2						28
		6/20/2013	3.46	18.81	2.1						39
		1/15/2014	5.02	17.25	1.5						28
		6/25/2014	3.24	19.03	2						39
		12/10/2014	5.02	17.25	1						31
		6/12/2015	3.8	18.47	1.5						39
		12/29/2015	5.03	17.24	1.2						53
		1/22/2016	7.53	14.74							
		6/8/2016	3.53	18.74	1.2						66
		12/29/2016	5.01	17.26	1.4						52
		12/28/2017	5.03	17.24	1.4						52
		12/27/2018	5.05	17.22	1.3						46
		12/30/2019	5.13	17.14	1.3						53
		3/18/2021	4.2	18.07	3.3	25 U					65
		1/6/2022	4.77	17.50	6.3						68
		1/5/2023	5	17.27	5.2						52
CMW-2D	22.20	*7/19/2006*			*250*						
		8/30/2007	3.99	18.21	33		1 U	1 U			9.2
		4/30/2009	3.29	18.91	92	14	1 U	1 U			4.5
		9/8/2009	4.20	18.00	92	8.8	1 U	1 U			4.2
		12/23/2009	4.81	17.39	92	12	1 U	1 U			3.4
		3/19/2010	3.79	18.41	89	5 U	1 U	1 U			3.4
		6/21/2010	3.02	19.18	74						3.1
		9/14/2010	4.13	18.07	78						3.1
		12/23/2010	4.56	17.64	98						3.3
		3/11/2011	3.93	18.27	99						3.2
		6/13/2011	2.94	19.26	90						3.2
		9/28/2011	4.32	17.88	89						2.7
		12/8/2011	4.71	17.49	110						3.0
		3/6/2012	4.37	17.83	120						3.1
		6/26/2012	2.80	19.40	120						3.3
		12/13/2012	4.59	17.61	150						3.5
		6/20/2013	3.18	19.02	160						3.2
		1/15/2014	4.72	17.48	140						2.9
		6/25/2014	2.94	19.26	140						3.0
		12/10/2014	4.66	17.54	140						2.0
		6/12/2015	3.48	18.72	170						2.0
		12/29/2015	16.61	5.59	190						3.7
		1/22/2016	16.67	5.53							
		6/8/2016	3.52	18.68	170						3.5
		12/29/2016	4.59	17.61	170						3.5
		12/28/2017	4.6	17.60	190						3.4
		12/27/2018	4.64	17.56	190						3.3
		12/30/2019	4.77	17.43	200						3.4
		3/18/2021	3.92	18.28	220						3.2
		1/6/2022	3.99	18.21	200						3.9
		1/5/2023	4.46	17.74	170						4
CMW-3	22.41	*7/19/2006*			*110*						90 [3]
		8/30/2007	3.78	18.63	1.3		1 U	1 U			2.9
		4/30/2009	2.32	20.09	1 U	5 U	1 U	1 U			0.11
		9/8/2009	4.02	18.39	1.1	5 U	1 U	1 U			0.086
		12/22/2009	4.02	18.39	1 U	5 U	1 U	1 U			0.23
		3/19/2010	3.61	18.80	1 U	5 U	1 U	1 U			0.2
		6/21/2010	2.77	19.64	1 U						0.26
		9/14/2010	4.01	18.40	1 U						0.2
		12/23/2010	3.80	18.61	1 U						0.29
		3/11/2011	3.23	19.18	1 U						3.2
		6/13/2011	2.10	20.31	1 U						0.53
		9/28/2011	4.00	18.41	2						0.6
		12/8/2011	4.24	18.17	1 U						1.2
		3/6/2012	3.93	18.48	1 U						3.7
		6/26/2012	2.42	19.99	1 U						1.5
		12/13/2012	3.75	18.66	1 U						1.4
		6/20/2013	2.81	19.60	1						2.8
		1/15/2014	4.23	18.18	1.3						5
		6/25/2014	2.6	19.81	1.5						7.5
		12/10/2014	3.87	18.54	1.5						15
		6/12/2015	3.33	19.08	1.5						8.5
		12/29/2015	7.45	14.96	1.6						25
		1/22/2016	7.49	14.92							
		6/8/2016	3.13	19.28	1.4						14
		12/29/2016	3.98	18.43	1.8						27
		12/28/2017	4.04	18.37	1.6						26
		12/27/2018	4.11	18.30	1.3						26
		12/30/2019	4.23	18.18	1.6						26
		3/18/2021	3.52	18.89	3.0 U						33
		1/6/2022	2.96	19.45	1.6						46
		1/5/2023	3.51	18.90	1.1						47

Table 1. Summary of Water Level and Chemical Data

Project No. 050004, Barbee Mill, Renton, WA

Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Concentration in µg/L						Concentration in mg/L
					Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
		Cleanup Level/Performance Standard (See Note 2)			*16*	*105*	*2.1*	*11*	*0.5*	*0.5*	*75*
Performance Monitoring Wells (Continued)											
CMW-4S	27.44	*7/19/2006*			*4300*						50
		8/30/2007	9.40	18.04	510		1 U	1 U			28
		4/30/2009	8.11	19.33	180	5 U	1 U	1 U			12
		9/8/2009	9.57	17.87	230	5 U	1 U	1 U			8
		12/22/2009	9.82	17.62	210	5 U	1 U	1 U			17
		3/19/2010	9.03	18.41	230	5 U	1 U	1 U			17
		6/21/2010	8.36	19.08	200						11
		9/27/2010	9.47	17.97	200						9.2
		12/23/2010	9.69	17.75	190						17
		3/11/2011	9.05	18.39	140						23
		6/13/2011	8.24	19.20	140						11
		9/28/2011	9.64	17.80	170						7.9
		12/8/2011	10	17.44	160						5.6
		3/6/2012	9.55	17.89	130						17
		6/26/2012	8.09	19.35	120						9.8
		12/13/2012	9.58	17.86	120						15
		6/20/2013	8.47	18.97	110						7.9
		1/15/2014	9.79	17.65	25						16
		6/25/2014	8.22	19.22	110						11
		12/10/2014	9.52	17.92	120						15
		6/12/2015	8.78	18.66	110						8.3
		12/29/2015	11.72	15.72	100						24
		1/22/2016	9.06	18.38							
		6/8/2016	8.5	18.94	89						12
		12/29/2016	9.63	17.81	99						17
		12/28/2017	9.78	17.66	86						11
		12/27/2018	9.79	17.65	83						11
		12/30/2019	9.84	17.60	79						13
		3/18/2021	9.04	18.40	62	25 U					88
		1/6/2022	8.89	18.55	93						2.9
		1/5/2023	9.35	18.09	58						12
CMW-4D	27.92	*2/15/2007*			*3400*						13
		8/30/2007	9.51	18.41	1700		1 U	1 U			10
		4/30/2009	8.20	19.72	1400	5 U	1 U	1 U			6
		9/8/2009	9.71	18.21	420	5 U	1 U	1 U			2
		12/22/2009	10.16	17.76	1700	5 U	1 U	1 U			9
		3/19/2010	9.17	18.75	910	5 U	1 U	1 U			6.1
		6/21/2010	8.56	19.36	740						4.7
		9/27/2010	9.61	18.31	320						2.1
		12/23/2010	9.77	18.15	1000						8.8
		3/11/2011	9.23	18.69	910						5.8
		6/13/2011	8.33	19.59	580						4.5
		9/28/2011	9.72	18.20	490						3.5
		12/8/2011	10.04	17.88	660						19
		3/6/2012	9.72	18.20	640						5
		6/26/2012	8.14	19.78	510						4.5
	27.59 [7]	12/13/2012	9.39	18.20	570						6.1
		6/20/2013	8.19	19.40	370						4.1
		1/15/2014	9.60	17.99	610						7.2
		6/25/2014	7.95	19.64	340						5.4
		12/10/2014	9.43	18.16	530						6.9
		6/12/2015	8.54	19.05	300						4
		12/29/2015	9.35	18.24	460						7.2
		1/22/2016	9.29	18.30							
		6/8/2016	8.24	19.35	320						5.9
		12/29/2016	9.42	18.17	400						6.9
		12/28/2017	9.46	18.13	340						6
		12/27/2018	9.45	18.14	300						7.2
		12/30/2019	9.57	18.02	280						9.2
		3/18/2021	8.76	18.83	260						9.0
		1/6/2022	8.78	18.81	250						10
		1/5/2023	9.13	18.46	230						7.7
CMW-5	31.07	*6/23/2006*			*2900*						
		8/30/2007	12.32	18.75	22		1 U	1 U			1.8
		5/5/2009	10.87	20.20	6	5 U	1 U	1 U			1.8
		9/8/2009	12.72	18.35	7.8	5 U	1 U	1 U			0.069
		12/22/2009	12.56	18.51	18	5 U	1.4	1 U			5.8
		3/18/2010	12.03	19.04	7	9.5	1 U	1 U			2.2
		6/21/2010	11.34	19.73	9.3						1.7
		9/27/2010	12.65	18.42	7.9						0.056 U
		12/27/2010	12.09	18.98	6.9						0.99
		3/11/2011	11.67	19.40	8.8						5.2
		6/14/2011	11.02	20.05	5.1						0.37
		9/29/2011	12.43	18.64	6.2						0.17
		12/9/2011	12.62	18.45	5.3						0.092
		3/7/2012	12.1	18.97	4.1						8.7
		6/26/2012	10.66	20.41	3.4						15
		12/13/2012	11.85	19.22	3.4						23
		6/21/2013	11.26	19.81	2.4						30
		1/14/2014	12.27	18.80	3.3						29
		6/26/2014	11.08	19.99	1.8						37
		12/10/2014	11.93	19.14	2.3						38
		6/12/2015	11.69	19.38	2.1						33
		12/30/2015	11.86	19.21	2.4						39
		1/22/2016	11.59	19.48							
		6/8/2016	11.23	19.84	1.6						43
		12/28/2016	12.01	19.06	1.6						27
		12/28/2017	12.17	18.90	1.6						27
		12/27/2018	12.21	18.86	1.2						33
		12/30/2019	12.17	18.90	1.5						34
		3/19/2021	11.76	19.31	3.0 U						35
		1/6/2022	10.81	20.26	1.0 U						28
		1/5/2023	11.35	19.72	2						17
CMW-6	31.03	*6/5/2006*			*23*						
		8/30/2007	11.61	19.42	110						25
		5/1/2009	9.70	21.33	210						21
		9/8/2009	12.17	18.86	210						17
		12/23/2009	11.63	19.40	220						16
		3/18/2010	11.28	19.75	230						18
		6/21/2010	13.36	17.67	200						17
		9/15/2010	12.19	18.84	210						16
		12/27/2010	10.79	20.24	240						22
		3/11/2011	10.56	20.47	180						17
		6/14/2011	10.10	20.93	210						17
		9/29/2011	11.47	19.56	200						16
		12/9/2011	11.42	19.61	200						19
		3/7/2012	10.87	20.16	170						20
		6/26/2012	11.57	19.46	150						18
		12/13/2012	10.35	20.68	170						14
		6/21/2013	13.85	17.18	150						12
		1/15/2014	11.04	19.99	180						15
		6/26/2014	14.03	17.00	110						12
		12/10/2014	10.58	20.45	170						14
		6/11/2015	10.83	20.20	120						12
		12/30/2015	12.24	18.79	160						11
		1/22/2016	10.85	20.18							
		6/8/2016	10.36	20.67	110						10
		12/28/2016	10.62	20.41	150						13
		12/28/2017	10.00	21.03	150						11
		12/27/2018	10.82	20.21	130						11
		12/30/2019	12.95	18.08	140						12
		3/19/2021	10.55	20.48	140	25 U					14
		1/6/2022	8.43	22.60	150						14
		1/5/2023	9.58	21.45	140						8.5

Table 1. Summary of Water Level and Chemical Data

Project No. 050004, Barbee Mill, Renton, WA

Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Concentration in µg/L						Concentration in mg/L
					Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
		Cleanup Level/Performance Standard (See Note 2)			*16*	*105*	*2.1*	*11*	*0.5*	*0.5*	*75*
Performance Monitoring Wells (Continued)											
WP-1A		*8/10/2005*			*2,490*						
		5/1/2009			430						20
		9/9/2009			52						7.2
		12/22/2009			110						17
		3/18/2010			550						43
		6/22/2010			330						19
		9/14/2010			48						4.3
		12/27/2010			210						28
		3/11/2011			25						3.9
		6/13/2011			270						20
		9/28/2011			NM (6)						NM (6)
		12/8/2011			21						2.6
		3/6/2012			34						1.9
		6/26/2012			480						37
		1/22/2013[8]			71						5.2
		6/20/2013			60						4.5
		1/14/2014			5.7						1.6
		6/25/2014			45						2.3
		12/10/2014			6.7						2.7
		6/11/2015			19						0.48
		12/29/2015			38						3.4
		6/8/2016			5.2						0.067
		12/29/2016			6.5						23
		12/28/2017			15						6
		12/27/2018			17						9.1
		12/30/2019			10						3.2
		3/18/2021			3.0 U						0.086
		1/6/2022			7.8						2.0
		1/5/2023			3.9						0.51
WP-8		5/1/2009			680						11
		9/9/2009			490						9.5
		12/22/2009			450						18
		3/18/2010			550						13
		6/22/2010			430						8.4
		9/14/2010			560						13
		12/27/2010			610						19
		3/11/2011			490						18
		6/13/2011			480						15
		9/28/2011			NM (6)						
		12/8/2011			420						19
		3/6/2012			490						22
		6/26/2012			480						25
		1/22/2013[8]			360						24
		6/20/2013			390						24
		1/14/2014			350						22
		6/25/2014			360						23
		12/10/2014			400						21
		6/11/2015			370						19
		12/29/2015			250						20
		6/8/2016			270						16
		12/29/2016			300						17
		12/28/2017			170						17
		12/27/2018			230						13
		1/25/2019			240						14
		12/30/2019			210						14
		3/18/2021			240						12
		1/6/2022			180						14
		1/5/2023			140						11
Extraction Wells											
EW-1	26.81	6/3/2009			41				0.26 U	0.42 U	14
		9/9/2009	6.86	19.95	63				0.25 U	0.4 U	12
		12/23/2009	10.12	16.69	110				0.26 U	0.41 U	22
		3/18/2010	7.08	19.73	130				0.25 U	0.4 U	23
		6/22/2010	5.76	21.05	180						12
		9/15/2010	6.93	19.88	200						17
		12/27/2010	6.74	20.07	120						18
		3/11/2011	6.51	20.30	130						16
		6/14/2011	5.80	21.01	150						16
		9/29/2011	6.67	20.14	110						15
		12/9/2011	7.19	19.62	110						17
		3/6/2012	6.82	19.99	71						17
		6/26/2012	5.54	21.27	76						17
		12/14/2012	6.62	20.19	70						22
		6/21/2013	6.11	20.70	100						18
		1/14/2014	7.19	19.62	74						17
		6/26/2014	5.81	21.00	80						19
		12/10/2014	6.72	20.09	92						20
		6/11/2015	6.40	20.41	110						17
		12/30/2015	6.73	20.08	88						21
		1/22/2016	6.41	20.40							
		6/9/2016	6.09	20.72	90						18
		12/29/2016	6.85	19.96	73						17
		12/28/2017	6.74	20.07	71						14
		12/27/2018	6.90	19.91	73						14
		12/30/2019	6.90	19.91	74						15
		3/19/2021	6.46	20.35	100						15
		1/6/2022	5.37	21.44	60						22
		1/5/2023	6.05	20.76	68						17
EW-2	26.67	6/3/2009			12						4.2
		9/9/2009	6.88	19.79	100						12
		12/23/2009	10.71	15.96	140						19
		3/18/2010	7.33	19.34	290						39
		6/22/2010	5.88	20.79	150						13
		9/15/2010	7.13	19.54	190						20
		12/27/2010	6.87	19.80	180						17
		3/11/2011	6.56	20.11	31						5.2
		6/14/2011	5.83	20.84	130						17
		9/29/2011	6.79	19.88	45						8.2
		12/9/2011	7.30	19.37	170						22
		3/6/2012	6.89	19.78	67						11
		6/26/2012	5.54	21.13	57						10
		12/14/2012	6.75	19.92	110						17
		6/21/2013	6.21	20.46	120						18
		1/14/2014	7.32	19.35	150						18
		6/26/2014	5.88	20.79	130						17
		12/9/2014	6.83	19.84	210						25
		6/11/2015	6.51	20.16	190						21
		12/30/2015	6.84	19.83	190						22
		1/22/2016	6.46	20.21							
		6/9/2016	6.05	20.62	180						24
		12/29/2016	6.97	19.70	160						20
		12/28/2017	6.82	19.85	110						13
		12/27/2018	7.02	19.65	150						18
		12/30/2019	7.01	19.66	160						24
		3/19/2021	6.61	20.06	170	25 U					23
		1/6/2022	5.35	21.32	50						7.2
		1/5/2023	6.04	20.63	120						12

Table 1. Summary of Water Level and Chemical Data

Project No. 050004, Barbee Mill, Renton, WA

Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Concentration in µg/L						Concentration in mg/L
					Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
				Cleanup Level/Performance Standard (See Note 2)	*16*	*105*	*2.1*	*11*	*0.5*	*0.5*	*75*
Extraction Wells (Continued)											
EW-3	26.77	6/3/2009			51				0.27 U	0.42 U	24
		9/9/2009	7.67	19.10	150				0.25 U	0.4 U	26
		12/23/2009	7.11	19.66	130				0.26 U	0.41 U	21
		3/18/2010	8.14	18.63	1900				0.26 U	0.41 U	91 (4)
		6/22/2010	6.67	20.10	97						19
		9/15/2010	7.92	18.85	7.7						16
		12/27/2010	7.56	19.21	130						17
		3/11/2011	7.25	19.52	23						4.7
		6/14/2011	6.57	20.20	140						20
		9/29/2011	7.60	19.17	27						9.6
		12/9/2011	8.00	18.77	180						25
		3/7/2012	7.65	19.12	190						25
		6/26/2012	6.18	20.59	130						19
		12/14/2012	7.44	19.33	200						25
		6/20/2013	6.90	19.87	200						21
		1/14/2014	7.96	18.81	180						19
		6/26/2014	6.63	20.14	160						20
		12/9/2014	7.52	19.25	250						22
		6/11/2015	7.21	19.56	210						18
		12/30/2015	7.53	19.24	260						22
		1/22/2016	7.14	19.63							
		6/8/2016	6.88	19.89	200						20
		12/29/2016	7.62	19.15	240						20
		12/28/2017	7.54	19.23	240						21
		12/27/2018	7.68	19.09	92						14
		12/30/2019	7.68	19.09	220						24
		3/19/2021	7.30	19.47	190						19
		1/6/2022	5.94	20.83	59						6.0
		1/5/2023	6.63	20.14	11						0.6
EW-4	27.65	9/9/2009	8.38	19.27	14						0.056 U
		12/23/2009	8.37	19.28	10						0.056 U
		3/18/2010	7.88	19.77	11						0.056 U
		6/22/2010	6.67	20.98	13						0.056 U
		9/15/2010	8.34	19.31	76						0.056 U
		12/27/2010	7.34	20.31	26						0.056 U
		3/11/2011			27						0.056 U
		6/14/2011	6.48	21.17	12						0.056 U
		9/29/2011	7.64	20.01	25						0.38
		12/9/2011	7.89	19.76	12						0.22
		3/7/2012	7.39	20.26	5.7						0.056 U
		6/26/2012	5.95	21.70	6.8						0.056 U
		12/14/2012	6.94	20.71	3.4						0.12
		6/20/2013	6.81	20.84	11						0.86
		1/14/2014	7.77	19.88	61						7
		6/26/2014	6.52	21.13	12						1.7
		12/9/2014	7.32	20.33	160						88
		6/11/2015	7.19	20.46	13						2.4
		12/30/2015	6.12	21.53	35						43
		1/22/2016	6.56	21.09							
		6/8/2016	6.67	20.98	14						3
		12/29/2016	7.24	20.41	23						4.4
		12/28/2017	7.31	20.34	31						3.5
		12/27/2018	7.45	20.20	32						3.3
		12/30/2019	7.43	20.22	81						9.1
		3/19/2021	7.26	20.39	110	25 U					8.2
		1/6/2022	4.48	23.17	52						7.0
		1/5/2023	6.32	21.33	41						4.8
EW-5	28.34	6/3/2009			61						1.3
		9/9/2009	8.05	20.29	39						1.9
		12/23/2009	8.98	19.36	44						1.6
		3/18/2010	8.36	19.98	84						73
		6/22/2010	7.28	21.06	62						0.61
		9/15/2010	9.24	19.10	29						2.3
		12/27/2010	7.86	20.48	55						0.58
		3/11/2011	7.74	20.60	70						1.3
		6/14/2011	6.99	21.35	260						85
		9/29/2011	8.34	20.00	1400						140
		12/9/2011	8.28	20.06	520						29
		3/6/2012	7.79	20.55	250						8.5
		6/26/2012	6.50	21.84	220						6.2
		12/14/2012	7.14	21.20	220						6.8
		6/21/2013	7.34	21.00	160						4.5
		1/14/2014	8.01	20.33	97						4.1
		6/26/2014	7.02	21.32	140						4.9
		12/9/2014	7.53	20.81	130						5.7
		6/11/2015	7.69	20.65	160						6.1
		12/30/2015	6.95	21.39	160						5.5
		1/22/2016	6.42	21.92							
		6/9/2016	6.89	21.45	85						4
		12/29/2016	7.35	20.99	81						4.1
		12/28/2017	7.40	20.94	86						4.5
		12/27/2018	7.47	20.87	24						2.4
		12/30/2019	7.28	21.06	110						7.5
		3/19/2021	7.36	20.98	37						3.4
		1/7/2022	4.51	23.83	17						1.9
		1/5/2023	5.98	22.36	30						1.2
EW-6	28.61	6/3/2009			140						2.7
		9/9/2009	11.15	17.46	360						7.8
		12/23/2009	9.25	19.36	230						2.7
		3/18/2010	8.62	19.99	1900						52
		6/22/2010	7.97	20.64	190						36
		9/15/2010	11.31	17.30	180						4.5
		12/27/2010	8.12	20.49	170						2.6
		3/11/2011	8.06	20.55	64						1.5
		6/14/2011	7.23	21.38	390						15
		9/29/2011	8.56	20.05	500						10
		12/9/2011	8.50	20.11	190						4.9
		3/6/2012	8.02	20.59	200						6.4
		6/26/2012	6.74	21.87	170						8.1
		12/14/2012	7.37	21.24	110						4.9
		6/21/2013	7.56	21.05	140						6.8
		1/14/2014	8.24	20.37	81						4.3
		6/26/2014	7.25	21.36	120						7.6
		12/9/2014	7.81	20.80	150						8.8
		6/11/2015	7.93	20.68	150						7.5
		12/30/2015	7.19	21.42	130						6.5
		1/22/2016	6.67	21.94							
		6/9/2016	7.21	21.40	100						6
		12/29/2016	7.58	21.03	110						6.6
		12/28/2017	7.64	20.97	92						6.9
		12/27/2018	7.75	20.86	91						6.3
		12/30/2019	7.52	21.09	69						6.0
		3/19/2021	7.62	20.99	56	25 U					6.4
		1/6/2022	4.77	23.84	65						8.0
		1/5/2023	6.28	22.33	38						3.8

Table 1. Summary of Water Level and Chemical Data

Project No. 050004, Barbee Mill, Renton, WA

Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Concentration in µg/L						Concentration in mg/L
					Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
Cleanup Level/Performance Standard (See Note 2)					*16*	*105*	*2.1*	*11*	*0.5*	*0.5*	*75*
Extraction Wells (Continued)											
EW-7	28.66	6/3/2009			110						2.5
		9/9/2009	9.61	19.05	300						6
		12/23/2009	9.32	19.34	350						7.6
		3/18/2010	8.65	20.01	260						7.9
		6/22/2010	7.64	21.02	200						7
		9/15/2010	9.63	19.03	830						8.7
		12/27/2010	8.19	20.47	240						6.9
		3/11/2011	8.07	20.59	130						8.5
		6/14/2011	7.30	21.36	410						18
		9/29/2011	8.65	20.01	320						11
		12/9/2011	8.61	20.05	180						8.3
		3/6/2012	8.13	20.53	81						3.8
		6/26/2012	6.81	21.85	150						8.4
		12/14/2012	7.46	21.20	36						1.6
		6/21/2013	7.63	21.03	100						4.7
		1/14/2014	8.32	20.34	41						2.6
		6/26/2014	7.34	21.32	150						7.6
		12/9/2014	7.92	20.74	76						5.8
		6/11/2015	8.01	20.65	170						8.2
		12/30/2015	7.28	21.38	35						1.8
		1/22/2016	6.74	21.92							
		6/9/2016	7.25	21.41	43						3
		12/29/2016	7.68	20.98	31						1.9
		12/28/2017	7.72	20.94	16						0.96
		12/27/2018	7.79	20.87	22						1.3
		12/30/2019	7.59	21.07	26						1.8
		3/19/2021	7.71	20.95	4.7						0.2
		1/6/2022	4.86	23.80	8.1						3.6
		1/5/2023	6.30	22.36	8.4						0.11
EW-8	28.88	6/3/2009			560						21
		9/9/2009	10.11	18.77	750						16
		12/23/2009	10.36	18.52	610						16
		3/18/2010	9.37	19.51	280						7.7
		6/22/2010	8.49	20.39	360						14
		9/15/2010	9.93 [3]	18.95	290						15
		12/27/2010	9.16	19.72	810						20
		3/11/2011	8.95	19.93	670						20
		6/14/2011	8.24	20.64	460						20
		9/29/2011	9.54	19.34	490						17
		12/9/2011	9.74	19.14	530						19
		3/6/2012	9.28	19.60	510						22
		6/26/2012	8.00	20.88	370						22
		12/14/2012	8.84	20.04	470						19
		6/21/2013	8.59	20.29	380						20
		1/14/2014	9.55	19.33	540						20
		6/26/2014	8.35	20.53	390						20
		12/9/2014	9.12	19.76	550						19
		6/11/2015	8.99	19.89	440						18
		12/30/2015	8.97	19.91	550						17
		1/22/2016	8.61	20.27							
		6/9/2016	8.51	20.37	420						18
		12/29/2016	9.17	19.71	450						16
		12/28/2017	9.28	19.60	390						15
		12/27/2018	9.38	19.50	390						14
		12/30/2019	9.28	19.60	390						16
		3/19/2021	9.03	19.85	380	25 U					13
		1/6/2022	7.45	21.43	350						13
		1/5/2023	8.31	20.57	240						7.5
Piezometers											
PZ-1	27.78	5/5/2009	6.59	21.19							
		9/9/2009	7.39	20.39							
		12/23/2009	7.17	20.61							
		3/18/2010	6.72	21.06							
		6/22/2010	5.80	21.98							
		9/13/2010	8.11	19.67							
		12/27/2010	7.31	20.47							
		3/11/2011	6.98	20.80							
		6/14/2011	7.07	20.71							
		9/29/2011	7.86	19.92							
		12/9/2011	7.85	19.93							
		3/6/2012	7.63	20.15							
		6/26/2012	6.85	20.93							
		12/13/2012	7.10	20.68							
		6/20/2013	7.30	20.48							
		1/14/2014	7.81	19.97							
		6/25/2014	6.87	20.91							
		12/10/2014									
		6/11/2015	7.46	20.32							
		12/29/2015	14.96	12.82							
		1/22/2016	14.33	13.45							
		6/8/2016	7.26	20.52							
		12/28/2016	7.63	20.15							
		12/28/2017	7.59	20.19							
		12/27/2018	7.61	20.17							
		12/30/2019	7.51	20.27							
		3/18/2021	7.34	20.44							
		1/6/2022	6.18	21.60							
		1/5/2023	6.92	20.86							
PZ-2	27.87	5/5/2009	5.76	22.11							
		9/9/2009	8.17	19.70							
		12/23/2009	7.74	20.13							
		3/18/2010	7.30	20.57							
		6/22/2010	6.41	21.46							
		9/13/2010	8.11	19.76							
		12/27/2010	6.89	20.98							
		3/11/2011									
		6/14/2011	6.24	21.63							
		9/29/2011	7.45	20.42							
		12/9/2011	7.45	20.42							
		3/6/2012	6.96	20.91							
		6/26/2012	6.83	21.04							
		12/13/2012	6.45	21.42							
		6/20/2013	6.58	21.29							
		1/14/2014	7.20	20.67							
		6/25/2014	6.32	21.55							
		12/10/2014									
		6/11/2015	6.74	21.13							
		12/29/2015	14.69	13.18							
		1/22/2016	14.70	13.17							
		6/8/2016	6.28	21.59							
		12/28/2016	6.60	21.27							
		12/28/2017	6.72	21.15							
		12/27/2018	6.85	21.02							
		12/30/2019	6.56	21.31							
		3/18/2021	7.20	20.67							
		1/6/2022	4.69	23.18							
		1/5/2023	5.40	22.47							

Table 1. Summary of Water Level and Chemical Data

Project No. 050004, Barbee Mill, Renton, WA

Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Concentration in µg/L						Concentration in mg/L
					Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
				Cleanup Level/Performance Standard (See Note 2)	*16*	*105*	*2.1*	*11*	*0.5*	*0.5*	*75*
Porewater Stations											
PW-CMW-2		*7/1/2006*			*1.5*						
		2/16/2007			3.1						4.9
		9/21/2007									4.8
		5/22/2009			1 U						0.056 U
		10/9/2009			17						9.8
		1/5/2010			1.1						0.1
		3/18/2010			1 U						0.056 U
PW-CMW-3		*7/1/2006*			*1.7*						
		3/12/2007									1.5
		5/22/2009			1 U						0.056 U
		10/9/2009			1.8						0.082
		1/5/2010			1 U						0.063
		3/18/2010			1 U						0.056 U
PW-CMW-4		*9/9/2005*			*1,400*						
		9/21/2007									26
		5/22/2009			2.2						0.056 U
		10/9/2009			2.6						0.12
		1/5/2010			2.3						0.23
		3/18/2010			1.3						0.056 U
PW-Control		2/4/2010			1 U						0.056 U
		3/18/2010			1 U						0.056 U
NS01-C1		6/22/2009			7.4						6.67
WD01-PW		6/18/2009			5.7						3.83
WD02-PW		6/18/2009			3.2						3.11
Quendall Terminals Monitoring Wells											
BH-21A	26.16	9/9/2009	8.11	18.05	5.9						
		12/23/2009	8.69	17.47							
		3/19/2010	7.30	18.86							
		6/22/2010	6.75	19.41							
		9/13/2010	7.79	18.37							
		3/11/2011	7.46	18.70							
		6/14/2011	6.72	19.44							
		9/29/2011	8.15	18.01							
		12/8/2011	8.28	17.88							
		3/6/2012	7.91	18.25							
		6/26/2012	6.64	19.52							
		12/13/2012	7.93	18.23							
		6/20/2013	7.00	19.16							
		1/14/2014	8.18	17.98							
		6/25/2014	6.76	19.40							
		12/10/2014	7.93	18.23							
		6/11/2015	7.34	18.82							
		12/29/2015	7.79	18.37							
		1/22/2016	7.70	18.46							
		6/8/2016	7.06	19.10							
		12/28/2016	7.99	18.17							
		12/28/2017	7.93	18.23							
		12/27/2018	7.94	18.22							
		12/30/2019	8.01	18.15							
		11/19/2020			4.6						60
		3/18/2021	7.43	18.73							
		1/6/2022	7.55	18.61							
		2/9/2022	8.23	17.93							
		1/5/2023	7.67	18.49							
BH-21B	25.88	9/9/2009	6.43	19.45	109						
		12/23/2009	6.63	19.25	77/65.5 [1]						
		3/19/2010	5.72	20.16							
		9/13/2010	6.24	19.64							
		3/11/2011	5.86	20.02							
		6/14/2011	5.07	20.81							
		9/29/2011	6.49	19.39							
		12/8/2011	6.63	19.25							
		3/6/2012	6.26	19.62							
		6/26/2012	5.95	19.93							
		12/13/2012	6.34	19.54							
		6/20/2013	5.36	20.52							
		1/14/2014	6.57	19.31							
		6/25/2014	5.16	20.72							
		12/10/2014	6.40	19.48							
		6/11/2015	5.65	20.23							
		12/29/2015	6.30	19.58							
		1/22/2016	6.27	19.61							
		6/8/2016	5.37	20.51							
		12/28/2016	6.46	19.42							
		12/28/2017	6.40	19.48							
		12/27/2018	6.50	19.38							
		12/30/2019	6.49	19.39							
		11/13/2020			160						7.1
		3/18/2021	5.76	20.12							
		1/6/2022	5.98	19.90							
		2/9/2022	6.41	19.47							
		1/5/2023	6.14	19.74							
BH-26A	28.98	9/9/2009	9.29	19.69	3.8						
		12/23/2009	8.27	20.71							
		3/19/2010	7.88	21.10							
		6/22/2010	7.51	21.47							
		9/13/2010	9.28	19.70							
		3/11/2011	7.25	21.73							
		6/14/2011	7.20	21.78							
		9/29/2011	8.74	20.24							
		12/8/2011	8.28	20.70							
		3/6/2012	7.62	21.36							
		6/26/2012	6.95	22.03							
		12/13/2012	6.98	22.00							
		6/20/2013	7.75	21.23							
		1/14/2014	7.99	20.99							
		6/25/2014	7.46	21.52							
		12/10/2014	7.39	21.59							
		6/11/2015	8.08	20.90							
		12/29/2015	6.56	22.42							
		1/22/2016	6.23	22.75							
		6/8/2016	7.67	21.31							
		12/28/2016	7.21	21.77							
		12/28/2017	7.28	21.70							
		12/27/2018	7.58	21.40							
		12/30/2019	7.20	21.78							
		11/9/2020			15						33
		3/18/2021	7.11	21.87							
		1/6/2022	5.09	23.89							
		2/9/2022	7.26	21.72							
		1/5/2023	5.94	23.04							

Table 1. Summary of Water Level and Chemical Data

Project No. 050004, Barbee Mill, Renton, WA

Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Concentration in µg/L						Concentration in mg/L
					Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
Cleanup Level/Performance Standard (See Note 2)					*16*	*105*	*2.1*	*11*	*0.5*	*0.5*	*75*
Quendall Terminals Monitoring Wells (continued)											
BH-26B	26.62	9/9/2009	6.88	19.74	31.8						
		12/23/2009	6.98	19.64							
		3/19/2010	6.10	20.52							
		6/22/2010	5.47	21.15							
		9/13/2010	6.75	19.87							
		3/11/2011	6.17	20.45							
		6/14/2011	5.44	21.18							
		9/29/2011	6.88	19.74							
		12/8/2011	6.94	19.68							
		3/6/2012	6.56	20.06							
		6/26/2012	5.31	21.31							
		12/13/2012	6.59	20.03							
		6/20/2013	5.76	20.86							
		1/14/2014	6.88	19.74							
		6/25/2014	5.56	21.06							
		12/10/2014	6.64	19.98							
		6/11/2015	6.05	20.57							
		12/29/2015	6.47	20.15							
		1/22/2016	6.39	20.23							
		6/8/2016	5.75	20.87							
		12/28/2016	6.68	19.94							
		12/28/2017	6.63	19.99							
		12/27/2018	6.77	19.85							
		12/30/2019	6.71	19.91							
		11/6/2020			32						17
		3/18/2021	6.06	20.56							
		1/6/2022	5.96	20.66							
		2/9/2022	6.70	19.92							
		1/5/2023	6.23	20.39							
BH-29A	27.64	9/9/2009	9.65	17.99	389						
		12/23/2009	9.91	17.73	400/372 [1]						
		3/19/2010	8.96	18.68							
		6/22/2010	8.29	19.35							
		9/13/2010	9.52	18.12	230						23
		3/11/2011	9.09	18.55							
		6/14/2011	8.17	19.47							
		9/28/2011	9.63	18.01	490						23
		12/8/2011	9.89	17.75							
		3/6/2012	9.53	18.11							
		6/26/2012	8.00	19.64							
		12/13/2012	9.55	18.09	370						19
		6/20/2013	8.44	19.20							
		1/14/2014	9.74	17.90							
		6/25/2014	8.20	19.44	230						21
		12/10/2014	9.56	18.08	260						20
		6/11/2015	8.77	18.87							
		12/29/2015	9.45	18.19	240						18
		1/22/2016	9.39	18.25							
		6/8/2016	8.45	19.19							
		12/28/2016	9.64	18.00	210						18
		12/28/2017	9.67	17.97	200						17
		12/27/2018	9.71	17.93	180						17
		12/30/2019	9.73	17.91	190						19
		11/9/2020			110						17
		3/18/2021	9.05	18.59	150						19
		1/6/2022	8.97	18.67	120						18
		2/9/2022	9.80	17.84							
		1/5/2023	9.31	18.33	150						15
BH-29B	27.8	9/9/2009	8.59	19.21	3						
		12/23/2009	8.80	19.00							
		3/19/2010	7.85	19.95							
		6/22/2010	7.19	20.61							
		9/13/2010	6.42	21.38							
		3/11/2011	8.01	19.79							
		6/14/2011	7.15	20.65							
		9/29/2011	8.58	19.22							
		12/8/2011	8.76	19.04							
		3/6/2012	8.40	19.40							
		6/26/2012	7.00	20.80							
		12/13/2012	8.52	19.28							
		6/20/2013	7.43	20.37							
		1/14/2014	8.70	19.10							
		6/25/2014	7.21	20.59							
		12/10/2014	8.56	19.24							
		6/11/2015	7.73	20.07							
		12/29/2015	8.45	19.35							
		1/22/2016	8.36	19.44							
		6/8/2016	7.42	20.38							
		12/28/2016	8.62	19.18							
		12/28/2017	8.55	19.25							
		12/27/2018	8.62	19.18							
		12/30/2019	8.61	19.19							
		11/9/2020			3						0.14U
		3/18/2021	7.86	19.94							
		1/6/2022	8.01	19.79							
		2/9/2022	8.56	19.24							
		1/5/2023	8.28	19.52							
BH-31B	27.24	9/29/2021	8.59	18.65	16						
		1/6/2022	7.22	20.02	30						
		2/9/2022	7.82	19.42	30						
		1/5/2023	7.47	19.77	12						

Notes

[1] Results from ICP/MS analysis and Arsenic Hydride analysis.

[2] Cleanup levels and performance standards identified in Performance Monitoring Plan (Aspect, in progress) and are based as follows:

Arsenic: Based on site-specific natural background concentration of arsenic in groundwater, as presented in the RI Work Plan (Aspect, 2021).

Zinc: Cleanup level based on current ARARs for fresh water.

TPH: Cleanup level based on MTCA Method A cleanup level for unrestricted use.

Iron: Performance standard is for the PAZ to not significantly elevate natural concentrations, which are naturally elevated due to reducing conditions created by peat deposits in Site soils.

Copper and Lead: Performance standard for PAZ is to not result in exceedance of surface water standard listed in table.

[3] Iron concentrations in samples collected prior to the PAZ being installed are not compared to the performance criteria.

[4] Iron concentrations in samples collected upgradient of the PAZ are not compared to the performance criteria.

[5] Results are for total/dissolved concentrations.

[6] WP-1A and WP-8 were damaged by debris and not sampled during the Sept 2011 monitoring event.

[7] Well casing was trimmed due to well monument subsidence.

[8] Well Points WP-1A and WP-8 were not located during the December 2012 monitoring event and were presumed destroyed. These well points were replaced at the same locations on January 22, 2013.

Data from wells BH-21A, BH-21B, BH-29A, BH-29B, BH-26A, and BH-26B in 2020 were collected by Geosyntec for the Quendall Site.

U = not detected at indicated reporting limit

Bold = data collected during this reporting period

Blue italics indicates baseline sample from location closest to current sample location, as follows:

existing location	baseline location
CMW-1	AZ-16
CMW-2S	AZ-3
CMW-2D	AZ-18
CMW-3	RMW-01
CMW-4S	AZ-5
CMW-4D	HCMW-01D
CMW-5	AZ-11
CMW-6	AZ-9
WP-1A	WP-1B
PW-CMW-2	PW-M
PW-CMW-3	PW-N
PW-CMW-4	PW-WP1B

Highlighted cells indicate exceedance of cleanup levels

APPENDIX J

Barbee Sediment Data Gaps Evaluation (Anchor and Aspect 2010)

MEMORANDUM

To:	Ching Pi Wang, Washington Dept. of Ecology	**Date:**	March 31, 2010
From:	Clay Patmont, Anchor QEA and Jeremy Porter, Aspect Consulting		
cc:	Robert Cugini, Barbee Mill Company. and Lynn Manolopoulos, Davis Wright Tremaine		
Re:	Barbee Sediment Data Gaps Evaluation		

This memorandum evaluates whether there are remaining data gaps that need to be filled to complete sediment characterization at the former Barbee Mill Site in Renton, Washington. Consistent with the requirements of Model Toxics Control Act (MTCA) Agreed Order (AO) No. DE 5396 between the Washington Department of Ecology (Ecology) and the Barbee Mill Company, this memorandum evaluates whether additional investigations are needed to delineate the extent of arsenic in sediment offshore from the northern half of the former Barbee Mill property (currently Conner Homes at Barbee Mill, LLC property) and the southwestern corner of the adjoining Quendall Terminals property). This memorandum includes the following:

- Summary of arsenic occurrences in groundwater, porewater, and sediment at the Barbee Mill Site;
- Conceptual site model of transport and attenuation pathways that may affect arsenic releases into Lake Washington sediments, building on detailed groundwater-surface water transport investigations performed at the Quendall Terminals property; and
- Identification of any remaining data gaps (if any) needed to complete the remedial investigation/feasibility study (RI/FS) of the Barbee Mill Site.

Arsenic Occurrences in Groundwater, Porewater, and Sediment

Arsenic concentrations in upland groundwater, offshore groundwater (at sediment well points typically screened 2 to 4 feet below mudline), and sediment porewater (collected at a depth of 0 to 10 centimeters [cm] below mudline) have been monitored prior to and after implementation of upland remedial actions at the Site. Groundwater and porewater data collected at the Site are summarized in Appendix A. Groundwater and porewater sampling performed during the

design investigation for the passive attenuation zone (PAZ; Aspect 2006) delineated the lateral and vertical extent of arsenic in groundwater exceeding the 20 μg/L site-specific groundwater cleanup level. Exceedances of the groundwater cleanup level along the shoreline extended from boring AZ-16 on the former Barbee Mill property, north to AZ-8 on the Quendall Terminals property (sampling locations and data are provided in Appendix A). Arsenic concentrations exceeding the groundwater cleanup level were detected up to 21 feet below ground surface (bgs) along the western property boundary. To intercept the groundwater arsenic plume, the PAZ was installed along the downgradient boundary of the former Barbee Mill property to a maximum depth of 22 feet bgs.

Groundwater and porewater monitoring continues in accordance with the Ecology-approved Performance Monitoring Plan (Aspect 2010). Data collected at performance monitoring locations both before and after the installation of the PAZ are summarized in Table 1; data from the most recent sampling event (December 2009) are depicted on Figure 1. Based on these data, the effectiveness of the remedial actions in reducing groundwater and porewater arsenic concentrations is summarized in the sections below.

Upland Groundwater. Arsenic concentrations in shallow groundwater downgradient of the PAZ at wells CMW-2 through CMW-5 have declined 95 to 99 percent since the PAZ was installed (Table 1). Arsenic concentrations in deep groundwater, at wells CMW-2D and CMW-4D, have declined 50 to 65 percent following installation of the PAZ.

Concentrations of arsenic in groundwater at the south and east ends of the PAZ (39 μg/L at CMW-1 and 220 μg/L at CMW-6) are currently above the cleanup level of 20 μg/L. However, arsenic concentrations in these areas are anticipated to decrease in the future in response to remedial actions performed in upgradient areas (i.e., the 2005 soil removal and the on-going pump-and-treat system). In accordance with the AO, an updated evaluation of PAZ performance, including an updated evaluation of groundwater restoration time frames, will be performed later in 2010.

Additional data delineating the extent of arsenic in groundwater on the Quendall Terminals property have recently been collected as part of Quendall Terminals RI; these data are included in Table 1 and on Figure 1. Relevant data was collected at three well pairs: BH-21A/B, BH-26 A/B, and BH-29A/B. Each well pair includes a screen in the shallow interval (approximately 10 to 20 feet bgs) and a screen in the underlying deep aquifer interval (approximately 40 to 50 feet

bgs). Arsenic was detected above the 20 µg/L groundwater cleanup level at well BH-29A, which is located within the historic Barbee arsenic plume and downgradient of the PAZ. Arsenic was not detected above the cleanup level in the deeper well screen at this location (BH-29B), corroborating the limited vertical extent of arsenic observed during the earlier design investigation (Aspect 2006). The lateral extent of arsenic exceeding the 20 µg/L cleanup level in shallow groundwater on the Quendall Terminals property is bounded by well BH-26A to the east and BH-21A to the north.

During the Quendall Terminals RI, slightly elevated concentrations of arsenic were detected at the deep interval at Quendall Terminals wells BH-21B and BH-26B. These data are consistent with arsenic concentrations observed in deep groundwater elsewhere on the Quendall Terminals property and, based on the lateral and vertical delineation of arsenic in groundwater on Barbee Mill, do not appear associated with anthropogenic releases at the Barbee Mill Site. Elevated arsenic concentrations detected in these areas are likely naturally occurring, resulting from geochemically reducing conditions at the Site. That is, when reducing conditions occur in groundwater as a result of organic enrichment (e.g., due to wood waste and/or hydrocarbon releases), the more mobile forms of arsenic (As[III]) predominate, and ferric iron, which limits the mobility of arsenic by sorption, reduces to the more soluble and mobile ferrous iron. Therefore, reducing geochemical conditions in groundwater increases the mobility of arsenic, which results in increased concentrations of arsenic in groundwater.

Offshore Groundwater. Offshore, arsenic concentrations at well point WP-1A have declined approximately 95 percent since the PAZ was installed (from 2,400 to 110 µg/L; see Table 1). Although no data were collected at well point WP-8 prior to PAZ installation, arsenic concentrations at WP-8 have declined from 680 to 450 µg/L (35 percent) since this well point was installed in January 2009. This well point is located further away from the PAZ than WP-1A, and is therefore expected to exhibit slower decreases due to treatment by the PAZ.

Arsenic Occurrences in Sediment Porewater. Porewater was sampled at a depth of 10 cm below mudline both in the sediment offshore of the Barbee Mill property as well as offshore of the Quendall Terminals property. Porewater sampling has been performed quarterly at two locations offshore of the Barbee Mill property (PW-CMW-2 and PW-CMW-3) and one location on the Quendall Terminals property (PW-CMW-4). In June 2009, porewater samples were collected at three additional locations offshore of t the Quendall Terminals property, at stations WD01, WD02, and NS-01. Arsenic concentrations in surface sediment porewater at these six

stations since installation of the PAZ have ranged from non-detect to a maximum of 17 μg/L, below the groundwater cleanup level of 20 μg/L. These concentrations are also well below the surface water quality standard for dissolved arsenic based on aquatic life chronic toxicity of 190 μg/L (WAC 173-201A-240). In the area of historically highest porewater concentrations, at station PW-CMW-4, concentrations have declined from 1,400 to 2.2 μg/L since the PAZ was installed. This station is located adjacent to well point WP-1A, which has shown similar decreases (described above).

Arsenic Occurrences in Sediment. Surface sediment (0 to 10 cm) samples were collected in the northern half of the Barbee Mill Site as part of the initial site investigation by Retec in 1997 (VB4 and VB8), and surface sediment samples were collected in the southwestern corner of the adjoining Quendall Terminals property during the Quendall Terminals RI in 2009 (WD-01-SS, WD01, WD02, and NS01). Data are summarized in Figure 1. Sampling locations WD-01 and WD-01-SS were located within the nearshore groundwater discharge zone of the Barbee Mill arsenic plume, close to the area of historically highest porewater concentrations. The highest surface sediment arsenic concentration detected in this area was 16 milligrams per kilogram (mg/kg; dry weight basis), below both the 31 mg/kg lowest apparent effects threshold (LAET) and the 20 mg/kg floating percentile values developed by Ecology (2003) for screening freshwater sediment quality data. Bioassays were also performed on surface sediment collected from nearshore stations NS-01, NS-02 and WD-01 in December 2009 (see Figure 1). These samples did not exhibit any statistically significant differences in *Hyalella* or *Chironomus* survival or growth relative to appropriately matched reference samples, further confirming that there are no impacts to benthic macroinvertebrates in this area.

Summary. The groundwater data indicate that arsenic concentrations in groundwater leaving the former Barbee Mill property are declining due to completed remedial actions at the Site. Groundwater concentrations at the edges of the PAZ are currently elevated but are expected to decline; monitoring of the performance of the PAZ and the pump-and-treat system is ongoing.

The available site characterization data support the following conceptual site model:

- There is significant attenuation of arsenic concentrations along the groundwater-to-surface water discharge pathway. Concentrations of arsenic at closely located well point and porewater stations indicate substantial reductions in concentrations along the flowpath (e.g., from 110 μg/L at WP-1A [screened 2 to 4 feet below mudline] to 2.3 μg/L at PW-CMW-4 [located 10 cm below mudline]). Similar attenuation of arsenic

concentrations was observed in well point/porewater data pairs collected during the design investigation and pilot test of the PAZ (Aspect 2006). Arsenic concentrations in nearshore porewater are below both the site-specific groundwater cleanup level and the surface water quality standard.

- There has also not been a significant accumulation of arsenic in sediments at the point of discharge within the plume. The maximum detected concentration in sediment was 16 mg/kg, which is below applicable sediment criteria. Confirmatory bioassay testing further verified the absence of impacts to benthic macroinvertebrates in this area.

To further confirm these empirical observations, sediment fate-and-transport modeling was performed. This modeling is described in the section below.

Conceptual Site Model of Transport and Attenuation Pathways

For the PAZ design, a three-dimensional groundwater flow model was constructed to further evaluate groundwater hydraulics and arsenic fate-and-transport, complementing the site characterization data summarized above. Model results were summarized in the Engineering Design Report (Aspect 2006). This model was subsequently applied to the adjacent Quendall Terminals Site for the Quendall RI (Anchor QEA and Aspect 2010), which also included a 1-dimensional analytical model to evaluate chemical fate-and-transport through sediment. Given the close similarities in groundwater flow and sediment characteristics between the Barbee and Quendall Sites, many of the fate-and-transport processes characterized at the Quendall Terminals Site also apply to the Barbee Mill arsenic plume. A description of the groundwater and sediment models and results is provided below.

The shallow groundwater flowpath through the northern portion of the former Barbee Mill property and the southern portion of the Quendall Terminals property is predominantly horizontal. Groundwater containing arsenic concentrations above the 20 µg/L cleanup level flow though this shallow zone and discharge to Lake Washington along upward flowpaths (i.e., vertical seepage through the lake bed). Groundwater modeling performed for the PAZ design (Aspect 2006) predicted that the arsenic plume enters Lake Washington within 100 feet of the shoreline, with the highest concentrations located adjacent to the shore. Groundwater flowpaths and velocities are also very similar between the former Barbee Mill property and the adjacent Quendall Terminals property, and the groundwater model developed for the Quendall Terminals RI (Anchor and Aspect 2010) corroborates the earlier predictions. Based on available groundwater modeling and empirical measurements, the estimated seepage rate at both

properties is approximately 0.44 cm/day with a standard error of ± 0.27 cm/day (160 ± 97 cm/year; see Appendix B summary of seepage data collected in the Site vicinity).

As discussed above, the Site-specific groundwater cleanup level for arsenic at Barbee Mill is 20 μg/L. The surface water quality standard for dissolved arsenic based on aquatic life chronic toxicity is considerably higher at 190 μg/L (WAC 173-201A-240). While shallow groundwater arsenic concentrations at the Barbee Mill Site (including shoreline well point data) are declining rapidly (Table 1), maximum near-term (i.e., transient) groundwater concentrations of up to 1,200 μg/L may continue to flow toward Lake Washington in localized areas until the PAZ successfully attenuates the arsenic plume. In order to evaluate whether additional data may be needed to characterize these transient releases, further evaluation of the groundwater-to-surface water transport pathway was performed and is presented below.

For the Quendall Terminals RI, a combination of detailed sampling and analysis and application of a peer-reviewed 1-dimensional contaminant transport model was used to characterize physical mixing processes occurring within 4 feet of the lake bed and refine the conceptual site model of nearshore groundwater discharge into Lake Washington. Detailed concentration profiles of cations (sodium, potassium, calcium, and magnesium) were measured in the nearshore zone at the Quendall Terminals property to quantify the combined effects of diffusion/ dispersion, bioturbation/bioirrigation, and exchange with the overlying surface water (see Appendix B summary of cation profiles). The framework used to evaluate these cation data and to refine the conceptual site model of arsenic transport and attenuation at the Barbee Mill Site was the 1-dimensional steady state model developed by the University of Texas (UT) and widely used at other sediment cleanup sites (Lampert and Reible 2009). The UT model simulates chemical (dissolved and sorbed phase) fate and transport under the processes of advection, diffusion/dispersion, bioturbation/bioirrigation, and exchange with the overlying surface water.

The UT model works under the assumption that the overlying surface water contaminant concentrations are negligible. While this assumption is reasonable for arsenic (lake water concentrations average roughly 0.75 μg/L based on King County data collected at Lake Washington station #831 from 2006 to 2008; n=11), the cation data exhibit non-zero concentrations in surface water. In order to appropriately evaluate the cation data profiles given their non-zero concentrations in the surface water, concentrations measured within the porewater were normalized by first subtracting the surface water concentration from the

porewater cation data, and then by dividing them by the maximum cation concentration collected from the 4-foot depth within each profile.

The UT model coefficients were developed based on site-specific data or literature values. For example, the range of net sedimentation rates measured at the Quendall Terminals property of 0.2 to 0.7 cm/yr was input into the model. Coefficients that were expected to exhibit little variability or those to which the model is relatively insensitive were treated as fixed values. The model was then calibrated to the cation porewater data by adjusting the two key site-specific coefficients—the boundary layer mass transfer coefficient and dispersivity—so that the predictions closely matched the measured vertical profiles of cation concentrations. This calibration was performed separately for the seepage and sedimentation rate ranges (± 1 standard error) noted above (see Appendix B). The calibration to the cation dataset resulted in estimates of the boundary layer mass transfer coefficient in the range of 1 to 5 cm/day, within the literature range. The calibration also resulted in a range of dispersivity coefficients from 12 to 30 cm; this range is towards the upper end of the modeled domain length that is often used as a rule-of-thumb in groundwater models. However, this calibrated dispersivity value range represents the combined effects of several mixing-like processes in the sediment bed, including dispersion associated with groundwater flow, bioturbation, and hyporheic exchange. Based on the correspondence of these data, the calibrated UT model provides a reliable basis to assess transport and attenuation processes along the groundwater-to-surface water pathway at the Barbee Mill Site.

Based on this calibration range developed from the cation data, the model was then used to simulate arsenic transport at the Barbee Mill Site. The only model inputs that changed when it was used to calculate arsenic concentrations were the chemical-specific coefficients for arsenic (diffusivity in water and partition coefficient (K_d). Based on co-located analyses of surface sediment arsenic and porewater arsenic concentration at the Barbee Mill Site, the average Log-K_d of 3.6 was applied to the model (this value is also within the middle of the range of literature values of sediment arsenic K_d).

Even under worst-case maximum transient groundwater arsenic concentrations of up to 1,200 μg/L and under the range of site-specific seepage rates, sedimentation rates, boundary layer mass transfer coefficients and dispersivity values summarized above, the maximum surface sediment (0 to 10 cm average) porewater concentrations predicted by the UT model are less than 5 μg/L, well below the surface water quality standard for dissolved arsenic based on

aquatic life chronic toxicity of 190 μg/L (WAC 173-201A-240). The available surface sediment porewater data collected at the Barbee Mill Site are consistent with this prediction, and corroborate the model results (Figure 1). The conceptual site model summarized above reveals that groundwater arsenic concentrations attenuate to levels well below the surface water quality standard prior to discharge into Lake Washington.

As described above, the highest surface sediment arsenic concentration detected in the nearshore groundwater discharge zone of the Barbee Mill arsenic plume is 16 mg/kg, below both the 31 mg/kg lowest LAET and the 20 mg/kg floating percentile values developed by Ecology (2003) for screening freshwater sediment quality data. Similarly, the UT model predicts maximum surface sediment arsenic concentrations of less than 20 mg/kg, even under worst-case maximum transient groundwater arsenic concentrations of up to 1,200 μg/L and under the range of site-specific seepage rates, sedimentation rates, boundary layer mass transfer coefficients and dispersivity values summarized above. Similar to the conceptual site model for groundwater-to-surface water transport summarized above, surface sediment arsenic concentrations are currently attenuated to levels below freshwater sediment screening values.

Remaining Data Gaps

Based on the information summarized above, no additional sediment investigations are needed to delineate the extent of arsenic in sediment offshore from the northern half of the Barbee Mill property and the southwestern corner of the adjoining Quendall Terminals property. The existing data, when supplemented with available fate and transport models, are sufficient to complete the RI/FS of the Barbee Mill Site.

However, it would be beneficial to obtain more data on the rate of groundwater restoration before performing an RI/FS for the Barbee Mill Site. As discussed above, the Ecology-approved performance monitoring plan (Aspect 2010) specifies periodic monitoring of arsenic concentrations at 16 monitoring wells located on the former Barbee Mill property, and two well points located on the Quendall Terminals property. The rate of groundwater restoration on the former Barbee Mill and Quendall Terminals properties will be re-estimated annually based on data collected under the plan. Because of the significant declines in groundwater concentrations observed to date due to completed remedial actions at the Site and their influence on sediment conditions, the Barbee Mill sediment RI/FS should be sequenced to occur after the rate of groundwater restoration has been accurately estimated, which likely will require at least two more years of performance monitoring.

References

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Aspect, 2010. Performance Monitoring Plan, Barbee Mill Groundwater Remediation Project. Prepared by Aspect Consulting LLC. March 15, 2010.

Ecology, 2003. Development of Freshwater Sediment Quality Values for Use in Washington State. Publication Number 03-09-088. September.

Lampert, D. J. and D. Reible, 2009. An Analytical Modeling Approach for Evaluation of Capping of Contaminated Sediments. Soil and Sediment Contamination: An International Journal, 18:4, 470-488.

Attachments

Table 1 – Summary of Water Level and Chemical Data
Figure 1 – Summary of Arsenic Occurrences in Groundwater, Porewater, and Sediment
Appendix A – Historical Arsenic Concentrations in Groundwater
Appendix B – Cation Concentrations in Sediment Porewater and Lakebed Seepage Rates – Quendall Terminals

Table 1 - Summary of Water Level and Chemical Data

Barbee Mill Site

					Concentration in ug/L						Concentration in mg/L
Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
Cleanup Level/Performance Standard (See Note 2)					*20*	*32*	*2.5*	*3.5*	*0.5*	*0.5*	*70*
Performance Monitoring Wells											
CMW-1	22.75	*7/19/2006*			*31*						26
		8/30/2007	4.63	18.12	33						27
		5/5/2009	3.58	19.17	37				0.27 U	0.43 U	42
		9/8/2009	4.61	18.14	53				0.25 U	0.41 U	41
		12/23/2009	**5.36**	**17.39**	**39**				**0.26 U**	**0.41 U**	**39**
CMW-2S	22.27	*5/23/2006*			*120*						
		8/30/2007	4.32	17.95	4.1		1 U	1 U			1.4
		5/5/2009	3.28	18.99	1.7	5 U	1 U	1 U			0.63
		9/8/2009	4.52	17.75	2.1	6.3	1 U	1 U			1.9
		12/23/2009	**5.11**	**17.16**	**2.1**	**5 U**	**1 U**	**1 U**			**3.1**
CMW-2D	22.20	*7/19/2006*			*250*						
		8/30/2007	3.99	18.21	33		1 U	1 U			9.2
		4/30/2009	3.29	18.91	92	14	1 U	1 U			4.5
		9/8/2009	4.20	18.00	92	8.8	1 U	1 U			4.2
		12/23/2009	**4.81**	**17.39**	**92**	**12**	**1 U**	**1 U**			**3.4**
CMW-3	22.41	*7/19/2006*			*110*						90 [3]
		8/30/2007	3.78	18.63	1.3		1 U	1 U			2.9
		4/30/2009	2.32	20.09	1 U	5 U	1 U	1 U			0.11
		9/8/2009	4.02	18.39	1.1	5 U	1 U	1 U			0.086
		12/22/2009	**4.02**	**18.39**	**1 U**	**5 U**	**1 U**	**1 U**			**0.23**
CMW-4S	27.44	*7/19/2006*			*4300*						50
		8/30/2007	9.40	18.04	510		1 U	1 U			28
		4/30/2009	8.11	19.33	180	5 U	1 U	1 U			12
		9/8/2009	9.57	17.87	230	5 U	1 U	1 U			8
		12/22/2009	**9.82**	**17.62**	**210**	**5 U**	**1 U**	**1 U**			**17**
CMW-4D	27.92	*2/15/2007*			*3400*						13
		8/30/2007	9.51	18.41	1700		1 U	1 U			10
		4/30/2009	8.20	19.72	1400	5 U	1 U	1 U			6
		9/8/2009	9.71	18.21	420	5 U	1 U	1 U			2
		12/22/2009	**10.16**	**17.76**	**1700**	**5 U**	**1 U**	**1 U**			**9**
CMW-5	31.07	*6/23/2006*			*2900*						
		8/30/2007	12.32	18.75	22		1 U	1 U			1.8
		5/5/2009	10.87	20.20	6	5 U	1 U	1 U			1.8
		9/8/2009	12.72	18.35	7.8	5 U	1 U	1 U			0.069
		12/22/2009	**12.56**	**18.51**	**18**	**5 U**	**1.4**	**1 U**			**5.8**
CMW-6	31.03	*6/5/2006*			*23*						
		8/30/2007	11.61	19.42	110						25
		5/1/2009	9.70	21.33	210						21
		9/8/2009	12.17	18.86	210						17
		12/23/2009	**11.63**	**19.40**	**220**						**16**
WP-1A		*8/10/2005*			*2,490*						
		5/1/2009			430						20
		9/9/2009			52						7.2
		12/22/2009			**110**						**17**
WP-8		5/1/2009			680						11
		9/9/2009			490						9.5
		12/22/2009			**450**						**18**
Extraction Wells											
EW-1	26.81	6/3/2009			41				0.26 U	0.42 U	14
		9/9/2009	6.86	19.95	63				0.25 U	0.4 U	12
		12/23/2009	**10.12**	**16.69**	**110**				**0.26 U**	**0.41 U**	**22**
EW-2	26.67	6/3/2009			12				0.27 U	0.42 U	4.2
		9/9/2009	6.88	19.79	100				0.25 U	0.4 U	12
		12/23/2009	**10.71**	**15.96**	**140**				**0.26 U**	**0.41 U**	**19**
EW-3	26.77	6/3/2009			51						24
		9/9/2009	7.67	19.10	150						26
		12/23/2009	**7.11**	**19.66**	**130**						**21**
EW-4	27.65	9/9/2009	8.38	19.27	14						0.056 U
		12/23/2009	**8.37**	**19.28**	**10**						**0.056 U**
EW-5	28.34	6/3/2009			61						1.3
		9/9/2009	8.05	20.29	39						1.9
		12/23/2009	**8.98**	**19.36**	**44**						**1.6**
EW-6	28.61	6/3/2009			140						2.7
		9/9/2009	11.15	17.46	360						7.8
		12/23/2009	**9.25**	**19.36**	**230**						**2.7**
EW-7	28.66	6/3/2009			110						2.5
		9/9/2009	9.61	19.05	300						6
		12/23/2009	**9.32**	**19.34**	**350**						**7.6**
EW-8	28.88	6/3/2009			560						21
		9/9/2009	10.11	18.77	750						16
		12/23/2009	**10.36**	**18.52**	**610**						**16**
PZ-1	27.78	5/5/2009	6.59	21.19							
		9/9/2009	7.39	20.39							
		12/23/090	**7.17**	**20.61**							
PZ-2	27.87	5/5/2009	5.76	22.11							
		9/9/2009	8.17	19.70							
		12/23/2009	**7.74**	**20.13**							
Porewater Stations											
PW-CMW-2		*7/1/2006*			*1.5*						
		2/16/2007			3.1						4.9
		9/21/2007									4.8
		5/22/2009			1 U						0.056 U
		10/9/2009			17						9.8
		1/5/2010			**1.1**						**0.1**
PW-CMW-3		*7/1/2006*			*1.7*						
		3/12/2007									1.5
		5/22/2009			1 U						0.056 U
		10/9/2009			1.8						0.082
		1/5/2010			**1 U**						**0.063**
PW-CMW-4		*9/9/2005*			*1,400*						
		9/21/2007									26
		5/22/2009			2.2						0.056 U

Table 1 - Summary of Water Level and Chemical Data

Barbee Mill Site

					Concentration in ug/L						Concentration in mg/L
Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
Cleanup Level/Performance Standard (See Note 2)					*20*	*32*	*2.5*	*3.5*	*0.5*	*0.5*	*70*
		10/9/2009			2.6						0.12
		1/5/2010			**2.3**						**0.23**
NS01-C1		6/22/2009			7.4						6.67
WD01-PW		6/18/2009			5.7						3.83
WD02-PW		6/18/2009			3.2						3.11
Quendall Terminals Monitoring Wells											
BH-21A	26.16	9/9/2009	8.11	18.05	5.9						
		12/23/2009	**8.69**	**17.47**							
BH-21B	25.88	9/9/2009	6.43	19.45	109						
		12/23/2009	6.63	19.25	77/65.5 [1]						
BH-26A	28.98	9/9/2009	9.29	19.69	3.8						
		12/23/2009	**8.27**	**20.71**							
BH-26B	26.62	9/9/2009	6.88	19.74	31.8						
		12/23/2009	**6.98**	**19.64**							
BH-29A	27.64	9/9/2009	9.65	17.99	389						
		12/23/2009	**9.91**	**17.73**	400/372 [1]						
BH-29B	27.8	9/9/2009	8.59	19.21	3						
		12/23/2009	**8.80**	**19**							

Notes:

[1] Results from ICP/MS analysis and Arsenic Hydride analysis

[2] Cleanup levels and performance standards identified in Performance Monitoring Plan (Aspect, in progress) and are based as follows:

Arsenic: Cleanup level based on natural background concentration of arsenic in groundwater.

Zinc: Cleanup level based on current ARARs for fresh water, superceeding the previous cleanup level of 105 ug/L identified in Independent Remedial Action Plan (Hart Crowser 2000).

TPH: Cleanup level based on MTCA Method A cleanup level for unrestricted use.

Iron: Performance standard is for the PAZ to not significantly elevate natural concentrations, which are naturally elevated due to reducing conditions created by peat deposits in Site soils.

Copper and Lead: Performance standard for passive attenuation zone is to not result in exceedance of surface water standard listed in table.

[3] Iron concentrations in samples collected prior to the wall being installed are not compared to the performance criteria

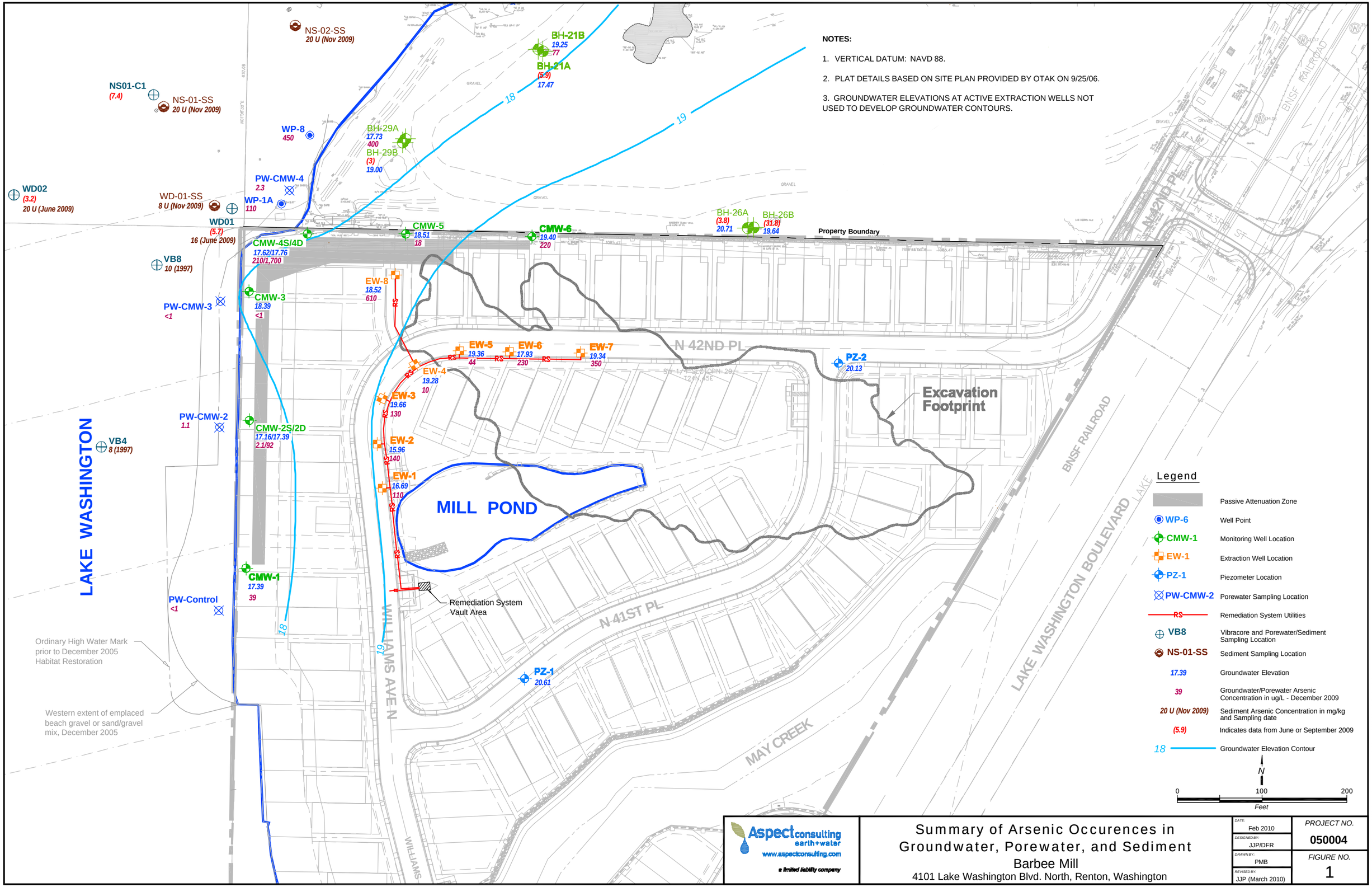
U =not detected at indicated reporting limit

bold = data collected during this reporting period

Blue italics indicates baseline sample from location closest to current sample location, as follows:

existing location	baseline location
CMW-1	AZ-16
CMW-2S	AZ-3
CMW-2D	AZ-18
CMW-3	RMW-01
CMW-4S	AZ-5
CMW-4D	HCMW-01D
CMW-5	AZ-11
CMW-6	AZ-9
WP-1A	WP-1B
PW-CMW-2	PW-M
PW-CMW-3	PW-N
PW-CMW-4	PW-WP1B

highlighted cells indicate exceedance of cleanup levels



Aspect consulting earth+water
www.aspectconsulting.com
a limited liability company

Summary of Arsenic Occurences in Groundwater, Porewater, and Sediment

Barbee Mill

4101 Lake Washington Blvd. North, Renton, Washington

DATE: Feb 2010	PROJECT NO. 050004
DESIGNED BY: JJP/DFR	
DRAWN BY: PMB	FIGURE NO. 1
REVISED BY: JJP (March 2010)	

Q:\Barbee Mill\050004 Barbee Mill\2010-03\050004-02.dwg

Arsenic Concentrations in Sediment Porewater and at Well Points Prior to PAZ Installation - 2005 and 2006

Legend

- Passive Attenuation Zone
- WP-6 Proposed Well Point
- CMW-1 ~~Proposed~~ Monitoring Well Location
- EW-1 ~~Proposed~~ Extraction Well Location
- PZ-1 ~~Proposed~~ Piezometer Location
- PW-CMW-2 Proposed Porewater Sampling Location
- RS Remediation System Utilities

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE COORDINATE SYSTEM (SPC), NAD 93/91, NORTH ZONE.
2. VERTICAL DATUM: NAVD 88.
3. PRIMARY VERTICAL BENCHMARK: USGS "GAGINGSTA", BRASS DISK STAMPED "USGS" SET IN A DRILL HOLE IN THE SW CORNER OF A LARGE SLOPING CONCRETE STRUCTURE ON THE NORTHEAST SIDE OF A 36" CORRUGATED PIPE THAT HOUSES A STREAM GAUGE ON THE WEST SIDE OF THE MAY CREEK BRIDGE ON LAKE WASHINGTON BOULEVARD. ELEVATION: 28.91 FEET.
4. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED & HITCHINGS, INC. DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH, 2002.
5. PROPOSED PLAT DETAILS AND SITE GRADES PRELIMINARY BASED ON SITE PLAN PROVIDED BY OTAK ON 6/28/06.

Arsenic Concentration in mg/L

Depth in Feet

WP-1B 9/2005: 2.49 | 2'

PW-WP1B 9/2005: 1.4 | 0.3'

1.4 | 0.3'

PW-N 7/2006: 0.0017 | 0.3'

PW-M 7/2006: 0.0015 | 0.3'

PW-S 7/2006: 0.020 | 0.3'

WP-6 12/2006: 0.084 | 8.1'

WP-8, WP-1A, PW-CMW-4, CMW-4S/4D, CMW-5, CMW-6, CMW-3, PW-CMW-3, CMW-2S/2D, PW-CMW-2, CMW-1, PZ-1, PZ-2, EW-1, EW-2, EW-3, EW-4, EW-5, EW-6, EW-7, EW-8

Property Boundary

Excavation Footprint

Remediation System Vault Area

BNSF RAILROAD

BNSF UTILITY EASEMENT AF#9505150589

BNSF INVEN NO.0917 BNSF AC NO.869

LAKE WASHINGTON BOULEVARD

L.K. WA. BLVD.

MAY CREEK

INNER HARBOR LINE

WILLIAMS AVE N

N 42ND PL

PRIVATE ST. P2

SHARED DRIVEWAY/ ACCESS ESM'T

TRACT 'E' ACCESS & UTILITY TRACT

TRACT 'F' OPEN SPACE WATER QUALITY & UTILITY TRACT

TRACT 'H' OPEN SPACE

TRACT 'A' OPEN SPACE

TRACT 'B' OPEN SPACE

TRACT 'C' OPEN SPACE

TRACT 'Y' OPEN SPACE

0 100 200 Feet

N

Aspect consulting IN-DEPTH PERSPECTIVE

179 Madrone Lane North, Bainbridge Island, WA 98110, (206) 780-9370

811 First Avenue #480, Seattle, WA 98104, (206) 328-7443

Site Plan
Barbee Mill
4101 Lake Washington Blvd. North
Renton, Washington

DATE	PROJECT NO.
February 2007	050004
DESIGNED BY: JJP	
DRAWN BY: MS	FIGURE NO. 1
REVISED BY: LAL	

Q:\Barbee Mill\050004 Barbee Mill\2006-10 PAZ\050004-06.dwg

Legend

- AZ-6 — Direct-Push Sampling Location
- RMW-02 — Monitoring Well Location

0.0074	6-9'
0.006	11-14'

Depth of screened interval

Dissolved Arsenic concentration in mg/L

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE COORDINATE SYSTEM (SPC), NAD 93/91, NORTH ZONE.
2. VERTICAL DATUM: NAVD 88.
3. PRIMARY VERTICAL BENCHMARK: USGS "GAGINGSTA", BRASS DISK STAMPED "USGS" SET IN A DRILL HOLE IN THE SW CORNER OF A LARGE SLOPING CONCRETE STRUCTURE ON THE NORTHEAST SIDE OF A 36" CORRUGATED PIPE THAT HOUSES A STREAM GAUGE ON THE WEST SIDE OF THE MAY CREEK BRIDGE ON LAKE WASHINGTON BOULEVARD. ELEVATION: 28.91 FEET.
4. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED & HITCHINGS, INC. DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH, 2002.

UNIMPROVED AREA

COR-2 ZONE

Property Boundary

A

A'

0.27	5-8'
0.033	10-13'
0.0088	18-21'
0.0063	25-28'
0.0079	32-35'
0.12	7-10'
0.052	18-21'
0.011	24-27'
0.016	29-32'
0.14	5-8'
0.025	13-16'
0.0089	18-21'
0.015	27-30'
0.0074	6-9'
0.006	11-14'
0.015/0.016	3-8'
0.030	3-6'
0.007	12-15'
0.0061	19-22'
0.009	23-26'
0.006	29-32'
0.75	8-11'
0.0033	19.5-22.5'
0.0047	27-30'
0.0039	33-36'
2.0	10-13'
4.5	16.5-19.5'
0.0044	23-26'
0.0031	28-31'
0.069	10-13'
0.0063	19-22'
0.011	10-13'
0.018	18-21'
0.0071	27-30'
0.002	33-36'
2.9	5-8'
0.0048	19-22'
0.12	5-8'
0.0051	33-36'
0.0031	5-8'
0.023	7-10'
0.0063	19-22'
0.015	25-28'
0.10	33-36'
0.0055	6-9'
0.55 to 5.2	3-8'
0.09 to 1.70	15-20'
0.11 to 0.5	3-8'
3.8	5-8'
0.075	5-8'
4.8	5-8'
32	5-8'
0.0042	5-8'
0.53	9-12'
0.048	5-8'
15	11-14'
0.51	5-8'
0.014	5-8'
0.0067	18-21'
0.025	18-21'
0.38	5-8'
0.25	18-21'
0.020	18-21'
0.23	5-8'
0.031	5-8'
0.0071	5-8'
0.025	13-16'
0.012	5-8'
0.0019	3-8'
0.0093	8-12'
0.028	16-20'

AZ-5, AZ-20, HCMW-01S, HCMW-01D, RMW-01, AZ-4, AZ-13, AZ-19, AZ-3, AZ-18, AZ-15, AZ-2, AZ-16, AZ-17, AZ-1, RMW-02, AZ-10, AZ-7, AZ-8, AZ-6, AZ-11, AZ-14, AZ-21, AZ-9, AZ-12, EC-1, EC-4, EC-8, EC-2, EC-10, EC-5, EC-12, EC-3, EC-9, EC-6, EC-7, EC-11, RMW-05, BG-1

Catch Basin (Typ.)

Excavation Footprint

Storm Sewer (Approx.)

1-½" Sanitary Force Main (Approx.)

To Sanitary Sewer

4" Gas Line (Approx.)

Storm Sewer (Approx.)

HCMW-05S/ HCMW-05D

AMW-2

LAKE WASHINGTON (KING COUNTY)

LAKE WASHINGTON

R HARBOR LINE

LAKE WASHINGTON BLVD.

MAY CREEK

LOAD DOCK

ACCESS START

3224059002

3224059049

3224056866

3224055853

3224059081

N

0 100 200

Feet

Aspect consulting
IN-DEPTH PERSPECTIVE

179 Madrone Lane North
Bainbridge Island, WA 98110
(206) 780-9370

811 First Avenue #480
Seattle, WA 98104
(206) 328-7443

Distribution of Arsenic in Groundwater

2006: Prior to PAZ Installation (from Engineering Design Report, Aspect 2006)

Renton, Washington

DATE:	July 2006
DESIGNED BY:	JJP
DRAWN BY:	JRS/PMB
REVISED BY:	
PROJECT NO.	050004
FIGURE NO.	1

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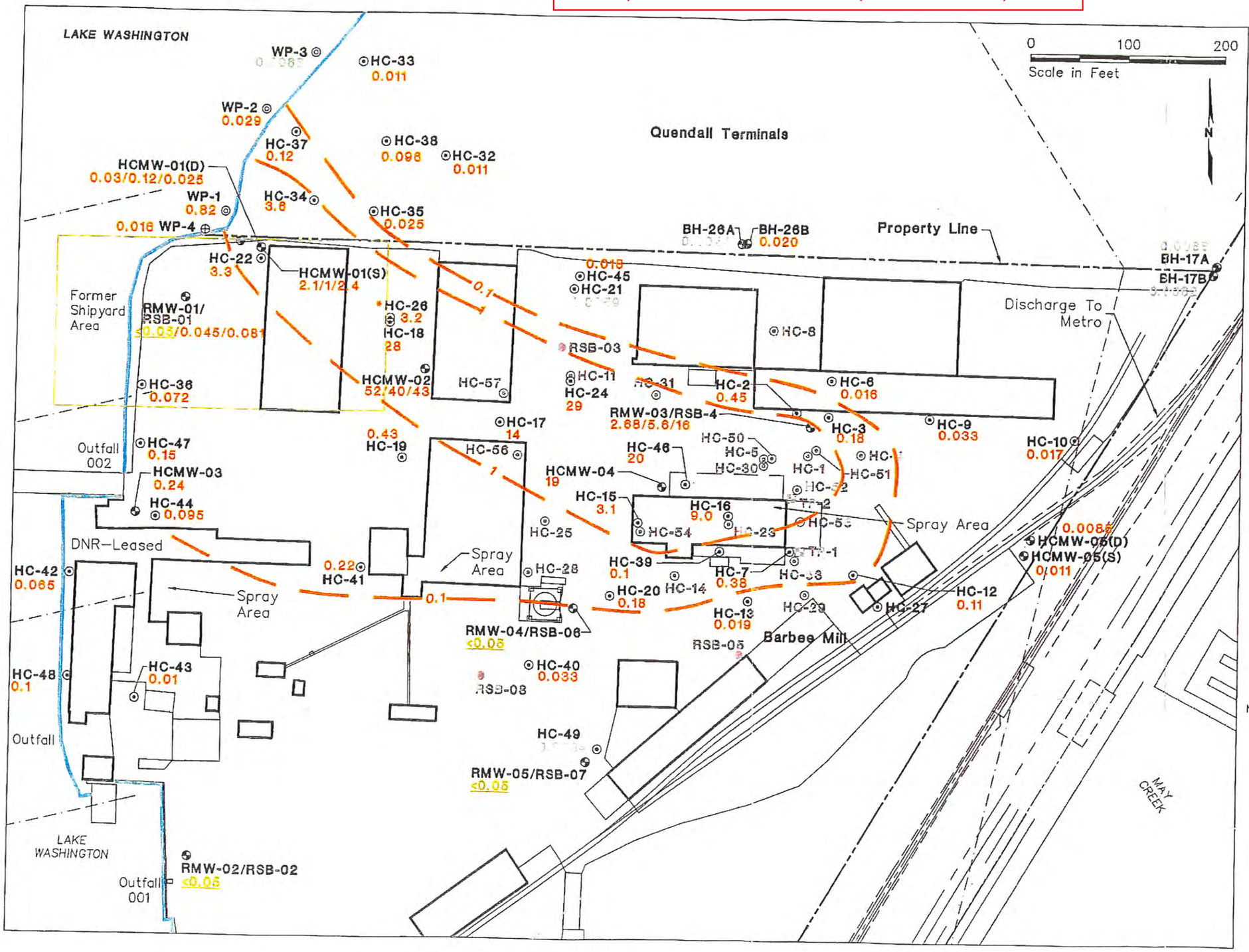
Arsenic Concentrations in Groundwater

1998 and 1999 Site Investigations, Prior to Remedial Activities. Figure from Independent Remedial Action Plan (Hart Crowser 2000).



Exploration Location, Number, and Type (Source, Date)

- HCMW-02 Monitoring Well (Hart Crowser, 1998 and 1999)
- WP-4 Permanent Well Point (Hart Crowser, 1998)
- WP-1 Temporary Well Point (Hart Crowser, 1998)
- HC-1 Strataprobe Boring (Hart Crowser, 1998 and 1999)
- RMW-02 Monitoring Well (RETEC, 1996)
- RSB-02 Soil Boring (RETEC, 1996)
- BH-17A Monitoring Well (Woodward Clyde, 1988)
- TP-1 Test Pit (Hart Crowser, 1999)

Arsenic Concentration in mg/L

- <0.05 Not Detected at Detection Limit Indicated
- 0.0 Below Groundwater Screening Level of 0.0068 mg/L
- 0.45 Above Groundwater Screening Level of 0.0068 mg/L
- * Deep Sample (14 to 16 Feet below Ground Surface)
- —1— As Concentration Contour in mg/L
- Approximate Location of Lake Shore

Notes:
1. Base map prepared from electronic file provided by Bush, Roed & Hitchings, Inc. dated October 5, 1998.
2. Data are from 1998 or 1999, except where underlined, which are from July 1996 RETEC sampling. Refer to Tables 8 and Appendix B for specific groundwater data.

CVD 6/9/00 1=100 XREF=BASE4946 COLOR.PC2
49461022

HARTCROWSER

J-4946-10 6/00

Figure 11

Table 3.1-3a
Summary of Lakebed Seepage Estimates

		Sediment Type - Surface to Depth of Seepage Meter Imbedment		
Study and Method	**Location**	**Based on Closest Exploration**	**Observed in Field**	**Darcy Velocity in cm/day**
Aspect 2003				
Field-measured permeability and gradient across upper 10 to 12 inches of surface sediment at each location				
	WP-19A	No Adjacent Exploration	Silty Sand	4.88
		No Adjacent Exploration	Silty Sand	1.65
		No Adjacent Exploration	Sand	7.25
	WP-20A	Sandy Silt (VC-20A)	Silty Sand	2.44
		Sandy Silt (VC-20A)	Silty Sand	11.58
Aspect 2003				
Field-measured gradient across upper 4 to 6 feet of surface sediment at each location.				
Permeability of sand measured at other locations with similar sediment type (Aspect 2003). Permeability of silt based on calibrated groundwater model (Retec 1998)				
	WP-21A	Sand (VS-36)	Not Reported	5.49
	WP-21B	Sand (VS-36)	Not Reported	9.75
	WP-19C	Peaty Silt	Not Reported	0.21
	WP-19B	Sandy Silt	Not Reported	0.13
EPA 2009				
Bucket-and-bag seepage meters. Imbedment depth not reported. Assumed to be 1 foot or less for identifying sediment type.				
Data from May dive report (EPA, June 2009) assuming a bucket cross-sectional area of 559 cm2 (EPA, May 2009)				
	A (near VS-28)	Sandy Silt	Not Reported	0.70
				2.22
				0.10
				0.05
	B (near VS-23)	Silty Sand	Not Reported	2.99
				0.08
				0.31
	C (near VS-30)	Sand	Not Reported	0.82
				0.80
				0.21
				1.06
	D (near VS-3)	Silty Peat	Not Reported	1.73
				0.05
Minimum				0.05
Maximum				11.58
Geometric Mean				0.83

Table 3.1-3a
Summary of Lakebed Seepage Estimates (continued)

		Sediment Type - Surface to Depth of Seepage Meter Imbedment		
Study and Method	**Location**	**Based on Closest Exploration**	**Observed in Field**	**Darcy Velocity in cm/day**
Aspect 2009	Calibrated Groundwater Model - Accounts for local variation in gradients and the thickness of the shallow alluvium. Does not account for local variation in material type.			
		Darcy Velocity along Transect		
	Distance from Shore in Feet	WP-21 (south of T-Dock)	WP-20 (T-Dock)	WP-19 (North of T-Dock)
	37.5	0.76	0.66	0.46
	62.5	0.61	0.53	0.40
	87.5	0.52	0.46	0.36
	112.5	0.47	0.41	0.32
	137.5	0.49	0.37	0.30
	162.5	0.52	0.35	0.29
	187.5	0.52	0.34	0.28
	212.5	0.53	0.34	0.28
	237.5	0.66	0.35	0.28
Minimum		0.47	0.34	0.28
Maximum		0.76	0.66	0.46
Average		0.56	0.42	0.33
Average - All three transects			0.44	
Standard deviation - All three transects			0.13	

Table 3.1-3b
Summary of Lakebed Seepage Estimates

Variability of Shallow Alluvium Composition (Anchor 2009)		Percent of Core Thickness Comprised Primarily of Silt	
		Short cores less than 6 feet deep excluded	
	Location	C1	C2 (Duplicate Location)
South of T-Dock			
	NS01	3	27
	NS02	42	
	NS03	45	18
	NS04	78	60
	NS06	40	
	NS07	54	24
	NS08	55	67
	NS12	29	39
		Average (C1 and C2)	42

Table 3.1-3b
Summary of Lakebed Seepage Estimates (continued)

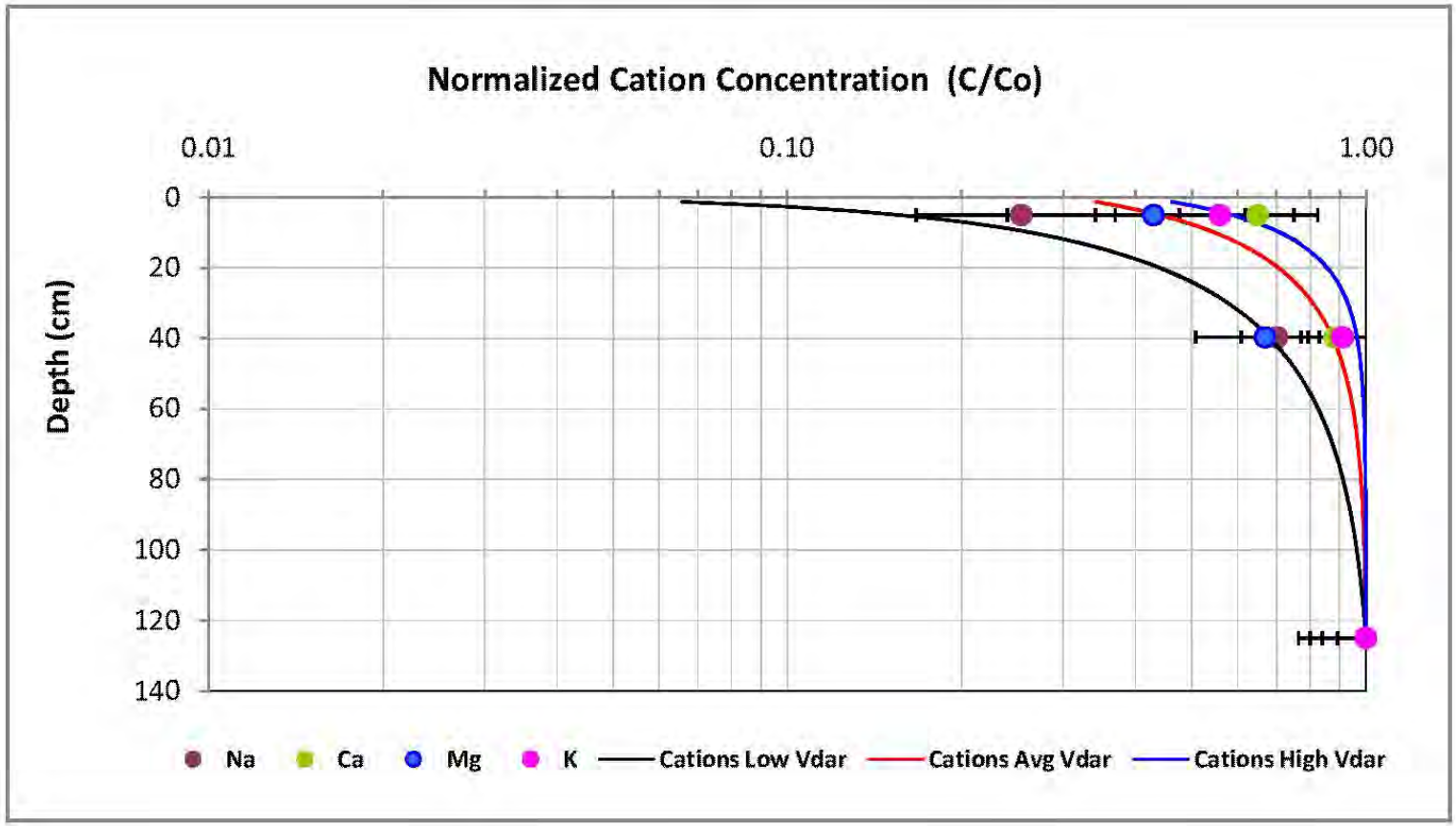
Variability of Shallow Alluvium Composition (Anchor 2009)		Percent of Core Thickness Comprised Primarily of Silt	
		Short cores less than 6 feet deep excluded	
	Location	C1	C2 (Duplicate Location)
North of T-Dock			
	NS05	91	93
	NS09	57	58
	NS10	8	
	NS11	69	
	NS13	60	
	NS14	10	
	NS15	56	
		Average (C1 and C2)	56
		Average for Nearshore Area	47
		Standard deviation in nearshore area	25

Notes:

1. No sediment core collected close to well point.

Data Sources:

Aspect 2003: Draft RA/FS (Anchor and Aspect 2004); Appendix F - Groundwater Vertical Permeability and Vertical Head Study
Anchor 2009: Sediment Core Logs - NS01 through NS15
EPA, May 2009: Interim Dive Report, May 1, 2009
EPA, April 2009: Dive Report, June 11, 2009



Notes:
Data points are normalized average porewater concentrations +/- standard error. Calibrations were performed for three Darcy velocities:
Low Vdar = 63 cm/yr, vg Vdar = 160 cm/yr, High Vdar = 257 cm/yr.

ANCHOR QEA

Figure 6.4-5
Cation Calibration Results
Draft Remedial Investigation
Quendall Terminals RI/FS

APPENDIX K

Summary of Groundwater Modeling

Summary of Groundwater Modeling

This appendix provides the methods and results of groundwater modeling completed for the Barbee Mill Site. A Site-wide groundwater model was constructed in 2006 as part of the *Draft Engineering Design Report*, and later updated as part of the 2011 *Performance Monitoring Report*.

Appendix A of the *Draft Engineering Design Report* (Attachment K1) describes the basic parameters, assumptions, and results of the groundwater model. The output of the model was used in the design of the PAZ and the pump-and-treat system.

Four years after the installation of the PAZ and the pump-and-treat system, the model was adjusted and re-calibrated to better match empirical performance data that had been collected since 2006. Section 4 of the 2011 *Performance Monitoring Report* (Attachment K2) describes the model adjustments, and the resulting updated restoration timeframe estimates. Model parameters that changed as part of the 2011 update are identified in the report, all other parameters were unchanged.

In 2023, the groundwater model was adjusted again to better match recent empirical performance data. The purpose of the model updates was to more closely match conditions observed at wells exhibiting slower attenuation than predicted by the previous version of the model.

Attachments

Attachment K1 – Draft Engineering Design Report – Appendix A. Barbee Mill Groundwater Remediation, Renton Washington. August 2, 2006.

Attachment K2 – Performance Monitoring Report, Barbee Mill Groundwater Remediation Project, Renton, Washington. August 11, 2011.

Attachment K3 – Groundwater Model Update for RI/FS Report and Restoration Time Frame Analysis, Barbee Mill Groundwater Remediation Project, Renton, Washington, March 2, 2023.

APPENDIX K

Attachment K1

Draft Engineering Design Report – Appendix A. Barbee Mill Groundwater Remediation, Renton Washington, August 2, 2006.

Introduction

This appendix describes the numerical hydraulic groundwater flow and contaminant fate and transport model developed for the Barbee Mill facility in Renton, Washington. The groundwater flow model replicates hydraulic conditions of the site following site remediation, while the chemical fate and transport package predicts the attenuation of residual concentrations of arsenic on site. The calibrated model was then used in design of the passive attenuation wall and groundwater extraction system.

General Site Hydrogeology

The general soil profile encountered in field explorations and observed during soil excavation was approximately ten feet of surficial fill, overlying 20 (to as much as 30 feet) of heterogeneous alluvial or lacustrine sand, silt, and peat. Below the alluvial sediments are glacial sands and gravels of an unknown thickness.

Groundwater is encountered at approximately 2 to 5 feet below ground surface, with a predominate gradient to the west-northwest towards Lake Washington. Water elevation data shows an upward gradient on the western half of the property, also indicating groundwater discharge to the lake. On the eastern half of the site, a downward gradient has been observed in paired wells (Hart Crowser 2000). A more detailed explanation of the site subsurface conditions can be found in the Independent Remedial Action Plan (IRAP) (Hart Crowser 2000) and supporting documents.

In addition to the information presented in the IRAP, an area-wide numerical groundwater flow and contaminant fate and transport model has previously been developed for the neighboring Quendall Terminals property (RETEC 1998). The area modeled included the Barbee Mill facility.

Groundwater Flow Model

To better understand the subsurface hydraulics of the Barbee Mill facility and to facilitate evaluation of arsenic attenuation, a numerical groundwater flow model of the site was developed. The model was developed using the USGS MODFLOW code (McDonald and Harbaugh 1988) with Waterloo Hydrogeologic's Visual MODFLOW pre- and post-processor – industry-standards used for modeling groundwater flow. MODFLOW was used to simulate steady-state 3-dimensional groundwater flow in the heterogeneous 2 aquifer system at the facility. A variety of features, such as time-varying boundary conditions and heterogeneous aquifer hydraulic properties, are incorporated into MODFLOW by the use of different packages or modules. In MODFLOW, the volume of the aquifer to be modeled is discretized horizontally into a rectangular grid of rows and columns, which is further subdivided by vertical layers. The resulting three-dimensional

rectangular blocks are termed cells. Within each cell, aquifer properties such as hydraulic conductivity and storativity are assigned a constant value. Heterogeneity is simulated by varying aquifer properties between cells.

Model Grid

Figure A-1 illustrates the area represented by the model and the model grid superimposed on site features. Figure A-2 presents the model grid in cross section. The Barbee Mill Site is represented by four vertical layers. These layers are:

- Layer 1 spans the water table near the excavation and is characteristic of the overlying fill;
- Layers 2 and 3 represent the lacustrine silts and peat. The primary purpose of the multiple layers is to allow for more accurate representation of vertical gradients that may arise as a result of the groundwater flow regime, especially near discharge zone(s), and to allow discretization of the excavation and backfill; and
- Layer 4 represents the deeper glacial sands and gravels.

Regional layer contours and elevations were digitized from the Port Quandall Groundwater Modeling and Analysis of Alternatives (RETEC 1998) and locally adjusted to reflect site specific stratigraphy observed in recent site borings and during the remedial excavation.

The model domain is discretized into 142 columns and 98 active rows for a total of 13,916 finite difference cells. Within the interior of the model, each cell represents an approximate area of 18 square feet. The model grid was rotated counterclockwise so that the north-westerly direction of groundwater flow was parallel to the x-axis of the model.

Boundary Conditions

Boundary conditions for the model domain were selected to best represent the natural regional conditions of the area and are specific to each layer. The model simulated steady-state groundwater flow conditions. Constant head cells were utilized to represent Lake Washington – a proportionally massive water body that would not be affected by on-site activities (e.g. pumping). Constant head cells were also used to replicate underflow of groundwater from the upgradient regional source in the deep glacial sands (Layer 4). The cells were located approximately along the Interstate I-405 corridor and also are assumed to not be affected by on-site activities.

The relative low permeability of the lacustrine silts and peat (Layers 2 and 3) limit the amount of upgradient contribution to the groundwater regime; therefore, the upgradient extent was modeled as no-flow. Similarly, the fill unit (Layer 1) decreases in thickness to the east until it either is bisected by May Creek or pinches out.

May Creek was specified within the model using MODFLOW's river package. The river package allows the creek to function both as a gaining surface water body where groundwater levels are high and as a loosing water body where the groundwater elevations are low with respect to river stage.

Groundwater Wells

Different types of wells specified within MODFLOW were utilized in various scenarios to aid in the collection and evaluation of data. Location of these monitoring points are illustrated on Figure A-3. The types of wells include:

Head Observation Wells were used to represent existing on site groundwater monitoring wells. The heads at these virtual wells were used to evaluate model calibration. The observation elevation was specified to be the middle of the screened interval.

Concentration Observation Wells were used to observe arsenic concentrations at various observation points. The observation wells provided spatial and temporal data about arsenic concentrations throughout the modeling scenarios.

Pumping Wells were utilized in the model to help design the proposed hydraulic containment system by evaluating the performance of different system configurations. The pumping system is intended to work in coordination with the proposed passive attenuation wall in intercepting arsenic before discharging to Lake Washington.

Hydraulic Flow Parameters

The groundwater flow model requires definition of several hydraulic parameters: hydraulic conductivity (K), specific storage (Ss), and specific yield (Sy). Two aquifers at the Barbee Mill facility were modeled: an unconfined aquifer with a free pheratic surface (Layer 1) and a confined aquifer (Layer 4). Layers 2 and 3 represent the aquitard, with flow generally normal (up or down, depending on location) to the prevailing horizontal flow direction. The model includes the area of backfilled excavation in Layer 1.

Specific storage is given a typical value of 0.0001 (ft^{-1}) across the model. Specific yield, which can be related to an unconfined storage coefficient, is slightly less than total porosity (0.32) with a specified value of 0.25. These values are similar to what was used in previous modeling efforts. The storage parameters for the backfilled excavation were assumed to be the same as the pre-excavation material.

Magnitude and distribution of hydraulic conductivities were initially estimated from values reported in the IRAP (Hart Crowser 2000), the Quendall modeling report (RETEC 1998), recent hydraulic testing, and boring logs. The backfilled excavation was simulated using a high hydraulic conductivity. Final hydraulic conductivities were refined as part of the calibration process described below.

Calibration

The Barbee Mill groundwater flow model was calibrated using an iterative process in which initial estimates of aquifer parameters (e.g. hydraulic conductivity) and constant elevation boundary cells were adjusted within the range of uncertainty to produce simulated groundwater elevations that best matched site data. The model was initially calibrated to groundwater elevations collected on June 23, 2006, approximately 2 months after excavation and backfill activities were completed.

Table 1 presents the final distribution of hydraulic conductivity and constant head values following calibration. The final values are consistent with previously reported values and more recent field measurements.

Table 2 presents the June 23, 2006 groundwater elevation data and final calibrated head values of all available monitoring points on the Barbee Mill facility. Figure A-4 graphically illustrates observed versus calibrated values. Inspection of the data indicates that the simulated head values favorably agree with measured values with a standard error of 0.27 ft and a correlation coefficient of 0.88. The one notable exception is HCMW-05s, with nearly a ~2 foot discrepancy. However, based on its location, the fact that the well is screened across two hydrogeologic units, and its proximity to May Creek, the data point may not be the most representative of any one aquifer condition. All calculated head values fall within the 95 percent interval, with all but three inside the 95 percent confidence interval (Figure A-4).

The solution technique specified in MODFLOW was the WHS Solver with typical head change and residual closure criterion resulting in acceptable mass balance.

Contaminant Transport Model

Groundwater contaminant transport at the Barbee Mill facility was simulated using the RT3Dv2.5 computer code (Clement 2002), the current extension of the original MT3D code (Zhang 1990). RT3Dv2.5 is a three-dimensional solute mass transport model capable of simulating advection, dispersion, and chemical reactions in groundwater flow, and is designed to be used in conjunction with MODFLOW.

RT3D simulates solute transport by tracking particles representing the solute plume through the established flow field. Features such as dispersion and chemical reactions can be turned on or off as the situation requires. Different values for the parameters defining the dispersion and reaction terms in the model can be assigned to different model regions, allowing simulation of heterogeneous physical and chemical conditions. The contaminant transport model assumes that any changes in solute concentration have minimal effect on fluid density and, therefore, do not alter the flow field.

Transport Model Parameters

The groundwater transport model simulates dispersion and sorption, and requires assigning effective porosity (n_e), dispersivity (α), and the partitioning coefficient (K_d). Partitioning was simulated assuming a linear isotherm with no kinetics or decay. The process we used in estimating these input parameters is discussed in the following paragraphs.

Effective Porosity. The effective porosity represents the connected pore space through which groundwater can flow, and is always less than or equal to total porosity. We applied a uniform value for effective porosity of 0.25, equal to that of the specific yield.

Dispersivity. Field scale estimates of dispersivity are difficult to accurately quantify. However, as a general rule longitudinal dispersivity (α_L) can be estimated as approximately 1/10th the plume length. Assumed typical flow path lengths from the excavation area to the discharge point (Lake Washington) are 500 ft. Thus, α_L was assumed to be 50 ft. Transverse dispersivity was assumed to be one order of magnitude

smaller than α_L, or 5 ft. Vertical dispersivity was assumed to be two orders of magnitude smaller than α_L, or 0.5 ft. Molecular diffusion was not considered an important transport mechanism, and was not simulated.

Partitioning Coefficient. The soil-water partitioning coefficient (K_d) for arsenic was estimated from several site specific studies as described in the IRAP Addendum (Aspect 2006) and the preceding Engineering Design Report. An average K_d value of 3.4 L/Kg was utilized for the base modeling scenario.

Contaminant Initial Concentrations and Boundary Conditions

Initial arsenic concentrations outside of the impacted plume area were assumed to be the average site background concentration (0.009 mg/L). An upgradient constant concentration boundary condition was also specified across all layers equal to 0.009 mg/L for the length of each simulation.

Within the impacted plume area, initial arsenic concentrations were specified based observations during post remedial investigations, as detailed in the Engineering Design Report. The base scenario included an arsenic concentration of 0.15 mg/L along the margins of the excavation and a concentration of 1.5 mg/L extending from the downgradient edge of the excavation to Lake Washington. Figure A-5 illustrates the initial concentration of arsenic in the base model run.

The specified condition was run for a period of approximately 10 to 15 years to allow the initial specified concentration to contour and allow the dispersive front on the leading edge of the plume to develop. This scenario is most representative of existing site conditions where the plume has been in-situ and maturing over the past ~60 years.

Transport Model Sensitivity Analysis

Contaminant transport model input parameters were based on site-specific data, literature values, or best professional judgment. When there was a choice between two values for a single parameter, the more conservative value was selected. To assess the effects of these conservative assumptions, a sensitivity analysis was performed. Primary input parameters evaluated for model sensitivity were the groundwater flow velocities, the partitioning coefficient, and dispersivity.

Additional sensitivity data with respect to initial arsenic concentrations, variation of K_d, and Lake Washington stage elevation is summarized in the preceding Engineering Design Report.

Stage of Lake Washington – The final hydraulic scenario selected for use with the contaminant fate and transport model utilized the early summer (June) condition. During the spring, the United States Corps of Engineers traditionally raise the stage of Lake Washington. In contrast, the stage is at it's lowest in the late fall and winter. Raising the stage of Lake Washington effectively increases the downgradient boundary condition and reduces the hydraulic gradient across the site. A smaller hydraulic gradient manifests itself as a lower groundwater velocity; therefore, less flushing occurs. In contrast, during

the winter (and low lake level), a higher hydraulic gradient would be present, allowing higher groundwater velocities and arsenic flushing rates.

Dispersivity – Increasing dispersivity has two effects. Short term, it slightly decreases breakthrough time as the leading edge of the contaminant plume is more spread out. Long term, as steady-state transport conditions are approached, increased dispersion has the effect of reducing plume concentrations. Reducing dispersivity has the opposite effect. Short term, the leading edge takes longer to travel downgradient but, long term, the steady state concentrations are higher.

Sorption – Soil-water partitioning coefficients (K_d) describe the relative ratio between the concentration of contaminant in water to the concentration in soil, thus given units of L/kg. Increasing the corrected K_d results in a retarding movement of the contaminant downgradient, as more of the solute is sorbed to the aquifer solids. A decrease in K_d for the sensitivity analysis indicates a more mobile solute, and proportionally longer plumb length. The inclusion of the K_d in this sensitivity analysis is for completeness only. Uncertainty in values is relatively small when compared with other factors that dominate contaminant transport at the site. Moreover, the calculated K_d is based on site-specific data and are consistent with the range of literature values. The calculated site-specific values ranged from 1.8 to 6.8, with an average value in the areas of elevated arsenic concentrations of 3.4 L/kg.

Conservative assumptions were used in selecting contaminant transport model input parameters. Sensitivity analysis shows the effect of the conservation is to decrease predicted arsenic travel times and to increase predicted concentrations. The use of conservative assumptions in the transport modeling likely under predicts contaminant migration downgradient of the impacted plume area, providing a margin of safety when applying model results.

Time Steps

Time steps were chosen so that relative contaminant migration could be effectively monitored and related to different points in time. The model represents site conditions following remediation and monitors the elution of arsenic for approximately 200 years.

Results

The following sections present the results of the Barbee Mill facility's groundwater flow and contaminant fate and transport model.

Groundwater Flow Model

The results of the steady state groundwater flow model define the flow conditions for the contaminant fate and transport model. Primarily depending on the gradients, groundwater flow velocities, and flow directions, calibration of the groundwater flow model is critical to accurately representing contaminant migration.

The calibrated distribution of hydraulic conductivity is presented in Table 1, with the final steady state groundwater contours illustrated in Figure A-6. These contours represent the hydraulic conditions encountered during the June 23, 2006 monitoring event and are used throughout the time span of the model. As discussed above, seasonal variation, which is dominated by the stage of Lake Washington, is assumed to only increase groundwater velocities and decrease remediation time.

Observations on the hydraulic characteristics of the calibrated groundwater flow model include:

Hydraulic Conductivities. The final calibrated saturated hydraulic conductivities are within the range of previously reported data for that portion of the site outside the area of soil excavation and reflects the zone of high permeability backfill in the excavation area.

Groundwater Velocities. The linear groundwater flow velocities are consistent with previously reported data. In addition, fall (low lake) groundwater velocities are on average 8 percent larger than spring (high lake) groundwater flow velocities. Furthermore, it is estimated that the relatively permeable backfill used during remediation increased the groundwater flow velocities downgradient of the excavation, near the shoreline approximately 35 percent. Final groundwater velocities are presented in Table 3.

Vertical gradients. The model accurately depicts a downward hydraulic gradient on the eastern extent of the site transitioning to an upward gradient toward the hydraulic discharge point of Lake Washington. Near the discharge point, groundwater flow is nearly vertical.

Groundwater – Surface water interaction. Consistent with the vertical gradients described above, May Creek is initially a loosing creek to the east, but begins to gain water as its course nears Lake Washington and dominates the flow regime in the shallow fill.

Groundwater Extraction System

The purpose of the groundwater pump and treat system is to remove additional arsenic mass to enhance the performance of the passive attenuation wall, and to provide a contingency method of containment. The number, location, and required flowrate from

groundwater pumping wells were adjusted to optimize capture while reducing total volume extracted. Each pumping well was specified to withdrawal from a completed interval of 5 to 15 feet below ground surface. To allow ease of future access and maintenance of the system, the location of the wells were restricted to either the street or public easements (e.g., the access path leading north to the Quendall Property).

In order to evaluate the effectiveness of capture, MODFLOW's particle tracking package, MODPATH, was utilized. MODPATH results show the advective movement of particles as flow lines through an established groundwater flow field. A ring of particles (elements used to designate flow lines) were placed within each cell containing a pumping well. Then, the particles were traced backward through the flow field to represent the capture area; therefore, as the flowrate is increased, the width of capture also increases. Hydraulic capture of groundwater is achieved when flow lines from adjacent wells overlap.

Figures A-7 through A-12 illustrates the pumping capture zone of one well (completed in the fill unit) at 0.5, 0.75, 1.0, 2.0, 3.0, and 4.0 gpm. As expected, modeling results indicate capture efficiency of pumping wells completed in the excavation backfill is reduced due to the increased permeability of the material; therefore, a proportionally higher extraction rate is required to achieve the same capture.

Optimal placement of the wells suggests that steady-state hydraulic capture is achieved with a minimum of five wells – four withdrawing at a rate of 1.0 gpm and one withdrawing at 4.0 gpm, as illustrated in A-13. However, to account for hydraulic uncertainties and to specify a robust system design capable of various pumping and operational scenarios, design capture is obtained using three wells withdrawing 4.0 gpm from the excavation backfill and 5 wells withdrawing at 1.5 gpm from the fill, as illustrated in Figure A-14.

Contaminant Fate and Transport Model

The calibrated transport parameters are summarized in Table 4. Figures A-15 through A-17 illustrates the temporal flushing of arsenic migration over a 200 year period. Results from three different monitoring points are provided: one at the centerline of mass, and one at each the eastern and southern margins of the plume, as illustrated on Figure A-3.

Figures A-18 through A-21 illustrates the spatial distribution of arsenic at 5 years, 20 years, 100 years, and 200 years following the soil removal action (with no additional remediation).

Figures A-22 through A-24 illustrate the spatial distribution of arsenic at 5 years, 20 years, and 100 years following the soil removal action and assuming groundwater extraction reduces the maximum concentration of arsenic downgradient of the excavated area to be 0.5 mg/L.

Figures A-25 and A-26 illustrate the concentration of arsenic extracted from a single well within the excavation footprint near the center of mass (Figure A-25) and along the margin of the impacted area (Figure A-26).

To evaluate the restoration timeframe for arsenic impacted groundwater, located between the downgradient edge of the PAZ and the discharge point into the lake, concentrations upgradient of the proposed wall were reduced to zero (representing in-situ treatment by

the wall) then allowed to naturally attenuate with time. Results of this analysis are illustrated by Figure A-27 and discussed further in the Engineering Design Report.

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Tables and Figures

Table A-1 – Calibrated Hydraulic Conductivity and Boundary Condition Values

Table A-2 – Measured and Calibrated Groundwater Elevation Values

Table A-3 – Calibrated Groundwater Flow Velocities

Table A-4 – Calibrated Transport Parameters

Figure A-1 – Groundwater Flow Model Domain

Figure A-2 – Typical Cross Section of Model Grid

Figure A-3 – Model Location Map of Monitoring Points

Figure A-4 – Calculated vs. Observed Groundwater Elevation Fit

Figure A-5 – Initial Modeled Arsenic Concentrations

Figure A-6 – Calibrated Steady State Groundwater Contours

Figure A-7 – Steady State Groundwater Capture at 0.5 gpm

Figure A-8 – Steady State Groundwater Capture at 0.75 gpm

Figure A-9 – Steady State Groundwater Capture at 1.0 gpm

Figure A-10 – Steady State Groundwater Capture at 2.0 gpm

Figure A-11 – Steady State Groundwater Capture at 3.0 gpm

Figure A-12 – Steady State Groundwater Capture at 4.0 gpm

Figure A-13 – Steady State Groundwater Capture – 4 Wells at 1.0 gpm; 1 Well at 4 gpm

Figure A-14 – Steady State Groundwater Capture – 5 Wells at 1.5 gpm; 3 Wells at 4 gpm

Figure A-15 – Temporal Flushing of Arsenic – Centerline of Mass

Figure A-16 - Temporal Flushing of Arsenic – Southern Margin of Plume

Figure A-17 - Temporal Flushing of Arsenic – Eastern Margin of Plume

Figure A-18 – Spatial Distribution of Arsenic – Year 5

Figure A-19 – Spatial Distribution of Arsenic – Year 20

Figure A-20 – Spatial Distribution of Arsenic – Year 100

Figure A-21 – Spatial Distribution of Arsenic – Year 200

Figure A-22 – Spatial Distribution of Arsenic Following Pumping – Year 5

Figure A-23 - Spatial Distribution of Arsenic Following Pumping – Year 20

Figure A-24 - Spatial Distribution of Arsenic Following Pumping – Year 100

Figure A-25 – Extracted Arsenic Concentration – Center of Mass

Figure A-26 – Extracted Arsenic Concentration – Southern Margin of Plume

Figure A-27 – Attenuation of Arsenic at the Mudline

Table A-1
Calibrated Hydraulic Conductivity and Boundary Condition Values
Barbee Mill Facility

Unit	Description	Value	Unit
Layer 1	Kx/Ky	8.0E-03	cm/sec
	Kz	2.0E-04	cm/sec
Excavation Backfill	Kx/Ky	1.0E-01	cm/sec
	Kz	1.0E-01	cm/sec
Layer 2	Kx/Ky	3.0E-04	cm/sec
	Kz	2.0E-05	cm/sec
Layer 3	Kx/Ky	3.0E-04	cm/sec
	Kz	2.0E-05	cm/sec
Layer 4	Kx/Ky	1.41E-02	cm/sec
	Kz	1.41E-02	cm/sec

Location	Description	Value	Unit
Lake Washington	Constant Head	15.02	feet
Upgradient (Layer 4)	Constant Head	24.00	feet
May Creek	River Package	(1)	

Notes:
(1) River cell conductance was calculated assuming: ground surface equal to riverbed elevation, stage = riverbed elevation + 1 ft, M=1.0 ft, K = 1.0e-4 cm/sec, and W=10 ft.
(2) Elevations are in MSL.

Table A-2
Measured and Calibrated Groundwater Elevation Values
Barbee Mill Facility

Well	Observed Head	Calculated Head	Difference
BH-17A	19.45	18.16	-1.29
BH-17B	18.44	18.34	-0.10
BH-26A	16.98	16.83	-0.15
BH-26B	17.44	17.04	-0.40
HCMW-01D	15.65	15.98	0.33
HCMW-01S	15.05	15.47	0.42
HCMW-05D	18.59	18.30	-0.29
HCMW-05S	20.4	18.26	-2.14
RMW-01	15.52	15.19	-0.33
RMW-02	15.14	15.26	0.12
RMW-05	17.06	18.49	1.43

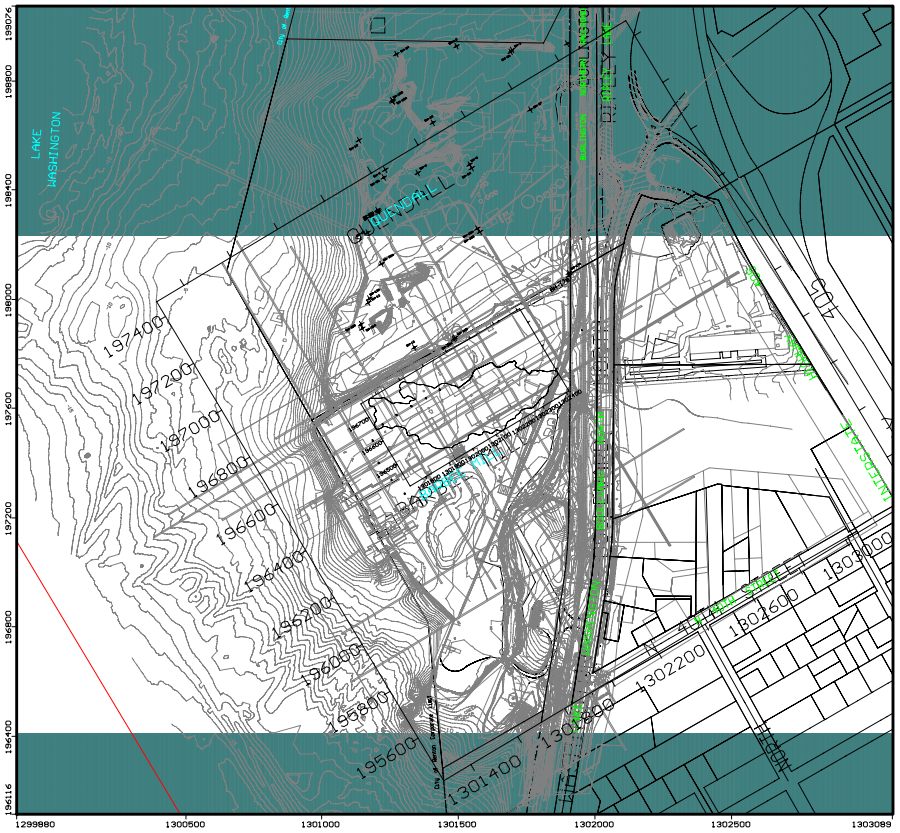
Notes:
(2) Elevations are in MSL.

Table A-3
Calibrated Groundwater Flow Velocities
Barbee Mill Facility

Location	Layer	Condition		Unit
		Spring	Fall	
East	Layer 1 - Fill	2.06E-04	2.21E-04	cm/s
	Layer 2 - Silt/Peat	6.40E-06	6.72E-06	cm/s
Center Line	Layer 1 - Fill	3.21E-04	3.50E-04	cm/s
	Layer 2 - Silt/Peat	9.70E-06	1.06E-05	cm/s
Mid	Layer 1 - Fill	3.24E-04	3.47E-04	cm/s
	Layer 2 - Silt/Peat	9.67E-06	1.04E-05	cm/s
South	Layer 1 - Fill	2.23E-04	2.58E-04	cm/s
	Layer 2 - Silt/Peat	8.20E-06	9.21E-06	cm/s

Table A-4
Calibrated Transport Parameters
Barbee Mill Facility

Parameter	Value	Unit
Distribution Coefficient	3.4	L/Kg
Dispersivity		
Longitudinal	50	ft
Transverse	5	ft
Effective Porosity	0.25	-



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Project: Barbee Mill
Description: Figure A-1
31 Jul 06

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Project: Barbee Mill
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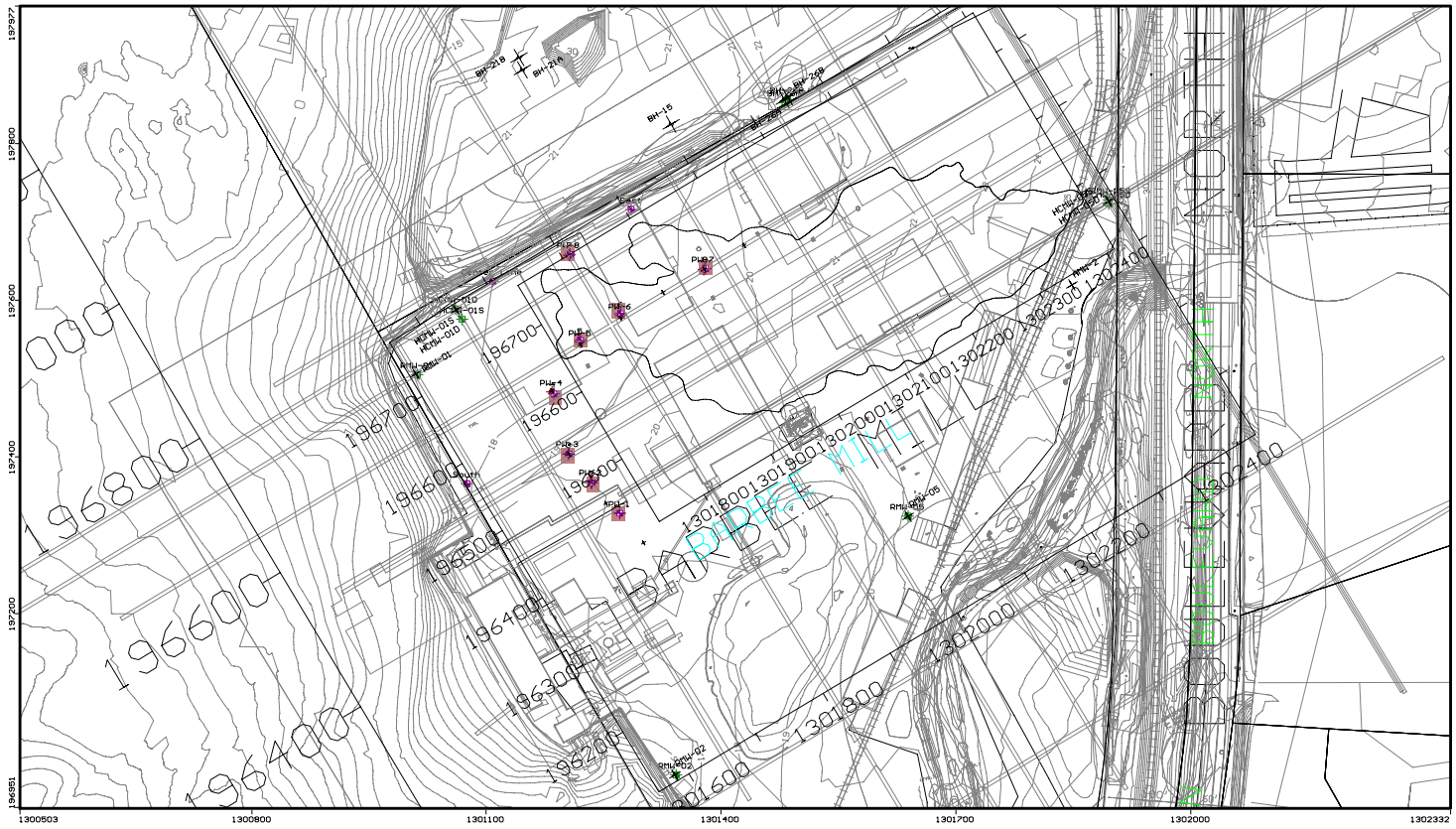

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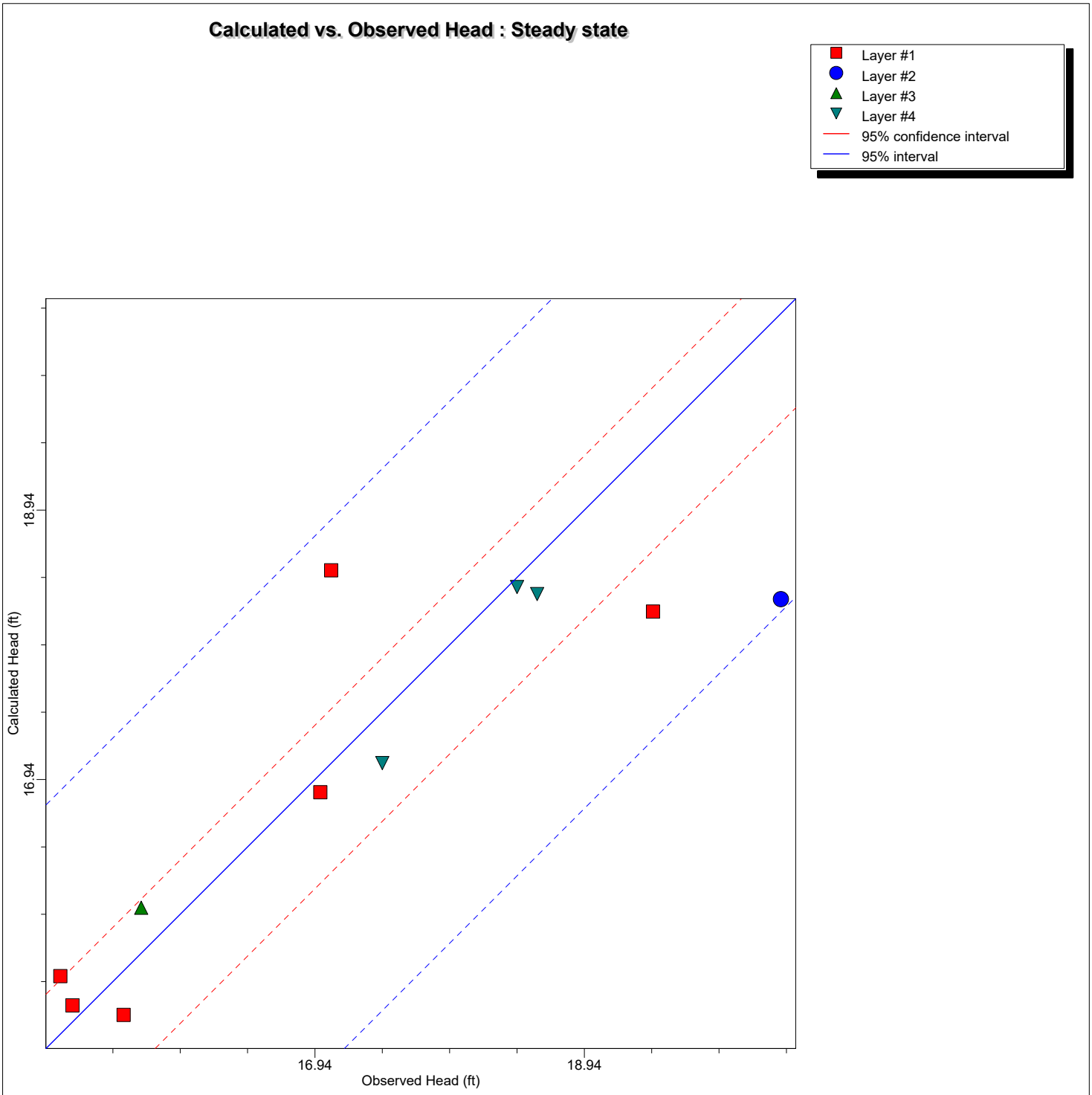


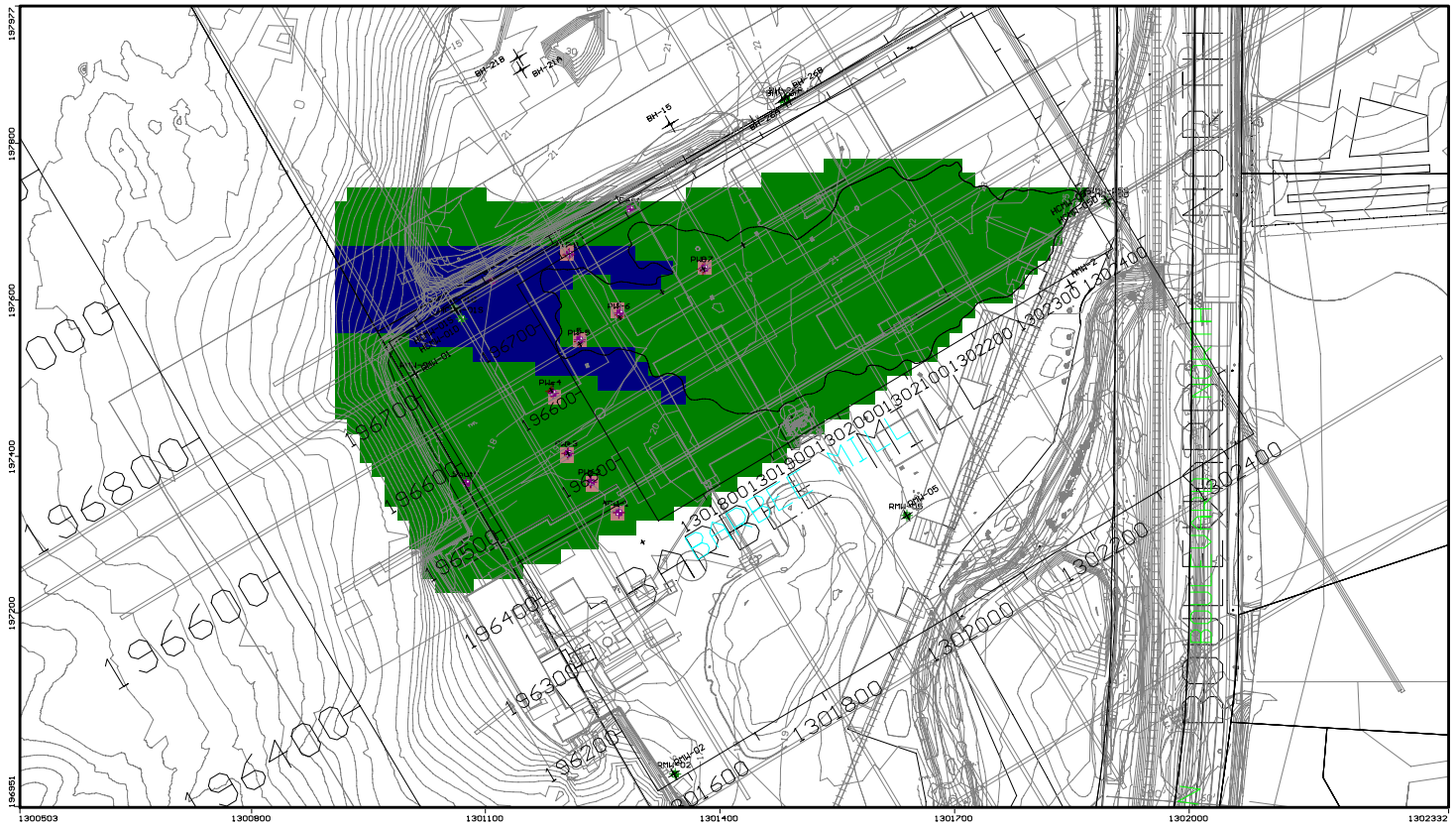
Num. of Data Points : 11
Max. Residual: -2.121 (ft) at HCMW-05S/A
Min. Residual: -0.071 (ft) at BH-17B/A
Residual Mean : -0.204 (ft)
Abs. Residual Mean : 0.627 (ft)

Standard Error of the Estimate : 0.276 (ft)
Root Mean Squared : 0.895 (ft)
Normalized RMS : 16.728 (%)
Correlation Coefficient : 0.873

Figure A-4

Waterloo Hydrogeologic, Inc.
Visual MODFLOW
VMOD Calibration server, Version 3.1.0 Build 89
(c) 1995-2002 Waterloo Hydrogeologic Inc.

Project: Barbee
Modeller:



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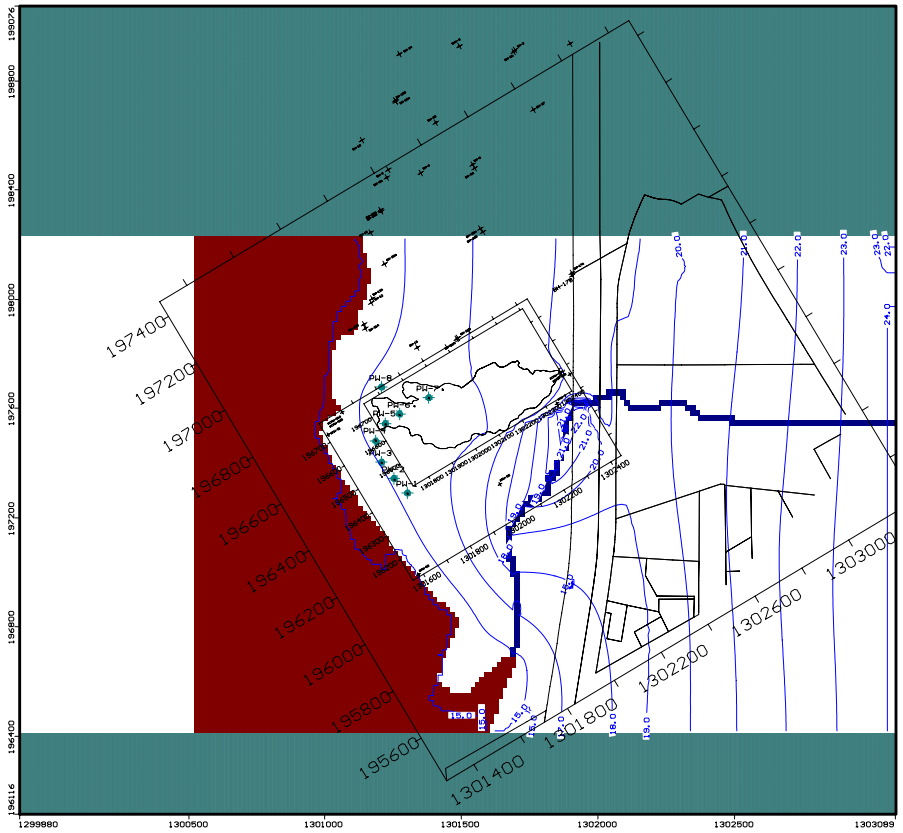

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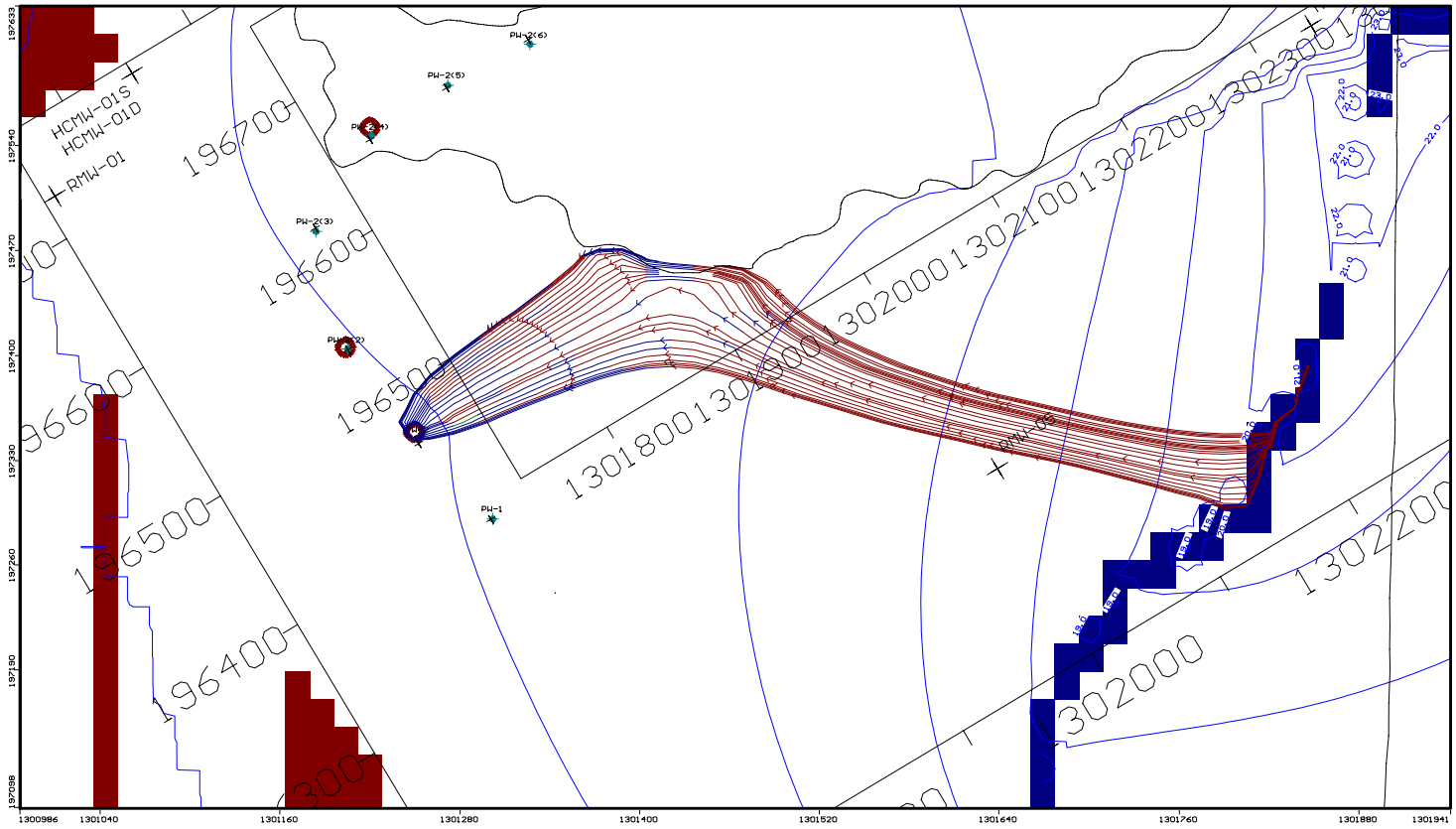

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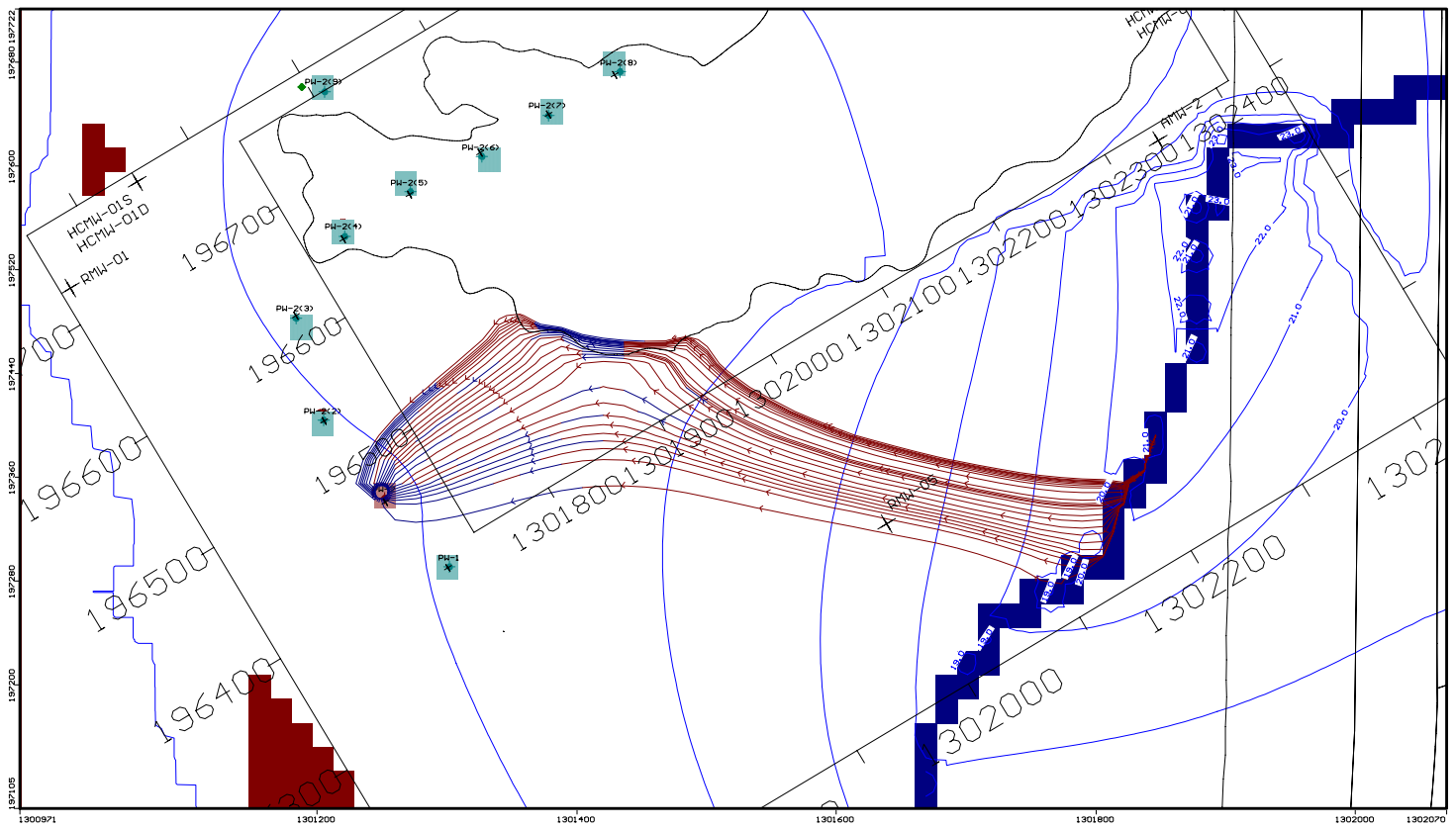

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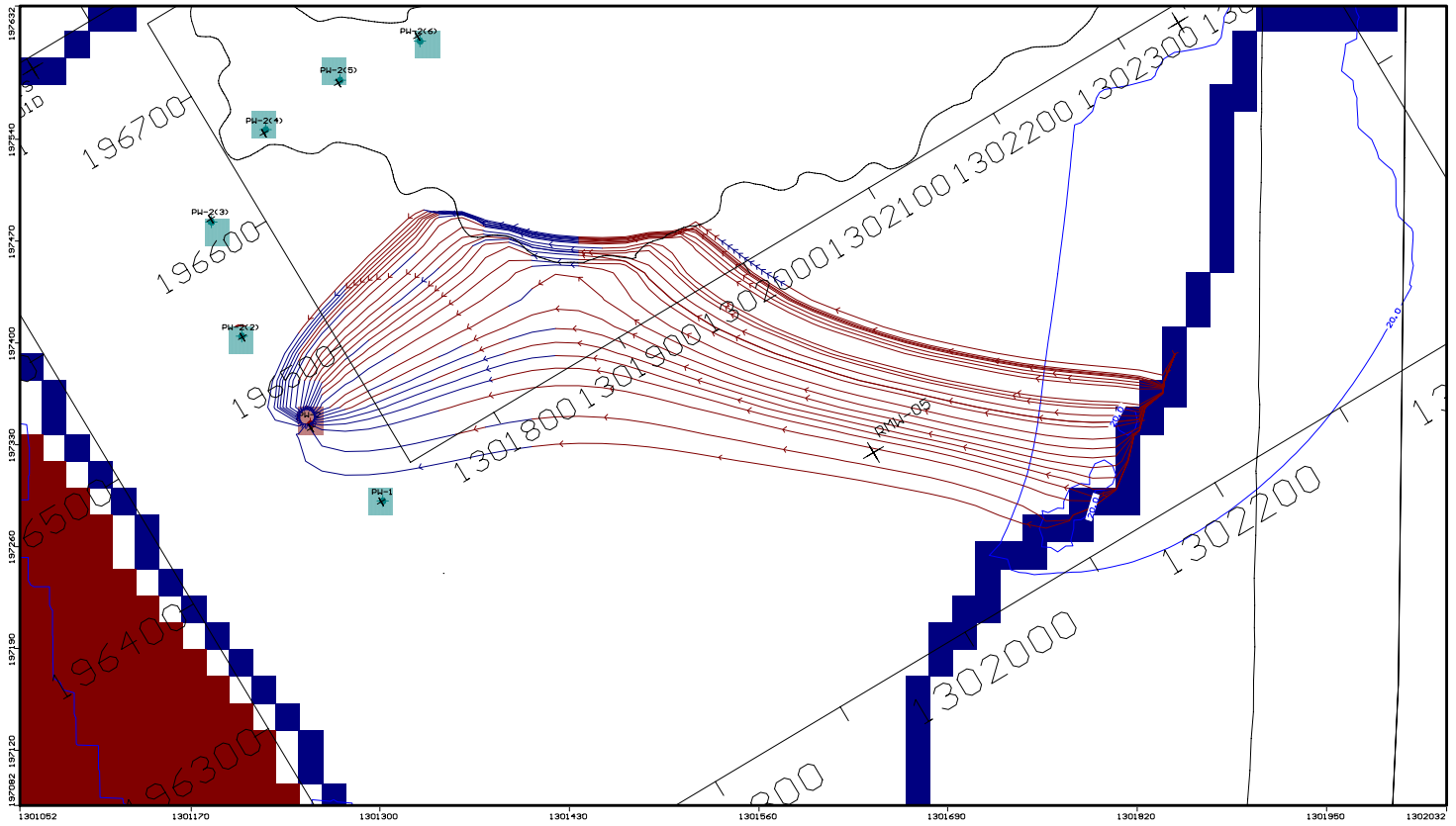

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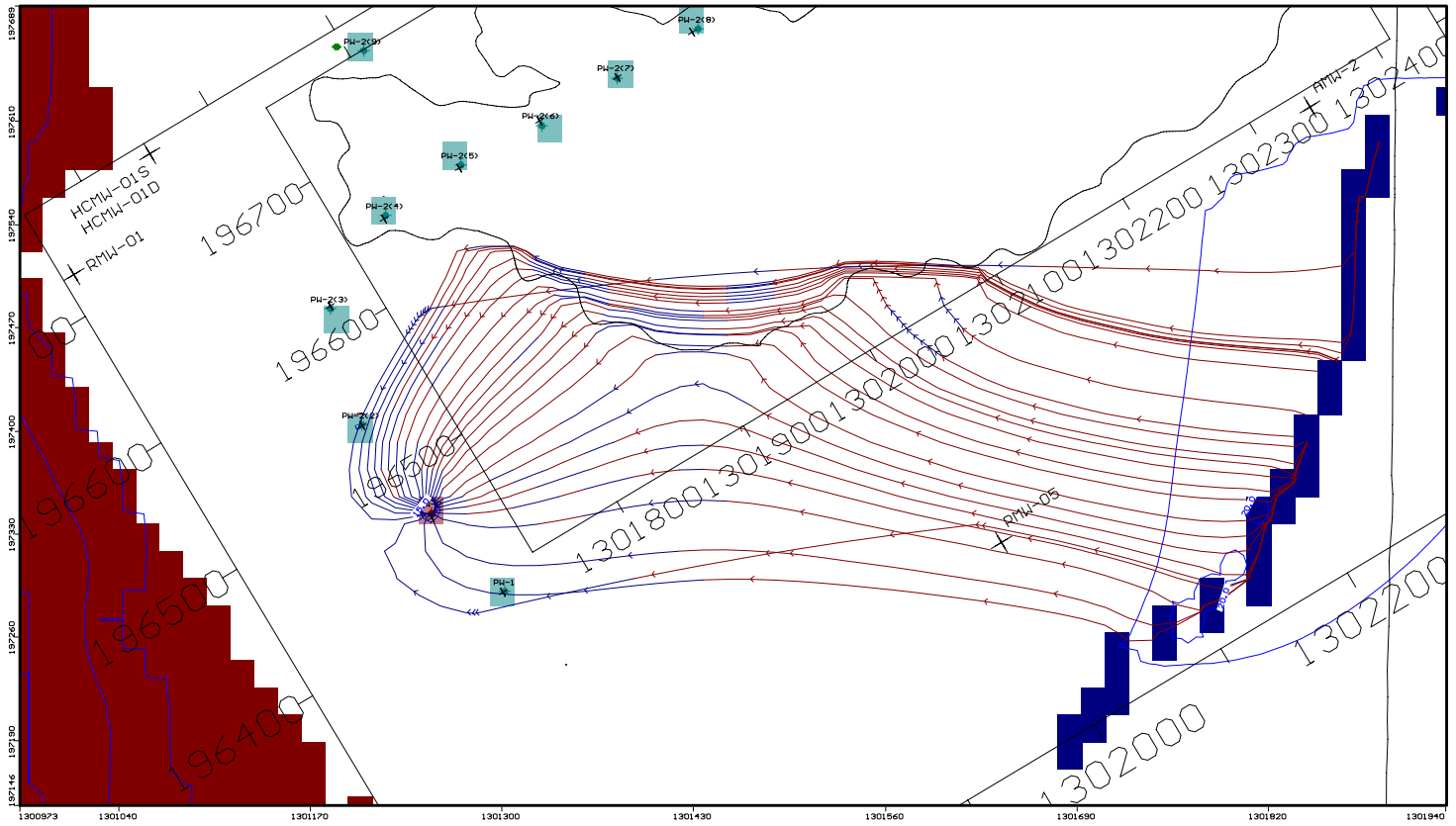

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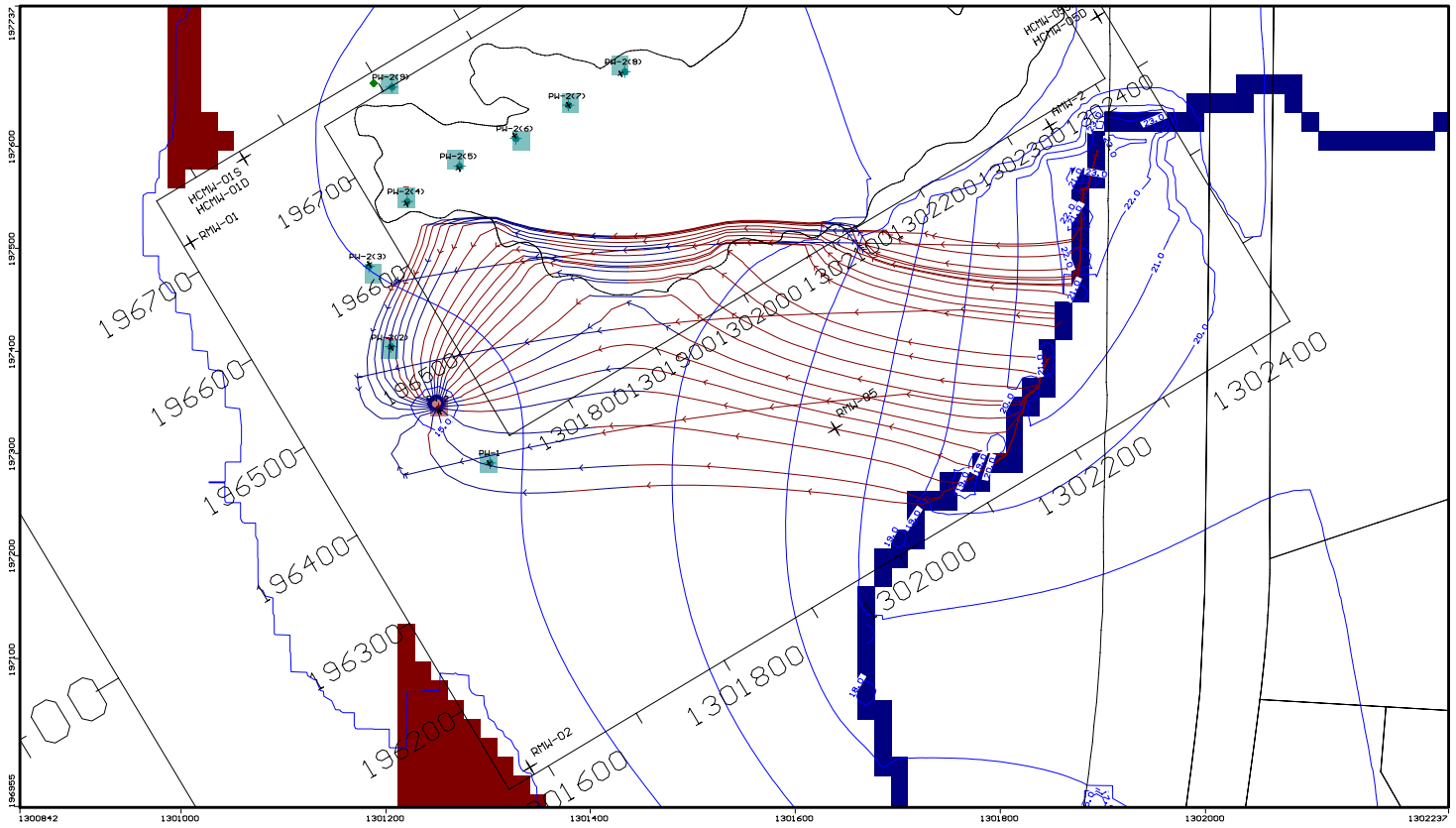

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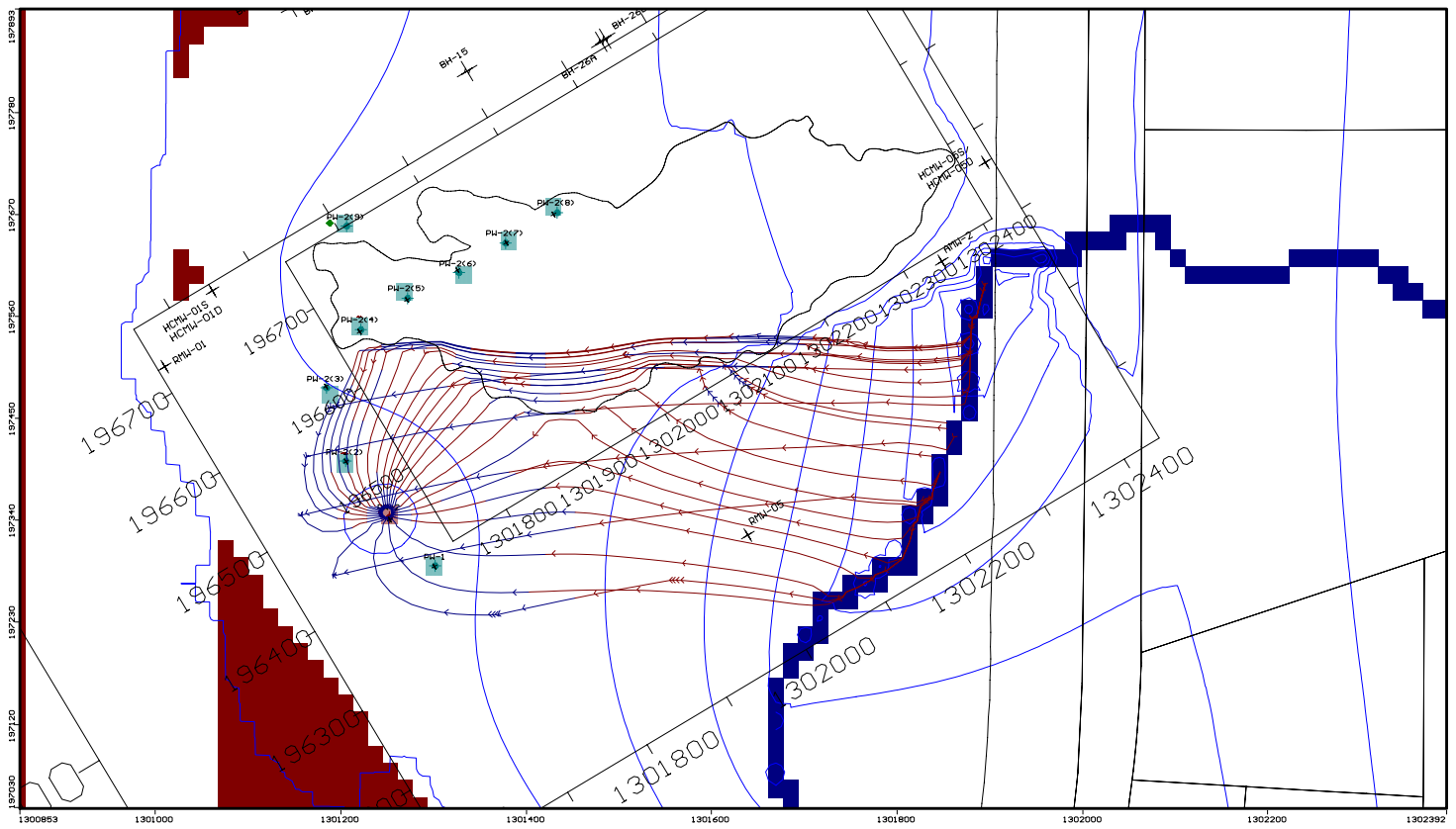

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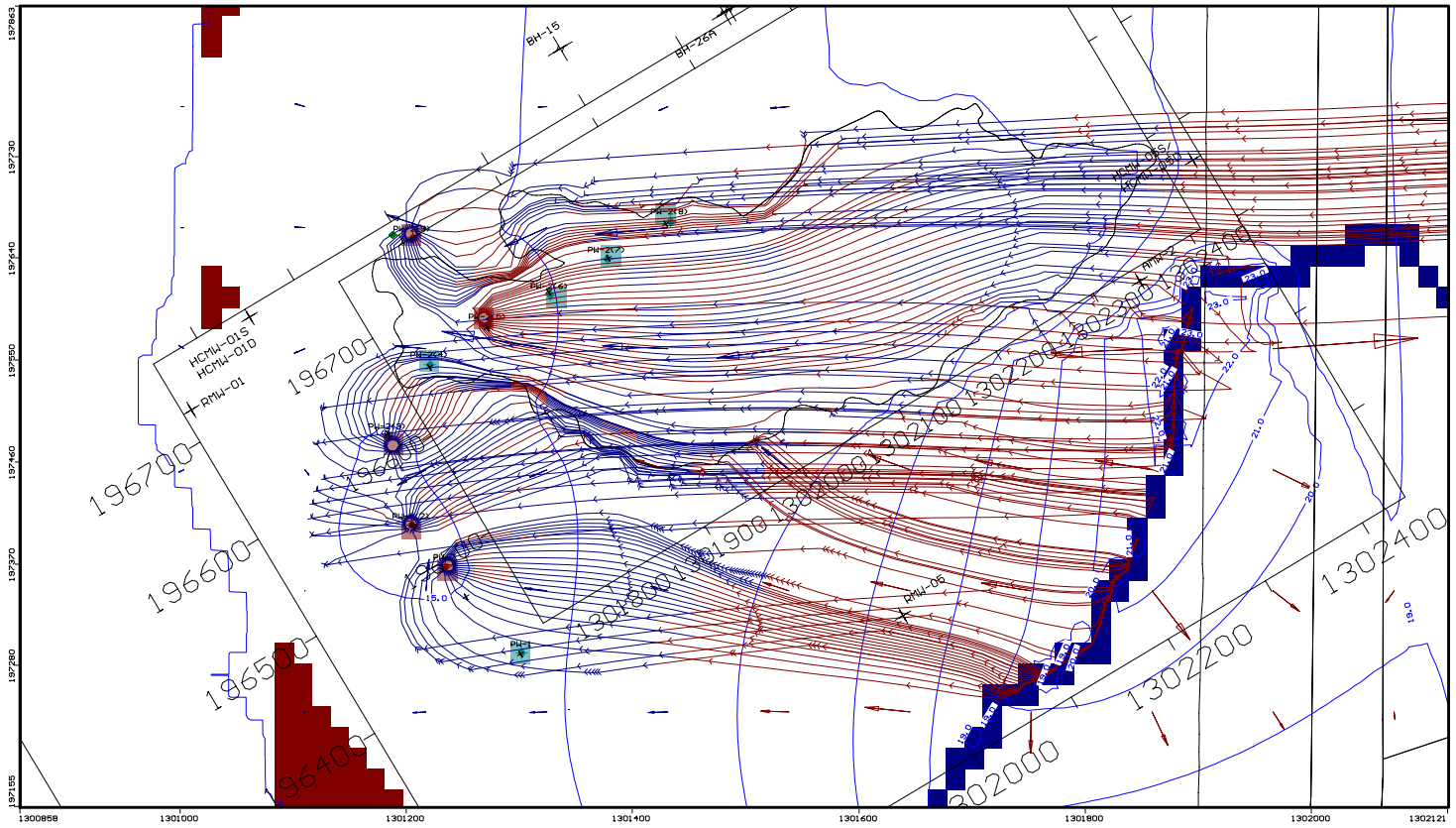

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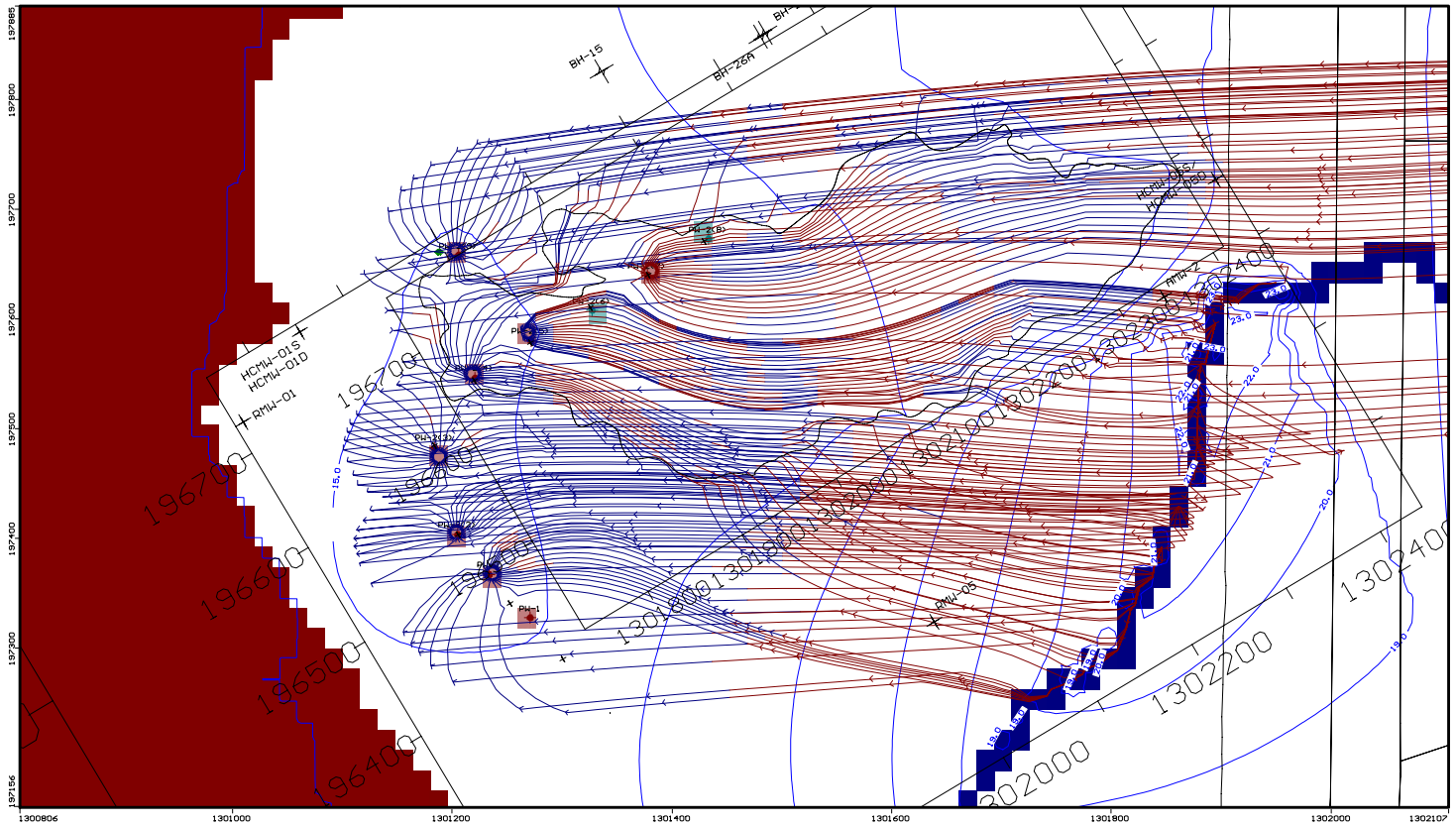

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Description: Figure A-14
31 Jul 06

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Figure A-15 - Temporal Flsuhing of Arsenic - Centerline of Mass

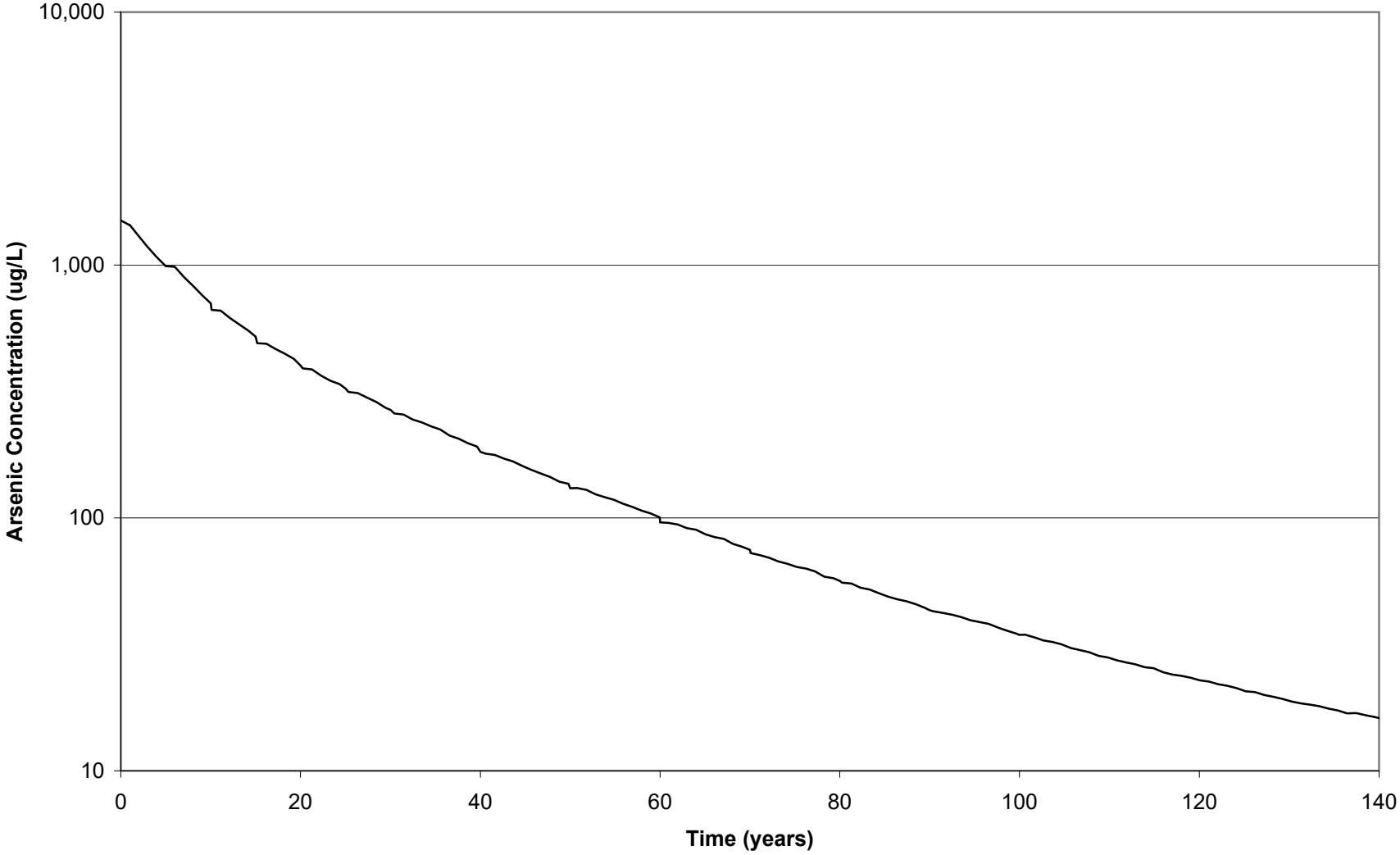


Figure A-16 - Temporal Flsuhing of Arsenic - Southern Margin of Plume

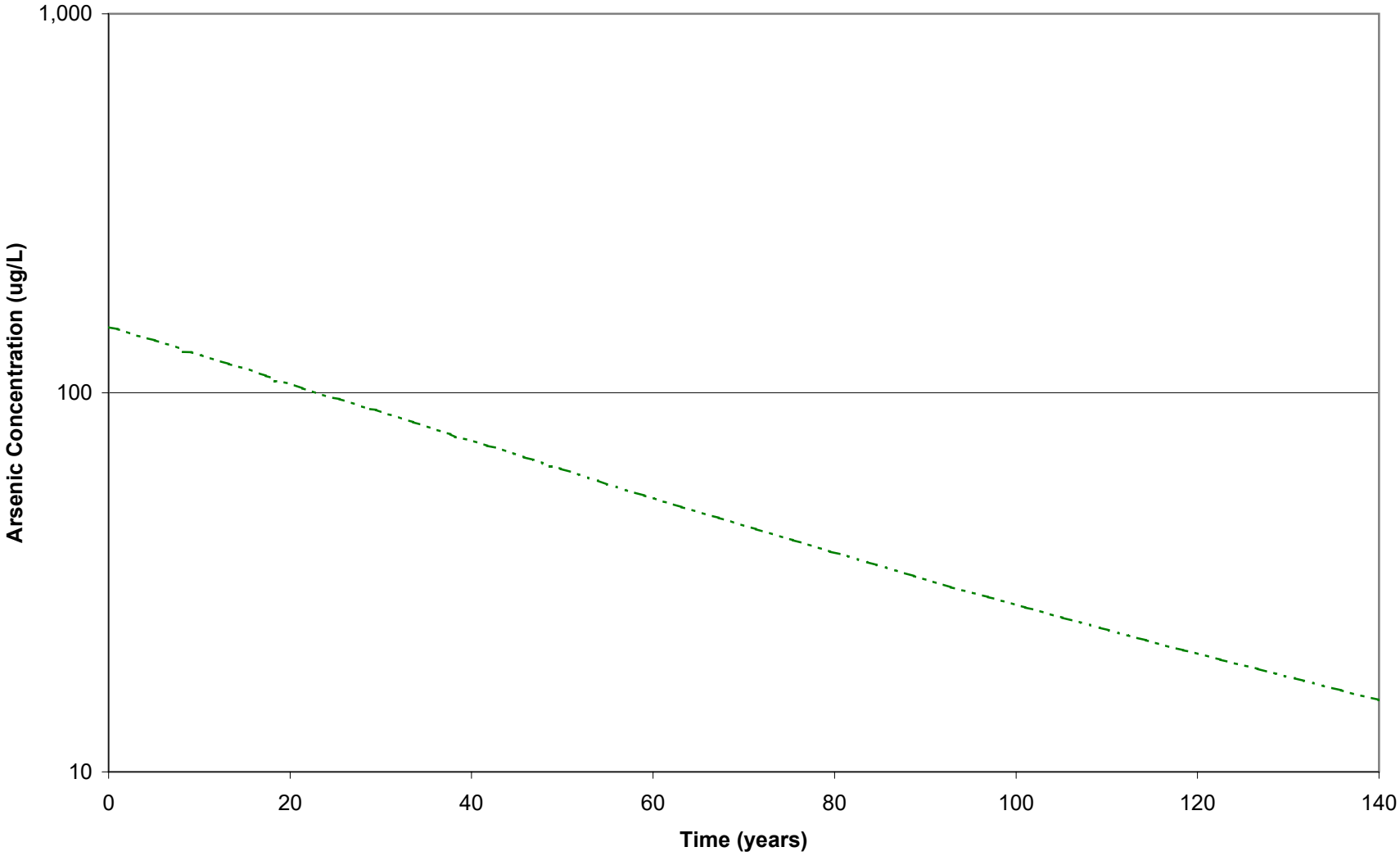
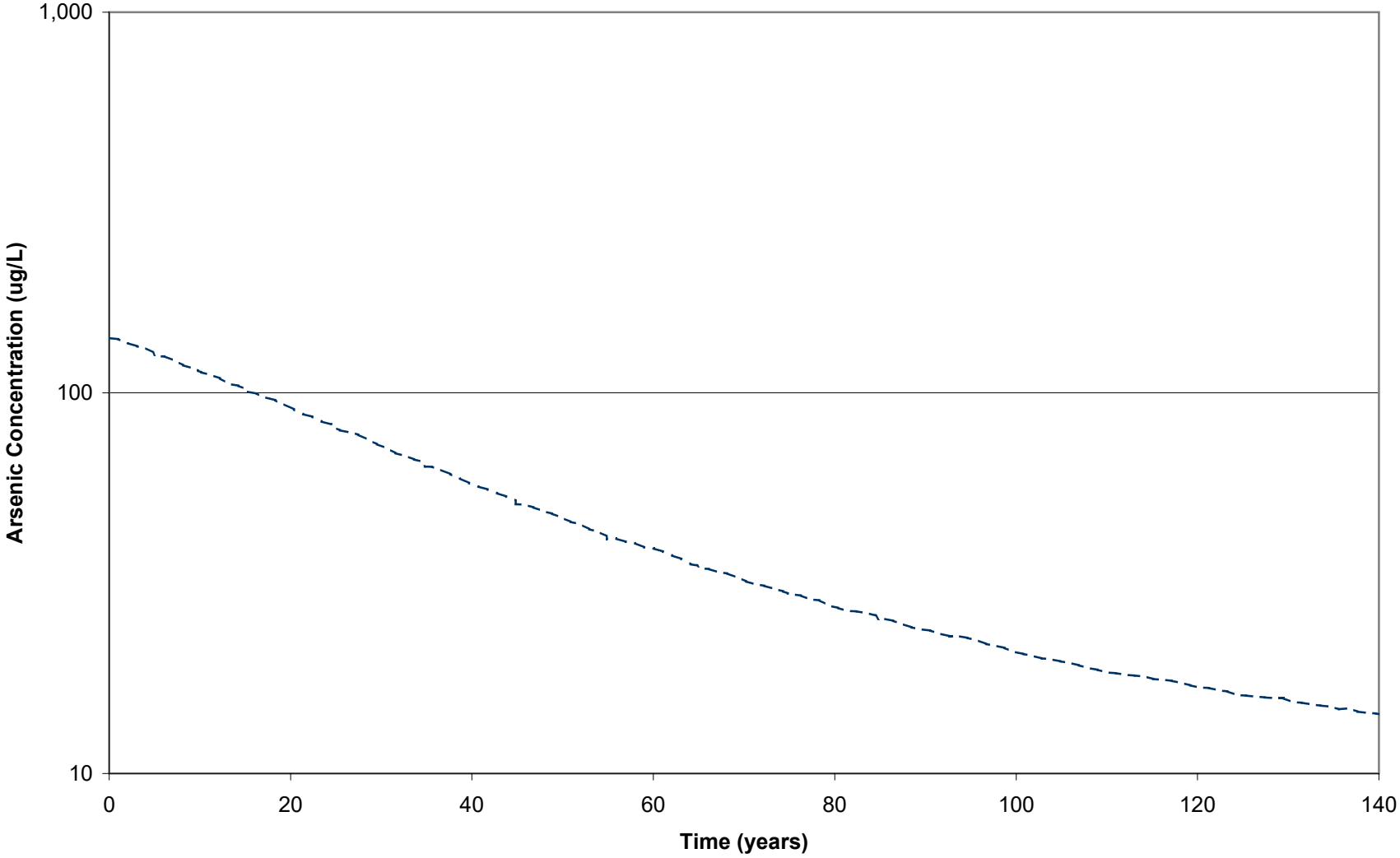
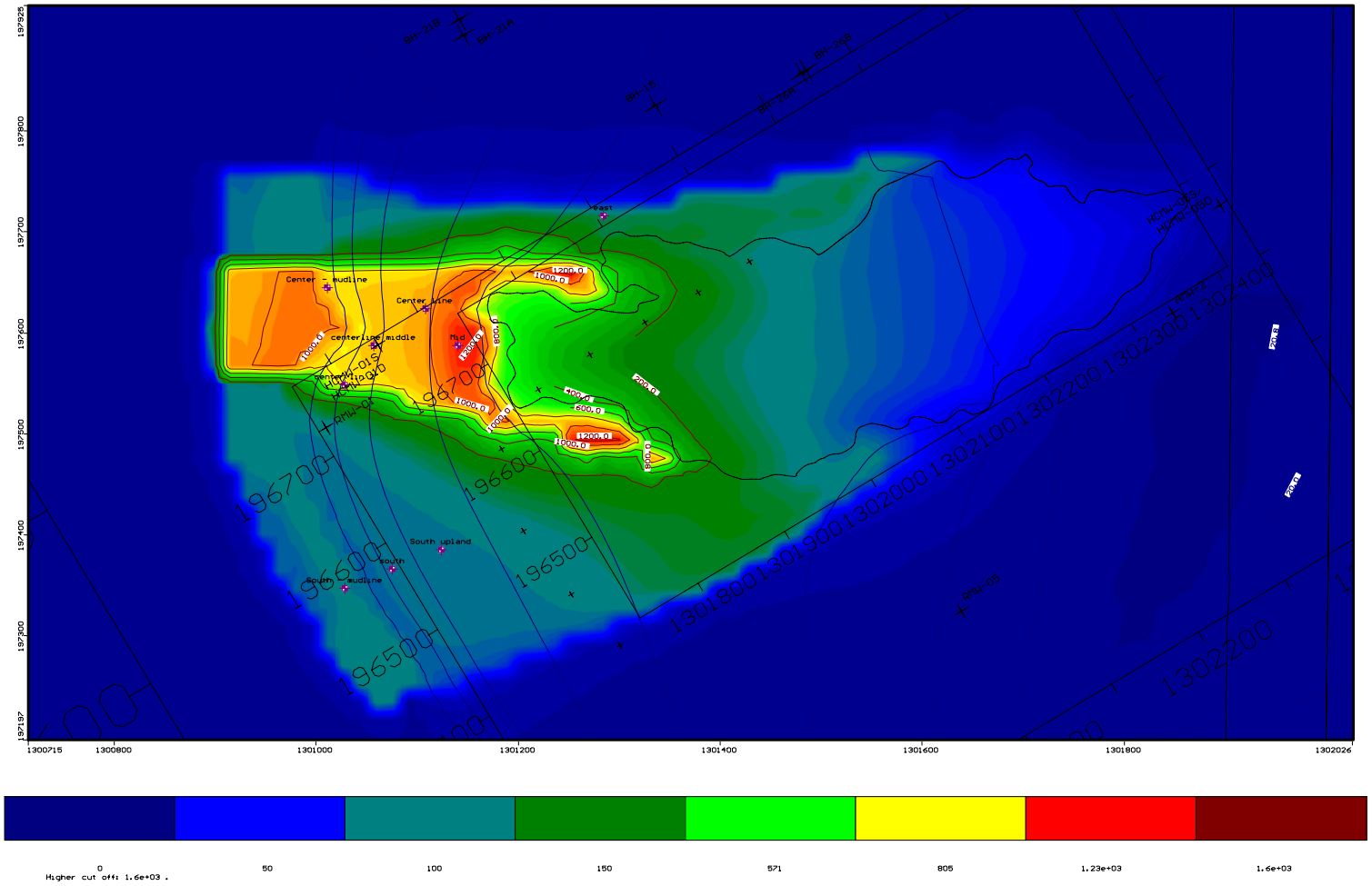


Figure A-17 - Temporal FIsuhing of Arsenic - Eastern Margin of Plume





Aspect Consulting
Project: Barbee Mill
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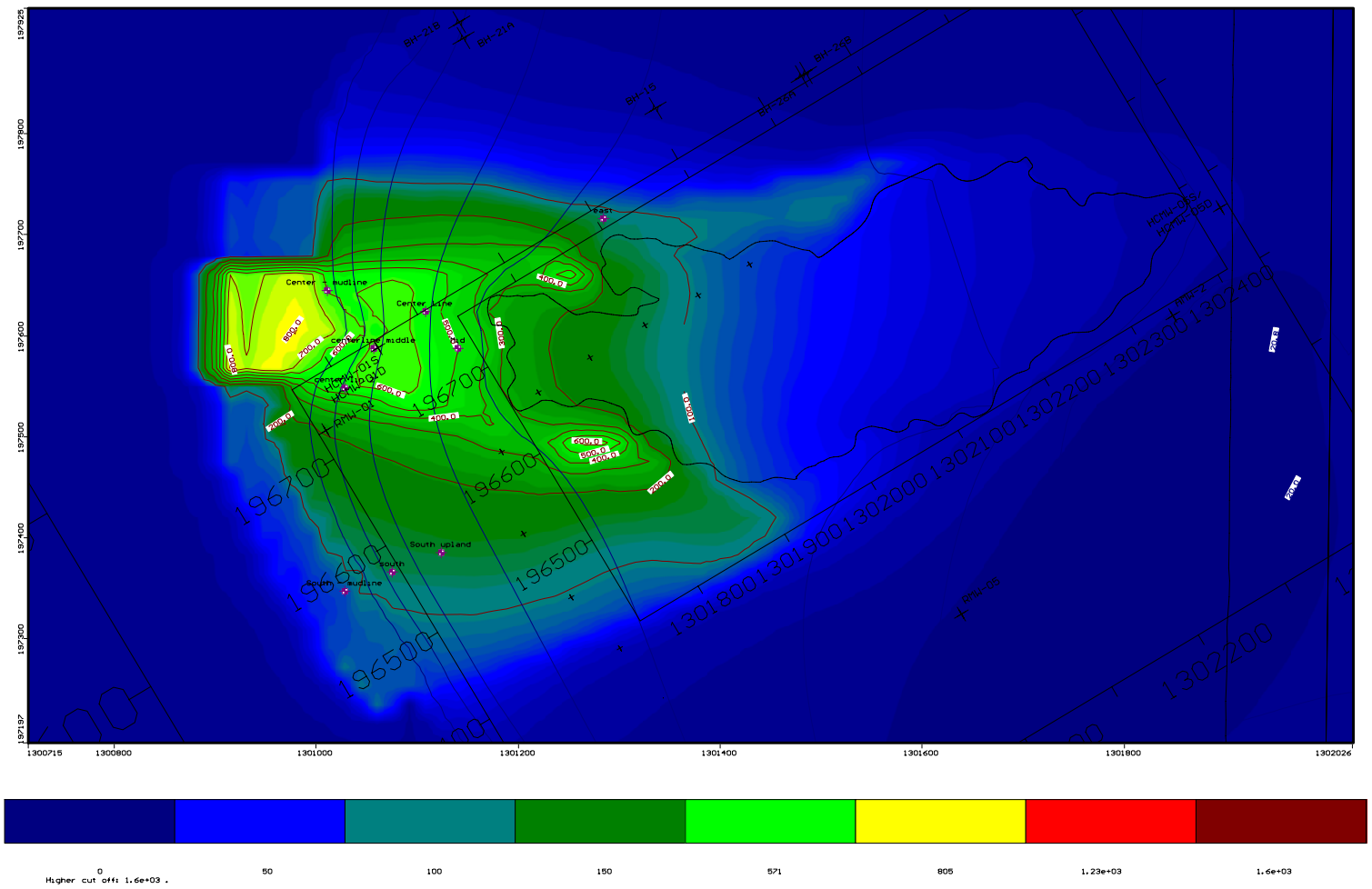

Aspect Consulting
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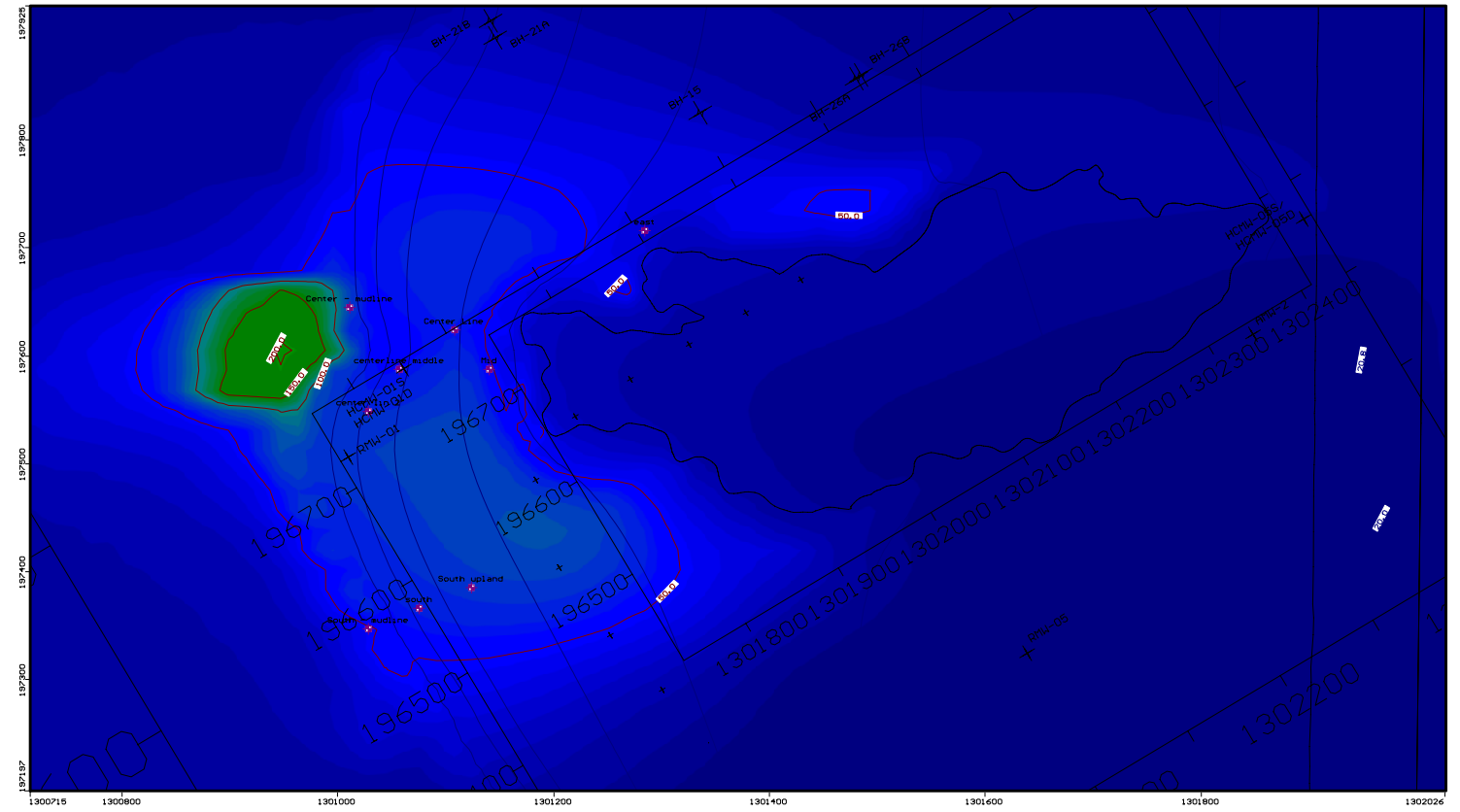

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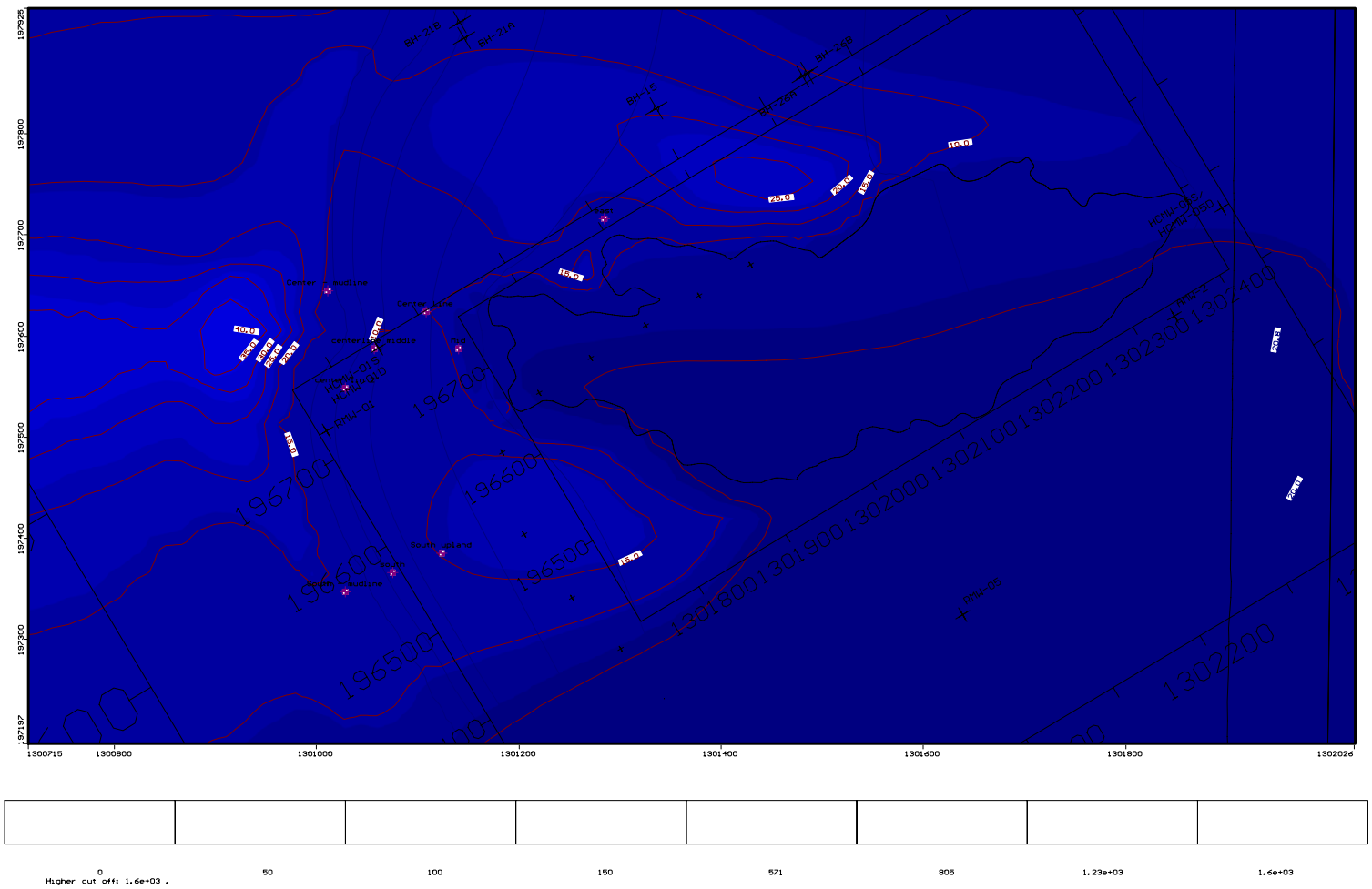

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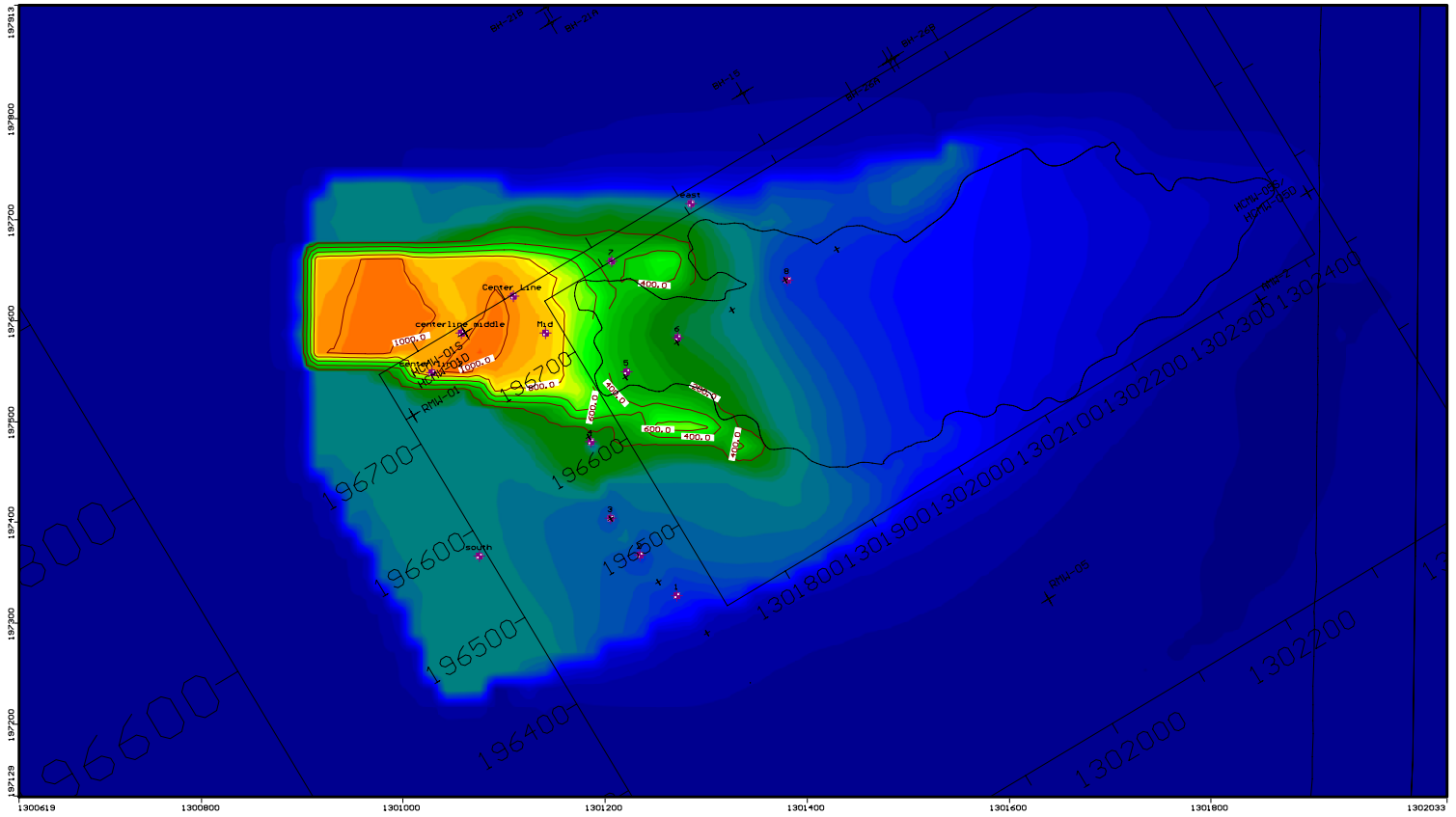

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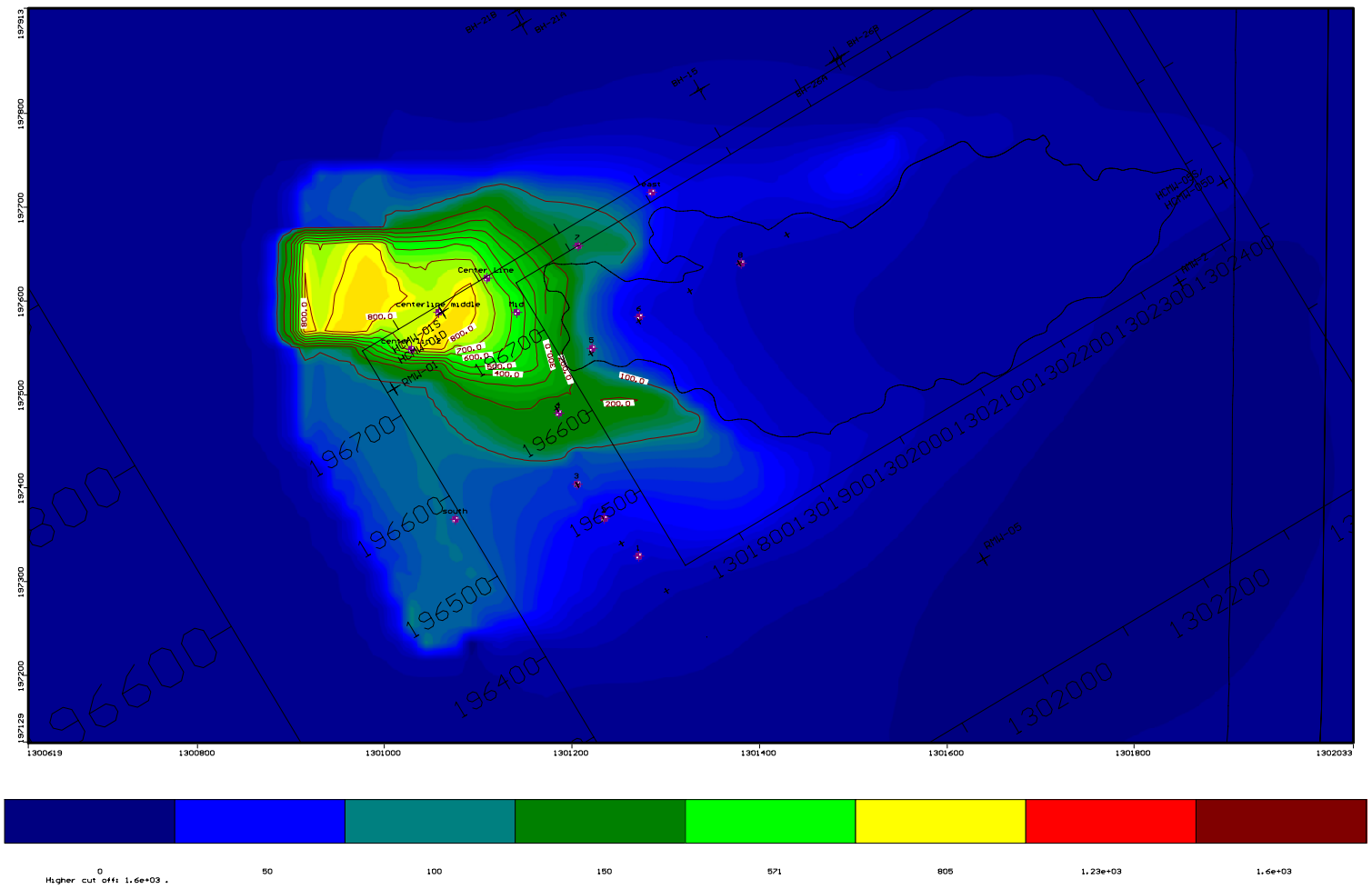

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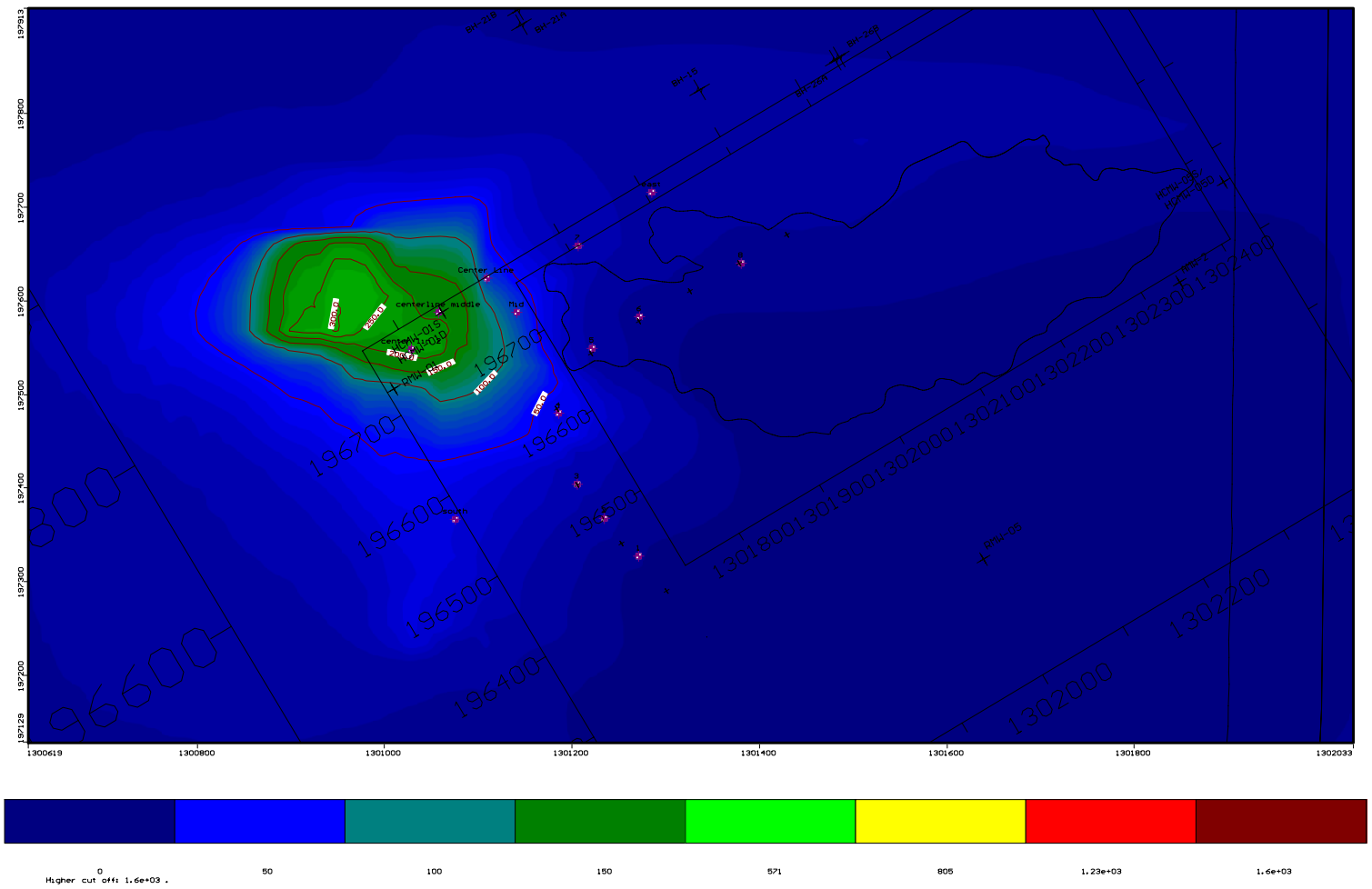

Aspect Consulting
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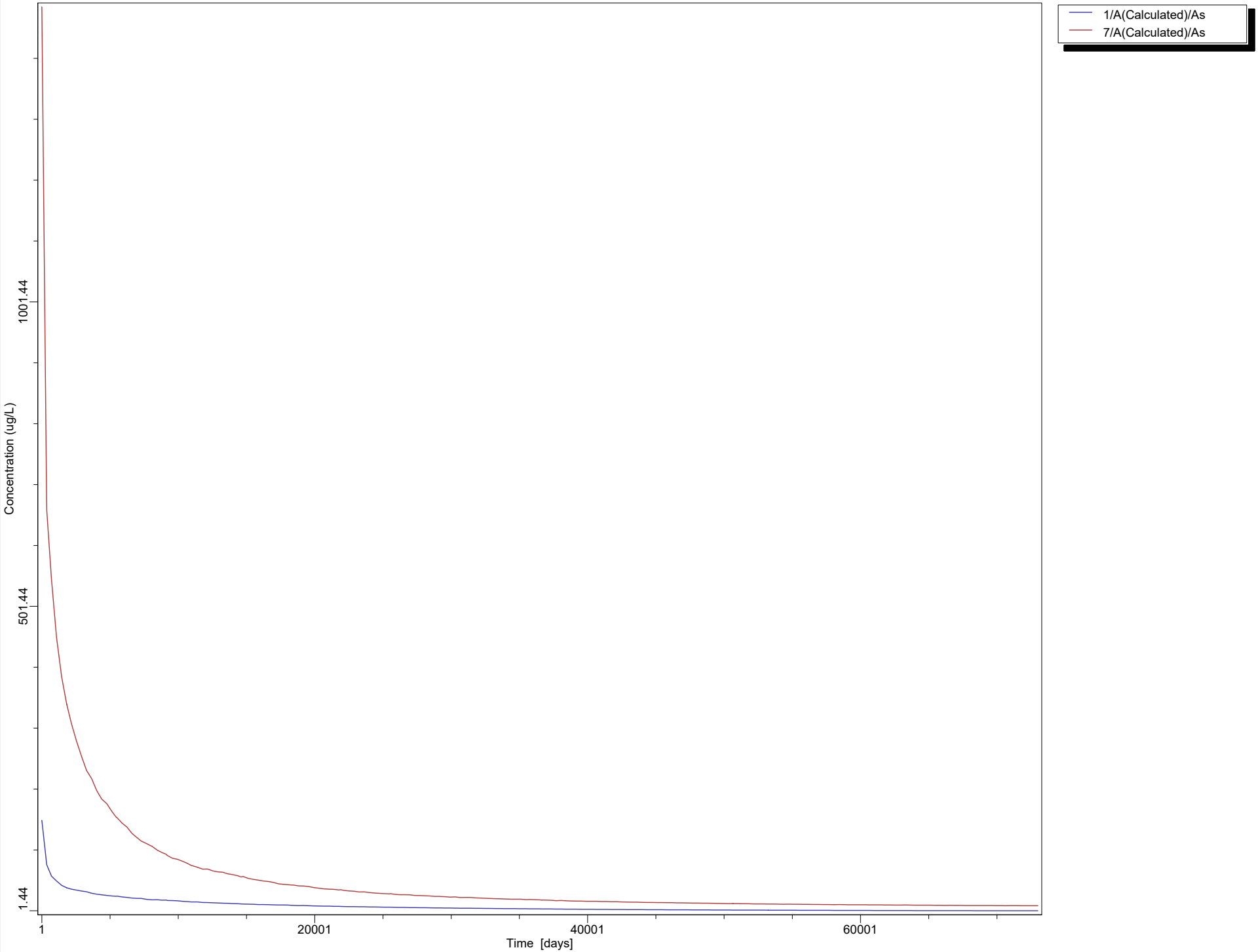

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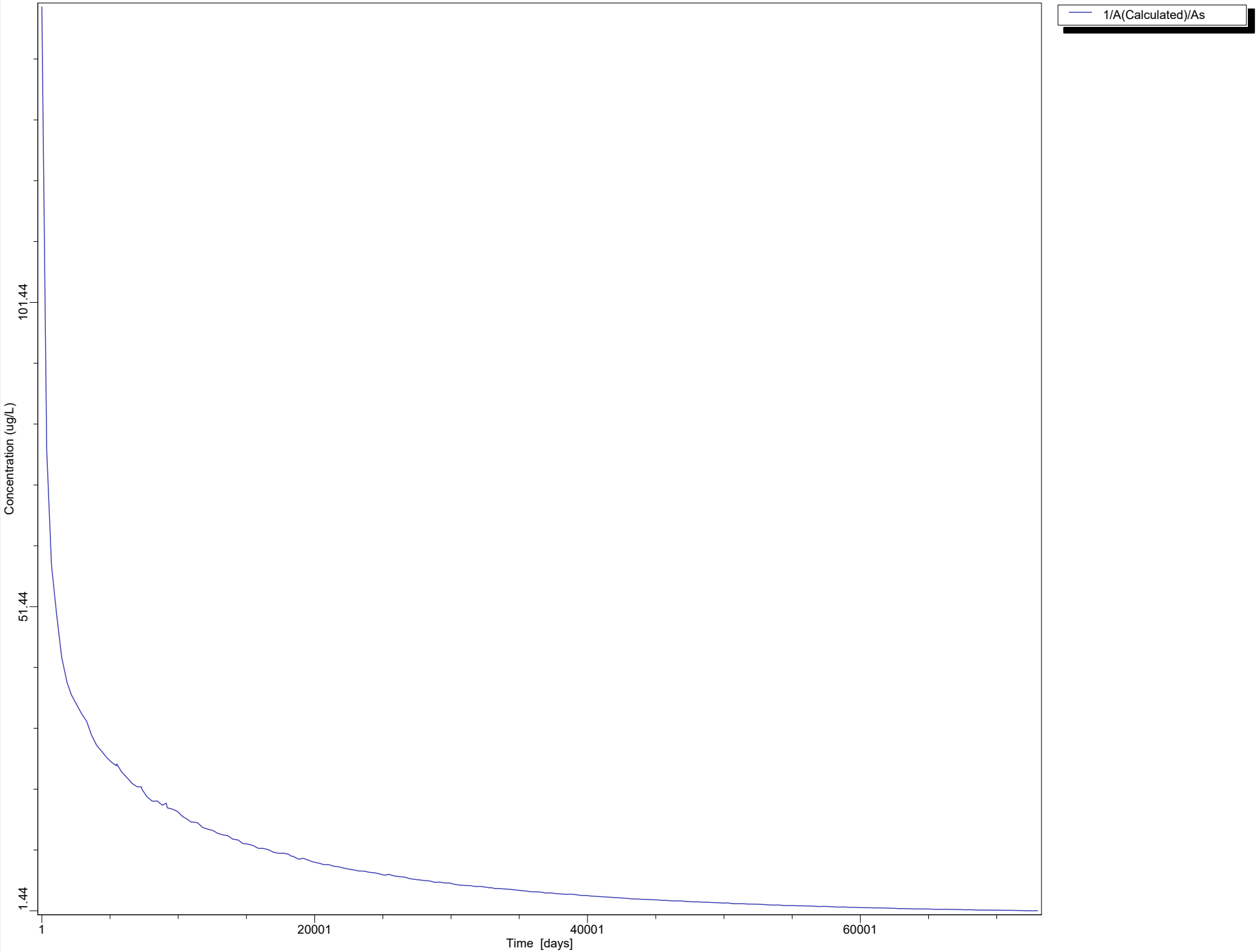
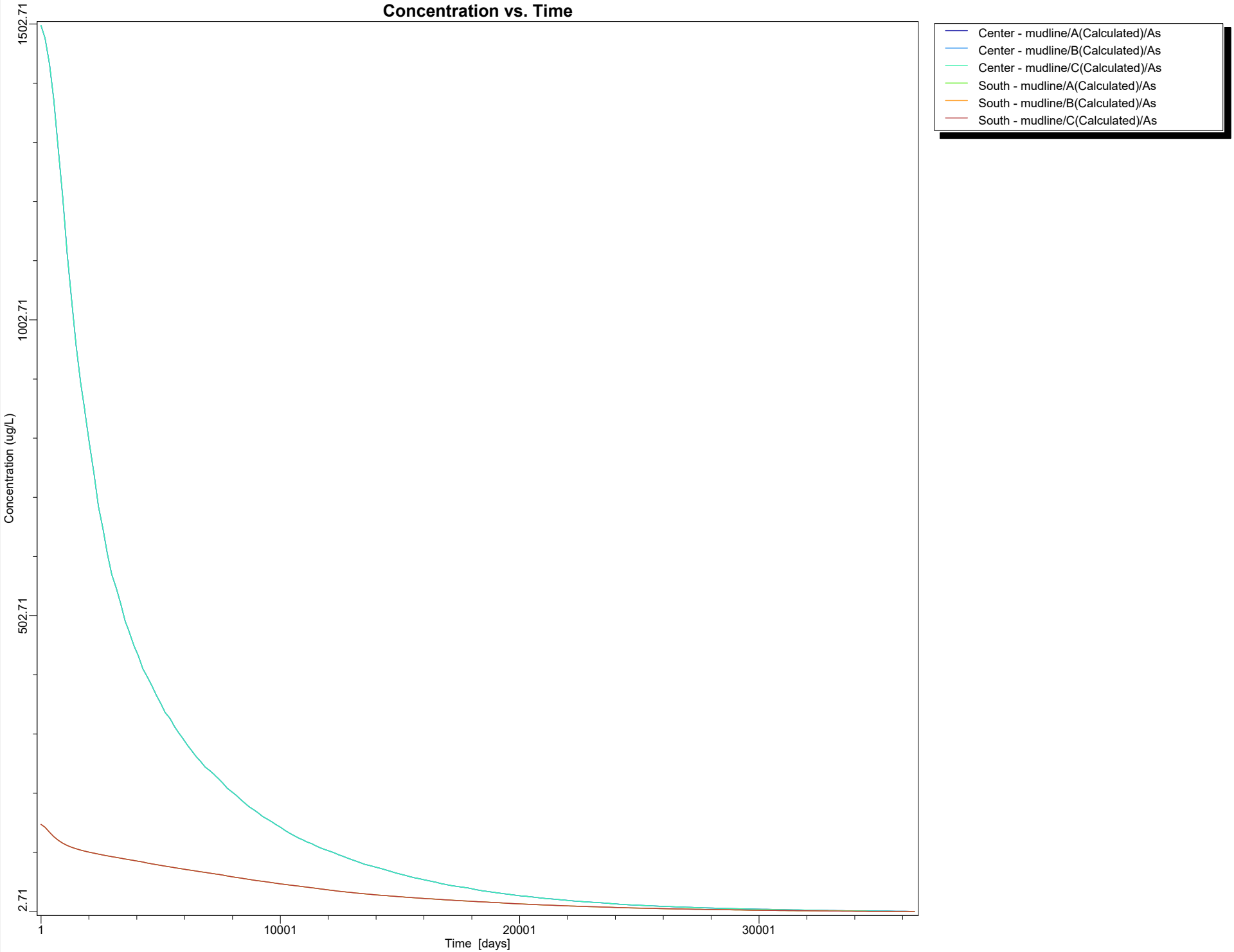


Project: Barbee Mill
Modeller:

Figure A-26



Project: Barbee
Modeller:

Figure A-27

APPENDIX K

Attachment K2

Performance Monitoring Report, Barbee Mill Groundwater Remediation Project, Renton, Washington, August 11, 2011.

PERFORMANCE MONITORING REPORT

Barbee Mill Groundwater Remediation Project

Prepared for: Barbee Mill Co., Inc.

Project No. 050004-008-03 • August 11, 2011 Draft

Aspect CONSULTING

earth + water

PERFORMANCE MONITORING REPORT

Barbee Mill Groundwater Remediation Project

Prepared for: Barbee Mill Co., Inc.

Project No. 050004-008-03 • August 11, 2011 Draft

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1 Introduction

This Performance Monitoring Report evaluates the performance of cleanup actions implemented to address arsenic, zinc, and petroleum hydrocarbon occurrences in groundwater at the Barbee Mill Site (Site). The Site includes portions of the following properties:

- The former Barbee Mill Property (Barbee Property), which is currently owned by Conner Homes at Barbee Mill LLC and is located at 4101 Lake Washington Boulevard North in Renton, Washington;
- The Quendall Terminals Property, located north of the Barbee Property; and
- State-owned aquatic lands of Lake Washington, located west of the Barbee Property.

Cleanup actions at the Site are described in the draft Interim Action Design and Implementation Report (Aspect, 2010b) and include the following activities to address arsenic and petroleum in groundwater:

- Removing soil from the Site exceeding MTCA Method A cleanup levels for arsenic and total petroleum hydrocarbons (TPH) and MTCA Method B cleanup levels for zinc.
- Installing a Passive Attenuation Zone (PAZ) along the downgradient boundary of the Barbee Property to prevent arsenic from migrating off the Barbee Property above the Site cleanup level.
- Installing a Groundwater Extraction and Treatment (Pump-and-Treat) System upgradient of the PAZ to remove additional arsenic mass from groundwater to enhance performance of the PAZ.
- Installing a network of monitoring wells and piezometers to evaluate performance of the PAZ and Pump-and-Treat System.

A site plan showing the layout of the PAZ, Pump-and-Treat System, and monitoring well network is provided on Figure 1. Groundwater monitoring at the Site is on-going in accordance with the Performance Monitoring Plan (Aspect, 2010a).

This report was prepared in accordance with Agreed Order DE 5396, dated December 1, 2009 (AO), between Barbee Mill Co., Inc. and the State of Washington Department of Ecology. The AO requires evaluation of remediation performance and re-evaluation of restoration time frame on an annual basis. Performance of Site remedial actions through May 2010 was evaluated in the Draft Performance Monitoring Report (Aspect, 2010c). This report documents the performance monitoring data collected through June 2011, evaluates the performance of the remedial actions by comparing monitoring data with remedial objectives, and updates the estimate of the Site restoration time frame.

The report is organized as follows:

- Section 2 – PAZ Performance Monitoring;
- Section 3 – Pump-and-Treat System Performance Monitoring;
- Section 4 – Estimated Restoration Time Frame; and
- Section 5 – Conclusions and Recommendations.

2 PAZ Performance Monitoring

Performance of the PAZ is evaluated by monitoring groundwater and porewater around and downgradient of the PAZ, and by inspecting the shoreline downgradient of the PAZ. Monitoring activities, results, and conclusions are provided below.

2.1 Groundwater Monitoring

Ongoing groundwater monitoring for the PAZ includes the following:

- Collecting groundwater samples from wells CMW-2S/2D, CMW-3, CMW-4S/4D, and CMW-5, and analyzing for the following parameters:
  - Dissolved arsenic, to monitor effectiveness of the PAZ at removing arsenic from groundwater.
  - Dissolved iron, pH, conductivity, dissolved oxygen, and oxidation/reduction potential (ORP), to evaluate changes to groundwater chemistry due to the PAZ.
- Collecting groundwater samples from well points WP-1A and WP-8, and analyzing for the following parameters:
  - Dissolved arsenic, to monitor the rate of attenuation downgradient of the PAZ.
  - Dissolved iron, pH, conductivity, dissolved oxygen, and ORP, to evaluate changes to groundwater chemistry downgradient of the PAZ.
- Collecting groundwater samples at wells CMW-1 and CMW-6, located at either end of the PAZ, and analyzing for dissolved arsenic and iron, to evaluate capture of the arsenic plume.
- Groundwater elevation measurements at the above wells and well points and at piezometers PZ-1 and PZ-2, to estimate groundwater flow patterns.

The groundwater monitoring data is summarized in Table 1. Trends in arsenic concentrations at each well and well point and groundwater elevation contour maps for June, September, and December 2010 and March and June 2011 are provided in Figures 2, 3, 4, 5, and 6, respectively.

The objectives of the PAZ are as follows:

- To intercept arsenic in groundwater exceeding the cleanup level of 20 micrograms per liter (µg/L) at the Barbee Property boundary;
- To reduce arsenic concentrations in groundwater exiting the PAZ to less than 20 µg/L; and
- To not alter water quality in groundwater in such a way that would negatively impact aquatic life in Lake Washington.

Groundwater monitoring data is evaluated relative to these objectives below.

2.1.1 Arsenic Plume Capture

The PAZ alignment was based on arsenic concentrations in samples collected from multiple depths at 21 borings along the Barbee Property boundary during the 2006 design investigation, as summarized in the draft Design Report (Aspect, 2006). The arsenic concentration at boring AZ-17 (25 µg/L) was used to locate the south end of the PAZ while the arsenic concentrations at boring AZ-9 (23 µg/L) was used to locate the north end of the PAZ. Although these concentrations were slightly above the site cleanup level of 20 µg/L, they were within the range of upgradient background concentrations (which were as high as 28 µg/L) used to calculate the cleanup level.

The PAZ's effectiveness at capturing arsenic in groundwater above the cleanup level is evaluated based on the arsenic concentrations at two monitoring wells (CMW-1, at the south end of the PAZ, and CMW-6, at the east end of the PAZ) and on the groundwater flow patterns for the Site (see Figures 2 through 6). Groundwater flow directions at the Site observed during the past 5 quarters are very similar to those reported in the previous performance monitoring report, and do not exhibit significant seasonal variability. Groundwater monitoring at CMW-1 and CMW-6 indicate the following:

- Arsenic concentrations at CMW-1 increased slightly after installation of the PAZ and slightly exceed the cleanup level. Concentrations over the last 18 months have fluctuated slightly, ranging between 40 and 49 µg/L, but have not exhibited an overall downward or upward trend. Arsenic was not detected downgradient of CMW-1 in previous porewater monitoring (Aspect, 2010c), and the arsenic concentrations at CMW-1 have not increased since porewater monitoring was last conducted.
- Arsenic concentrations at CMW-6 increased after installation of the PAZ and exceed the cleanup level by a wide margin. Since May 2009, concentrations have fluctuated slightly, ranging between 180 and 240 µg/L, but have not exhibited an overall downward or upward trend. Arsenic concentrations downgradient of CMW-6 (e.g., at BH-29A), have declined since 2009.

Although arsenic concentrations at CMW-1 and CMW-6 exceed the cleanup level, the removal of 55,000 tons of arsenic-contaminated soil from the source area in 2006, and on-going flushing of residual contamination upgradient of the PAZ, is expected to eventually reduce arsenic concentrations at CMW-1 and CMW-6 to below the cleanup level. Site restoration time frame is discussed in Section 4.

Interpretation of the monitoring data collected to date at CMW-1 and CMW-6 is hampered for two reasons:

- Operation of the Pump-and-Treat System can affect conditions at CMW-1 and CMW-6 by altering the direction and rate of groundwater flow. One possible effect is the potential of creating areas between pumping wells and Lake Washington of slow or stagnant groundwater flow. This could explain the lack of significant upward or downward trends in arsenic concentrations at these wells during pumping.

- Quarterly monitoring data was not collected prior to Pump-and-Treat System operation, so it is not known if the concentration fluctuations observed at CMW-1 and CMW-6 since June 2009 are due to seasonal differences in groundwater flow, variability in Pump-and-Treat System operation, or a combination of factors. The rebound analysis described in Section 3 will help evaluate both seasonal and long-term trends in arsenic concentrations in the absence of pump-and-treat.

As described in Section 3, the Pump-and-Treat System is scheduled to be shut down in August 2011 to evaluate the potential for rebound of arsenic concentrations in groundwater. In accordance with the Performance Monitoring Plan, continued quarterly monitoring of arsenic at CMW-1 and CMW-6, and quarterly measurement of groundwater elevations at all Site monitoring wells, is planned. The groundwater monitoring schedule of the Performance Monitoring Plan, updated to reflect monitoring recommendations in previous reports, is summarized in Table 2.

2.1.2 Arsenic Removal

The PAZ is designed to reduce arsenic concentrations in groundwater flowing through the PAZ by at least 95 percent. Downgradient of the PAZ, arsenic concentrations are expected to decline gradually (i.e., attenuate) as residual arsenic on soil desorbs into the treated groundwater. Below we evaluate the arsenic removal by the PAZ and the attenuation of arsenic downgradient of the PAZ.

2.1.2.1 PAZ Treatment Effectiveness

Arsenic removal by the PAZ is monitored at six monitoring wells constructed downgradient of the PAZ. Four shallow wells (CMW-2S, CMW-3, CMW-4S, and CMW-5) are screened near the water table, and two deeper wells (CMW-2D and CMW-4D) are located downgradient of the two deeper sections of the PAZ. Based on the surveyed coordinates for the wells and the PAZ, two of the shallow wells – CMW-3 and CMW-5 – are located within 1 foot of the edge of the PAZ, while the other wells are located approximately 5 to 8 feet away from the edge of the PAZ.

Arsenic concentrations at PAZ monitoring wells are summarized in Table 1 and on Figure 7. Concentrations at three of the four shallow wells – CMW-2S, CMW-3, and CMW-5 – have consistently been below cleanup levels since the PAZ was installed. Based on the reductions from initial concentrations at these locations, the PAZ has removed 98 to 99.5 percent of arsenic from groundwater.[1]

Concentrations at the fourth shallow well – CMW-4S – have dropped 97 percent to 140 µg/L compared to pre-remediation conditions. This concentration is above the cleanup level of 20 µg/L; however, concentrations measured during the last year of operation (June 2010 to June 2011) continue to show a steady decline. As discussed in the previous

[1] Using initial concentrations as the basis for arsenic removal is a reasonable estimate for initial performance, but as monitoring proceeds, actual removal of arsenic by the PAZ may be different than estimated using this method because actual influent concentrations – those entering the PAZ – are not monitored. Influent concentrations are expected to decrease over time, due to the prior excavation action and the on-going pump-and-treat system. However, performance of the PAZ will ultimately be evaluated by the effluent concentrations, not the percent removal.

performance monitoring report, concentrations at CMW-4S are likely elevated due to arsenic desorbing from soil downgradient of the PAZ. Contaminant fate-and-transport modeling (see Section 4) indicates that a more gradual decline in concentrations downgradient of the PAZ is consistent with the desorption and gradual flushing of residual arsenic on soil.

Arsenic concentrations at the two deep wells (CMW-2D and CMW-4D) have also declined, but more slowly than at the shallow wells. Data from these wells have shown the following:

- At CMW-2D: Concentrations have dropped 64 percent after the PAZ was installed. Concentrations initially decreased sharply but, over the past two years, concentrations have fluctuated only slightly and have not shown a clear downward or upward trend.
- At CMW-4D: Concentrations have been reduced 83 percent as of June 2011. Concentrations have varied considerably (between 320 and 1,700 µg/L) but show an overall downward trend. The variability appears seasonal, with the highest concentrations detected in December and the lowest concentrations detected in September of each monitoring year, based on two years of quarterly monitoring. More monitoring is needed to characterize the long-term trend at this well.

A slower response to PAZ treatment in the deeper system is not unexpected because groundwater flow in this unit is likely much slower than in the shallow unit, due to the presence of lower permeability sandy silt, silt, and peat layers. Slower groundwater flow rates provide slower flushing of residual arsenic downgradient of the PAZ.

Additional data is needed to perform statistical evaluation of long-term trends. In accordance with the Performance Monitoring Plan, continued quarterly monitoring of arsenic at the six PAZ monitoring wells is planned.

2.1.2.2 Attenuation Downgradient of the PAZ

Attenuation of arsenic in groundwater downgradient of the PAZ is evaluated based on data at one monitoring well, BH-29A (located 180 feet downgradient of the PAZ), and two sediment well points: WP-1A (located 50 feet downgradient of the PAZ) and WP-8 (located 150 feet downgradient of the PAZ). The well points, which are located in Lake Washington and screened approximately 2 feet below mudline, represent locations furthest downgradient of the PAZ where elevated arsenic concentrations have been measured and, therefore, the location where arsenic concentrations are likely to remain elevated the longest (see restoration time frame discussion in Section 4). Data are summarized in Table 1. Trends in arsenic concentrations at WP-1A and WP-8 are shown on Figure 7 and summarized as follows:

- WP-1A: Arsenic concentrations have declined 89 percent since the PAZ was installed as of June 2011. Arsenic concentrations at this location have varied significantly, ranging between 25 µg/L and 550 µg/L, but appear to continue declining.

- WP-8: This location was not sampled prior to PAZ installation. Arsenic concentrations at this well point have declined slightly (29 percent) since May 2009, but have not shown a clear downward trend.
- BH-29A: This location was not sampled prior to PAZ installation, and has only been sampled three times. Arsenic concentrations at this well declined 41 percent between September 2009 and September 2010.

Based on the data collected, arsenic concentrations downgradient of the PAZ are declining, but additional data are needed to evaluate seasonal and long-term trends. As summarized in Table 2, continued quarterly monitoring of arsenic at WP-1A and WP-8 and annual monitoring of arsenic at BH-29A is planned over the next year.

2.1.3 Effect of PAZ on Groundwater Chemistry

To determine the effect of the PAZ on groundwater chemistry, PAZ wells are monitored for iron and field parameters including pH, temperature, conductivity, dissolved oxygen, and ORP. Iron concentrations are summarized in Table 1 and field parameter data are summarized in Table 3. Results indicated the following:

- Iron was not detected above the performance standard of 70 mg/L in any sample. At locations where iron was analyzed before and after installation of the PAZ (CMW-3, CMW-4S, at CMW-4D), dissolved iron concentrations decreased after PAZ installation. Since PAZ installation, no upward or downward trend in iron concentrations has been observed.
- Little difference in temperature or ORP was noted between wells downgradient of the PAZ (CMW-2S, CMW-2D, CMW-3, CMW-4S, CMW-4D, CMW-5) and wells up- or cross-gradient of the PAZ (EW-1 through EW-8, CMW-1, and CMW-6). Dissolved oxygen was elevated in several samples from extraction wells, likely due to air entrainment during pumping. The average pH of groundwater was slightly higher downgradient of the PAZ (ranging between 6.5 and 9.7) than upgradient of the PAZ (ranging between 5.9 and 9.1). The average conductivity of groundwater was slightly lower downgradient of the PAZ (ranging between 66 and 537 µs/cm) than upgradient of the PAZ (ranging between 236 and 661 µs/cm). This data is consistent with the expected performance of the PAZ, in which ongoing reactions with the iron is expected to slightly raise the pH and remove dissolved minerals (consequently lowering the conductivity).

Based on the collected data, the PAZ is not adversely affecting groundwater chemistry. As summarized in Table 2, quarterly monitoring of dissolved iron and field parameters at PAZ monitoring wells will continue for the next year.

3 Pump-and-Treat System Performance Monitoring

The Pump-and-Treat System became operational on June 3, 2009. Performance monitoring for the Pump-and-Treat System is described in the Performance Monitoring Plan, and included the following:

- Collecting monthly effluent samples for total arsenic analysis and recording cumulative discharge flow, to confirm compliance with King County wastewater discharge authorization DA 4133-01. These data are summarized in Table 4.
- Monitoring system operation, including:
  - Inspecting wells, pumps, and piping for fouling;
  - Confirming that pumps are operable; and
  - Inspecting the settling tank for general water quality and accumulation of solids (settleable solids, biological growths, etc.).
- Collecting water samples from extraction wells EW-1 through EW-8 for analysis of total arsenic and iron. Data from these wells are summarized in Table 1. Trends in arsenic concentrations at these wells are shown on Figure 8.
- Measuring groundwater elevations in extraction wells during system operation on a quarterly basis. Elevations are summarized in Table 1 and are included in the water level contour maps provided on Figures 2 through 6.

Operational notes, including major maintenance activities, are provided in Table 4. During the past year of operation, the system was shut down temporarily in response to two exceedances in the sewer discharge limit for arsenic: one in October 2010, and one in April 2011. The systems were shut down from October 26 to December 23, 2010 and from April 15 to June 14, 2011. In each case, the system was restarted after receiving approval from King County. The reason for both exceedances is suspected to be anomalous high concentrations resulting from iron precipitates in samples. The settling tank was pumped out and thoroughly cleaned in March 2011. After the April 2011 exceedance, a "tee" was installed on the settling tank gravity discharge line to reduce the discharge of floating scum to the sewer, and manual scum removal (with photo-documentation) was added to monthly maintenance activities.

The purpose of the Pump-and-Treat System is to remove arsenic from groundwater upgradient of the PAZ. The primary objectives of removing arsenic upgradient of the PAZ are: 1) to reduce the restoration time frame for the Site to less than 50 years; and 2) to reduce arsenic concentrations entering the PAZ to 400 µg/L (so that the PAZ design objective of 95 percent arsenic removal achieves the Site cleanup level of 20 µg/L). Restoration time frame is discussed in Section 4. Monitoring results, system optimization, and a planned rebound evaluation are described below.

3.1 Monitoring Results

Monitoring data indicate the following:

- Monthly arsenic effluent concentrations have been compliant with the discharge authorization since startup, except for the two exceedances noted above.
- A total of 14,992,340 gallons of groundwater, containing an estimated 37 pounds of arsenic, have been removed by the system through June 30, 2011. The rate of arsenic removal based on sewer discharge monitoring has fluctuated throughout the period of pump-and-treat operation. A summary of the monthly removal rate and total mass of arsenic removed by the Pump-and-Treat System since startup is provided in Table 4.
- The average arsenic concentration in June 2011, 250 µg/L, is below the remediation goal for arsenic entering the PAZ of 400 µg/L. As of June 2011, two wells (EW-7 and EW-8) had arsenic concentrations (410 and 460 µg/L, respectively) slightly above the remediation goal.
- Total arsenic concentrations at extraction wells have varied substantially, with seemingly anomalous 'spikes' in concentration at most wells at least once in the past 2 years. Because total arsenic concentrations may be affected by the presence of precipitates in samples (Aspect, 2010c), extraction wells were monitored for dissolved arsenic beginning in September 2010. Since September 2010, concentrations have behaved as follows:
  - At EW-1, EW-2, EW-4, and EW-7, concentrations have overall declined.
  - At EW-3 and EW-5 concentrations have increased.
  - At EW-8, concentrations have overall increased slightly, but have declined the past 3 quarters.

  However, the data at extraction wells generally do not exhibit consistent trends. Possible reasons include:

  - Selection of wells being pumped at a given time, which has varied due to system optimization efforts;
  - Potential for natural seasonal variability (the Pump-and-Treat System has been operating since sampling was initiated at these wells, so seasonal variations have not been characterized in the absence of pumping); and
  - The fact that the system was shut down for almost 2 months preceding two of the last four monitoring events (December 2010 and June 2011).

3.2 System Optimization

Monthly arsenic and water removal rates for each well are summarized in Table 4. For much of the period, pumping focused on wells EW-5, EW-6, and EW-7, which are closest to well CMW-6 (where arsenic exceedances have been noted at the east end of the PAZ). In March 2011, wells EW-1 and EW-2 were added to increase the total system

discharge rate. In June 2011, well EW-8 (where the highest arsenic concentrations have been detected) was added to increase the rate of arsenic removal.

3.3 Rebound Analysis

As described above, arsenic concentrations at extraction wells have varied substantially and it is difficult to estimate long-term trends based on the current data. One of the likely causes of variability is the operation of the Pump-and-Treat System and operational changes in wells and pumping rates during the past two years. Based on discussions with Ecology after the previous performance monitoring report, rebound monitoring in the pump-and-treat area would be valuable for the following reasons:

- To identify long-term trends in arsenic concentrations upgradient of the PAZ, and compare to model predictions of restoration time frame (see Section 4); and
- To allow evaluation of PAZ performance and long-term trends downgradient of the PAZ without groundwater pumping.

This information would be used to evaluate the effectiveness of the interim actions for the upcoming Feasibility Study (currently contemplated in a draft amendment to the AO).

As noted above, there have been two temporary shutdowns, each lasting two months, which were immediately followed by groundwater monitoring. The temporary shutdown periods were not long enough to evaluate rebound, particularly given the historic variability in data. At a minimum, one year of monitoring without pumping is needed to assess seasonal effects. The rebound analysis is planned to be conducted as follows:

- The Pump-and-Treat System will be turned off in August 2011.
- Quarterly groundwater monitoring at Site wells will continue as shown in Table 2.
- Data will be documented in quarterly progress reports to Ecology.
- Observed trends after one year of monitoring will be evaluated and the estimated restoration time frame will be re-evaluated in the next performance monitoring report[2]. That report will also include recommendations for additional monitoring and/or Pump-and-Treat System operation.

[2] The next annual performance monitoring report would be due to Ecology on July 31, 2012, based on the currently contemplated schedule for the Agreed Order Amendment No.2.

4 Restoration Time Frame

Upgradient of the PAZ, residual arsenic is being flushed out by clean groundwater flowing onto the Site. Downgradient of the PAZ, residual arsenic is being flushed out by clean groundwater treated by the PAZ. This section describes the estimated restoration time frame (i.e., the time for arsenic concentrations to achieve cleanup levels in groundwater) in these two areas.

We estimated restoration time frames using the fate-and-transport model described in the previous performance monitoring report (Aspect, 2010c). That model was updated in the following sequence:

1) A finer grid of cells[3] was placed downgradient of the PAZ to improve the resolution of predicted arsenic concentrations close to the PAZ.

2) The initial arsenic concentration downgradient of the PAZ (north of the PAZ, is where arsenic concentrations were highest) was set at 700 µg/L. This was based on the average concentration detected in this area just after the PAZ was installed[4]. The model was run using a start date of May 2007 (when the PAZ was installed).

3) The model output was compared to the results at wells CMW-4S, CMW-5, and WP-1A. Parameters were adjusted slightly to determine if the model could better match the empirical data. A comparison of model-predicted concentrations and empirical data are shown on Figure 10.

4) The calibrated model was run using a start date of August 2011and assuming no pump-and-treat operation to estimate the time for the arsenic plume to flush out. For this modeled scenario, the initial arsenic concentration upgradient of the PAZ was set at 250 µg/L, and the initial concentration downgradient of the PAZ was set at 370 µg/L, based on the average concentration measured in this area in June 2011. A map showing the assumed initial arsenic concentrations is provided on Figure 9. Model-estimated restoration time frames at downgradient wells and well points are shown on Figure 11. Model-estimated restoration time frames at selected upgradient wells are shown on Figure 12.

The comparison of model predictions with empirical data and the predicted restoration time frames in each area of the Site are discussed below.

[3] Cell spacing was set at 10 feet wide instead of 25 feet wide.

[4] Previous modeling used the maximum concentration detected prior to the PAZ being installed. This resulted in a poor fit of the data trends before and after PAZ installation. Sufficient post-PAZ data has now been collected to compare modeling predictions with empirical trends, and exclusive use of post-PAZ data removes one of the variables complicating modeling based on pre-PAZ conditions.

4.1 Comparison of Modeled and Empirical Data

The general trend observed downgradient of the PAZ – an initially fast decline, followed by long-term gradual decline, in arsenic concentration – are consistent with the model predictions. However, arsenic concentrations at CMW-4S have declined slower than predicted by the model but concentrations at CMW-5 and WP-1A have declined faster than predicted. Variation of model parameters within reasonable ranges could not match all three curves. Possible reasons for the difference include:

- Modeling artifact for CMW-5, which is located less than 5 feet from the PAZ. At this close distance, even the finer model grid (5-foot cell spacing) cannot provide sufficient resolution. Model grids of less than 5 feet were considered but were determined to not add additional precision, due to uncertainty in model predictions of transport processes that occur over very short distances at model boundaries (such as the edge of the PAZ) where concentrations used in the model change dramatically.
- Actual groundwater conditions that vary from the simple model assumptions of uniform initial concentration, homogeneous soils, and equilibrium sorption.

4.2 Predicted Restoration Timeframe Downgradient of the PAZ

Restoration time frame downgradient of the PAZ was estimated by simulating flushing until cleanup levels were achieved at WP-1A, WP-8, and BH-29A (Figure 11). The model was run assuming the Pump-and-Treat System that has operated for the past two years would be shut down in August 2011 and not restarted. The estimated timeframes to achieve the cleanup level for arsenic in groundwater were 21 years at WP-1A, 25 years at BH-29A, and 40 years at WP-8. As described in the previous performance report, a longer restoration time frame would be predicted if the Pump-and-Treat System is operated for an additional period in the future because pumping would slow the rate of groundwater flow downgradient of the PAZ (and, consequently, the rate of arsenic flushing).

The predicted timeframes are less than predicted in the previous report (up to 52 years: Aspect 2010c). As noted above, the primary difference between the two modeling efforts is that this modeling exercise used the arsenic concentrations measured in August 2007, after the PAZ was installed, for initial conditions, rather than using data collected prior to installation of the PAZ. Overall, the empirical data are better matched by the updated model. However, as described in Section 4.1, although concentrations at two well locations have declined faster than the model predicts, concentrations at one location (CMW-4S) have declined more slowly than the model predicts. Additional monitoring is needed to better evaluate long-term trends and the potential for heterogeneity to affect restoration time frame.

4.3 Predicted Restoration Timeframe Upgradient of the PAZ

Restoration time frame downgradient of the PAZ was estimated by simulating flushing until cleanup levels were achieved at EW-1 and EW-8 (Figure 12). The model assumed the Pump-and-Treat System would be shut down in August 2011 and not restarted. The estimated timeframes to achieve the cleanup level for arsenic in groundwater were 39 years at EW-1 and 20 years at EW-8.

Restoration timeframe upgradient of the PAZ was not predicted in the previous performance report. The previously estimated restoration time frame for this area was approximately 95 years, based on pre-remediation data (Aspect, 2006). The updated estimate is significantly lower, with a maximum restoration time frame of 39 years. The current average concentration of arsenic upgradient of the PAZ, 250 µg/L, is less than was assumed based on pre-remediation data (500 µg/L). However, the current value is based on groundwater monitoring during a period of pump-and-treat operation. A rebound analysis, to evaluate arsenic concentrations without pump-and-treat, is planned to begin in August 2011. Monitoring of potential rebound is necessary to evaluate the validity of the assumed initial concentration.

5 Conclusions and Recommendations

Site monitoring data indicate that remedial actions have greatly reduced arsenic concentrations at the Site. The PAZ is removing residual arsenic in groundwater migrating from the Barbee Property and arsenic concentrations downgradient of the PAZ are declining. Although PAZ monitoring to date appears to confirm predicted performance, additional monitoring is needed to evaluate long term performance. In particular, evaluation of arsenic trends without pump-and-treat operation is needed to evaluate restoration time frame. Implementing the rebound analysis described in Section 3.3, and continued monitoring in accordance with Table 2, is recommended to provide additional data to complete the Site Remedial Investigation and Feasibility Study.

6 References

Aspect, 2006, Draft Engineering Design Report, Barbee Mill Groundwater Remediation, August 2, 2006.

Aspect, 2010a, Performance Monitoring Plan, Barbee Mill Groundwater Remediation Project, March 15, 2010.

Aspect, 2010b, Draft Interim Action Design and Implementation Report, Barbee Mill Site, June 1, 2010.

Aspect, 2010c, Draft Performance Monitoring Report, Barbee Mill Groundwater Remediation Project, July 6, 2010.

Limitations

Work for this project was performed and this report prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Barbee Mill Co., Inc. for specific application to the referenced property. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

Table 1 - Summary of Water Level and Chemical Data

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Barbee Mill Site

					Concentration in ug/L						Concentration in mg/L
Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
			Cleanup Level/Performance Standard (See Note 2)		*20*	*32*	*2.5*	*3.5*	*0.5*	*0.5*	*70*
Performance Monitoring Wells											
CMW-1	22.75	*7/19/2006*			*31*						26
		8/30/2007	4.63	18.12	33						27
		5/5/2009	3.58	19.17	37				0.27 U	0.43 U	42
		9/8/2009	4.61	18.14	53				0.25 U	0.41 U	41
		12/23/2009	5.36	17.39	39				0.26 U	0.41 U	39
		3/18/2010	4.45	18.30	49				0.26 U	0.41 U	48
		6/21/2010	3.55	19.20	40						58
		9/14/2010	4.57	18.18	45						42
		12/23/2010	4.99	17.76	48						33
		3/10/2011			43						32
		6/13/2011	**3.53**	**19.22**	**47**						**34**
CMW-2S	22.27	*5/23/2006*			*120*						
		8/30/2007	4.32	17.95	4.1		1 U	1 U			1.4
		5/5/2009	3.28	18.99	1.7	5 U	1 U	1 U			0.63
		9/8/2009	4.52	17.75	2.1	6.3	1 U	1 U			1.9
		12/23/2009	5.11	17.16	2.1	5 U	1 U	1 U			3.1
		3/19/2010	4.10	18.17	2.6	5 U	1 U	1 U			1.8
		6/21/2010	3.28	18.99	2						1.8
		9/14/2010	4.42	17.85	2.1						1.4
		12/23/2010	4.95	17.32	1.6						2.4
		3/10/2011	4.29	17.98	1.3						7.3
		6/13/2011	**3.24**	**19.03**	3.2						14
CMW-2D	22.20	*7/19/2006*			*250*						
		8/30/2007	3.99	18.21	33		1 U	1 U			9.2
		4/30/2009	3.29	18.91	92	14	1 U	1 U			4.5
		9/8/2009	4.20	18.00	92	8.8	1 U	1 U			4.2
		12/23/2009	4.81	17.39	92	12	1 U	1 U			3.4
		3/19/2010	3.79	18.41	89	5 U	1 U	1 U			3.4
		6/21/2010	3.02	19.18	74						3.1
		9/14/2010	4.13	18.07	78						3.1
		12/23/2010	4.56	17.64	98						3.3
		3/11/2011	3.93	18.27	99						3.2
		6/13/2011	**2.94**	**19.26**	**90**						**3.2**
CMW-3	22.41	*7/19/2006*			*110*						90 [3]
		8/30/2007	3.78	18.63	1.3		1 U	1 U			2.9
		4/30/2009	2.32	20.09	1 U	5 U	1 U	1 U			0.11
		9/8/2009	4.02	18.39	1.1	5 U	1 U	1 U			0.086
		12/22/2009	4.02	18.39	1 U	5 U	1 U	1 U			0.23
		3/19/2010	3.61	18.80	1 U	5 U	1 U	1 U			0.2
		6/21/2010	2.77	19.64	1 U						0.26
		9/14/2010	4.01	18.40	1 U						0.2
		12/23/2010	3.80	18.61	1 U						0.29
		3/11/2011	3.23	19.18	1 U						3.2
		6/13/2011	**2.10**	**20.31**	1 U						**0.53**
CMW-4S	27.44	*7/19/2006*			*4300*						50
		8/30/2007	9.40	18.04	510		1 U	1 U			28
		4/30/2009	8.11	19.33	180	5 U	1 U	1 U			12
		9/8/2009	9.57	17.87	230	5 U	1 U	1 U			8
		12/22/2009	9.82	17.62	210	5 U	1 U	1 U			17
		3/19/2010	9.03	18.41	230	5 U	1 U	1 U			17
		6/21/2010	8.36	19.08	200						11
		9/27/2010	9.47	17.97	200						9.2
		12/23/2010	9.69	17.75	190						17
		3/11/2011	9.05	18.39	140						23
		6/13/2011	**8.24**	**19.20**	**140**						**11**
CMW-4D	27.92	*2/15/2007*			*3400*						13
		8/30/2007	9.51	18.41	1700		1 U	1 U			10
		4/30/2009	8.20	19.72	1400	5 U	1 U	1 U			6
		9/8/2009	9.71	18.21	420	5 U	1 U	1 U			2
		12/22/2009	10.16	17.76	1700	5 U	1 U	1 U			9
		3/19/2010	9.17	18.75	910	5 U	1 U	1 U			6.1
		6/21/2010	8.56	19.36	740						4.7
		9/27/2010	9.61	18.31	320						2.1
		12/23/2010	9.77	18.15	1000						8.8
		3/11/2011	9.23	18.69	910						5.8
		6/13/2011	**8.33**	**19.59**	**580**						**4.5**
CMW-5	31.07	*6/23/2006*			*2900*						
		8/30/2007	12.32	18.75	22		1 U	1 U			1.8
		5/5/2009	10.87	20.20	6	5 U	1 U	1 U			1.8
		9/8/2009	12.72	18.35	7.8	5 U	1 U	1 U			0.069
		12/22/2009	12.56	18.51	18	5 U	1.4	1 U			5.8
		3/18/2010	12.03	19.04	7	9.5	1 U	1 U			2.2
		6/21/2010	11.34	19.73	9.3						1.7
		9/27/2010	12.65	18.42	7.9						0.056 U
		12/27/2010	12.09	18.98	6.9						0.99
		3/11/2011	11.67	19.40	8.8						5.2
		6/14/2011	**11.02**	**20.05**	**5.1**						**0.37**

Table 1 - Summary of Water Level and Chemical Data

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Barbee Mill Site

					Concentration in ug/L						Concentration in mg/L
Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
			Cleanup Level/Performance Standard (See Note 2)		*20*	*32*	*2.5*	*3.5*	*0.5*	*0.5*	*70*
Performance Monitoring Wells (Continued)											
CMW-6	31.03	*6/5/2006*			*23*						
		8/30/2007	11.61	19.42	110						25
		5/1/2009	9.70	21.33	210						21
		9/8/2009	12.17	18.86	210						17
		12/23/2009	11.63	19.40	220						16
		3/18/2010	11.28	19.75	230						18
		6/21/2010	13.36	17.67	200						17
		9/15/2010	12.19	18.84	210						16
		12/27/2010	10.79	20.24	240						22
		3/11/2011	10.56	20.47	180						17
		6/14/2011	**10.10**	**20.93**	**210**						**17**
WP-1A		*8/10/2005*			*2,490*						
		5/1/2009			430						20
		9/9/2009			52						7.2
		12/22/2009			110						17
		3/18/2010			550						43
		6/22/2010			330						19
		9/14/2010			48						4.3
		12/27/2010			210						28
		3/11/2011			25						3.9
		6/13/2011			**270**						**20**
WP-8		5/1/2009			680						11
		9/9/2009			490						9.5
		12/22/2009			450						18
		3/18/2010			550						13
		6/22/2010			430						8.4
		9/14/2010			560						13
		12/27/2010			610						19
		3/11/2011			490						18
		6/13/2011			**480**						**15**
Extraction Wells											
EW-1	26.81	6/3/2009			41				0.26 U	0.42 U	14
		9/9/2009	6.86	19.95	63				0.25 U	0.4 U	12
		12/23/2009	10.12	16.69	110				0.26 U	0.41 U	22
		3/18/2010	7.08	19.73	130				0.25 U	0.4 U	23
		6/22/2010	5.76	21.05	180						12
		9/15/2010	6.93	19.88	200						17
		12/27/2010	6.74	20.07	120						18
		3/11/2011	6.51	20.30	130						16
		6/14/2011	**5.80**	**21.01**	**150**						**16**
EW-2	26.67	6/3/2009			12						4.2
		9/9/2009	6.88	19.79	100						12
		12/23/2009	10.71	15.96	140						19
		3/18/2010	7.33	19.34	290						39
		6/22/2010	5.88	20.79	150						13
		9/15/2010	7.13	19.54	190						20
		12/27/2010	6.87	19.80	180						17
		3/11/2011	6.56	20.11	31						5.2
		6/14/2011	**5.83**	**20.84**	**130**						**17**
EW-3	26.77	6/3/2009			51				0.27 U	0.42 U	24
		9/9/2009	7.67	19.10	150				0.25 U	0.4 U	26
		12/23/2009	7.11	19.66	130				0.26 U	0.41 U	21
		3/18/2010	8.14	18.63	1900				0.26 U	0.41 U	91 (4)
		6/22/2010	6.67	20.10	97						19
		9/15/2010	7.92	18.85	7.7						16
		12/27/2010	7.56	19.21	130						17
		3/11/2011	7.25	19.52	23						4.7
		6/14/2011	**6.57**	**20.20**	**140**						**20**
EW-4	27.65	9/9/2009	8.38	19.27	14						0.056 U
		12/23/2009	8.37	19.28	10						0.056 U
		3/18/2010	7.88	19.77	11						0.056 U
		6/22/2010	6.67	20.98	13						0.056 U
		9/15/2010	8.34	19.31	76						0.056 U
		12/27/2010	7.34	20.31	26						0.056 U
		3/11/2011			27						0.056 U
		6/14/2011	**6.48**	**21.17**	**12**						0.056 U
EW-5	28.34	6/3/2009			61						1.3
		9/9/2009	8.05	20.29	39						1.9
		12/23/2009	8.98	19.36	44						1.6
		3/18/2010	8.36	19.98	84						73 (4)
		6/22/2010	7.28	21.06	62						0.61
		9/15/2010	9.24	19.10	29						2.3
		12/27/2010	7.86	20.48	55						0.58
		3/11/2011	7.74	20.60	70						1.3
		6/14/2011	**6.99**	**21.35**	**260**						**85 (4)**
EW-6	28.61	6/3/2009			140						2.7
		9/9/2009	11.15	17.46	360						7.8
		12/23/2009	9.25	19.36	230						2.7
		3/18/2010	8.62	19.99	1900						52
		6/22/2010	7.97	20.64	190						36
		9/15/2010	11.31	17.30	180						4.5
		12/27/2010	8.12	20.49	170						2.6
		3/11/2011	8.06	20.55	64						1.5
		6/14/2011	**7.23**	**21.38**	**390**						**15**

Table 1 - Summary of Water Level and Chemical Data

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Barbee Mill Site

					Concentration in ug/L						Concentration in mg/L
Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
Cleanup Level/Performance Standard (See Note 2)					*20*	*32*	*2.5*	*3.5*	*0.5*	*0.5*	*70*
Extraction Wells (Continued)											
EW-7	28.66	6/3/2009			110						2.5
		9/9/2009	9.61	19.05	300						6
		12/23/2009	9.32	19.34	350						7.6
		3/18/2010	8.65	20.01	260						7.9
		6/22/2010	7.64	21.02	200						7
		9/15/2010	9.63	19.03	830						8.7
		12/27/2010	8.19	20.47	240						6.9
		3/11/2011	8.07	20.59	130						8.5
		6/14/2011	**7.30**	**21.36**	**410**						**18**
EW-8	28.88	6/3/2009			560						21
		9/9/2009	10.11	18.77	750						16
		12/23/2009	10.36	18.52	610						16
		3/18/2010	9.37	19.51	280						7.7
		6/22/2010	8.49	20.39	360						14
		9/15/2010	9.93 [3]	18.95	290						15
		12/27/2010	9.16	19.72	810						20
		3/11/2011	8.95	19.93	670						20
		6/14/2011	**8.24**	**20.64**	**460**						**20**
PZ-1	27.78	5/5/2009	6.59	21.19							
		9/9/2009	7.39	20.39							
		12/23/2009	7.17	20.61							
		3/18/2010	6.72	21.06							
		6/22/2010	5.80	21.98							
		9/13/2010	8.11	19.67							
		12/27/2010	7.31	20.47							
		3/11/2011	6.98	20.80							
		6/14/2011	**7.07**	**20.71**							
PZ-2	27.87	5/5/2009	5.76	22.11							
		9/9/2009	8.17	19.70							
		12/23/2009	7.74	20.13							
		3/18/2010	7.30	20.57							
		6/22/2010	6.41	21.46							
		9/13/2010	8.11	19.76							
		12/27/2010	6.89	20.98							
		3/11/2011									
		6/14/2011	**6.24**	**21.63**							
Porewater Stations											
PW-CMW-2		*7/1/2006*			*1.5*						
		2/16/2007			3.1						4.9
		9/21/2007									4.8
		5/22/2009			1 U						0.056 U
		10/9/2009			17						9.8
		1/5/2010			1.1						0.1
		3/18/2010			1 U						0.056 U
PW-CMW-3		*7/1/2006*			*1.7*						
		3/12/2007									1.5
		5/22/2009			1 U						0.056 U
		10/9/2009			1.8						0.082
		1/5/2010			1 U						0.063
		3/18/2010			1 U						0.056 U
PW-CMW-4		*9/9/2005*			*1,400*						
		9/21/2007									26
		5/22/2009			2.2						0.056 U
		10/9/2009			2.6						0.12
		1/5/2010			2.3						0.23
		3/18/2010			1.3						0.056 U
PW-Control		2/4/2010			1 U						0.056 U
		3/18/2010			1 U						0.056 U
NS01-C1		6/22/2009			7.4						6.67
WD01-PW		6/18/2009			5.7						3.83
WD02-PW		6/18/2009			3.2						3.11

Table 1 - Summary of Water Level and Chemical Data

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Barbee Mill Site

					Concentration in ug/L						Concentration in mg/L
Well	TOC Elevation	Date	Depth to Water in Feet	Groundwater Elevation in Feet	Arsenic	Zinc	Lead	Copper	TPH-D	TPH-O	Iron
Cleanup Level/Performance Standard (See Note 2)					*20*	*32*	*2.5*	*3.5*	*0.5*	*0.5*	*70*
Quendall Terminals Monitoring Wells											
BH-21A	26.16	9/9/2009	8.11	18.05	5.9						
		12/23/2009	8.69	17.47							
		3/19/2010	7.30	18.86							
		6/22/2010	6.75	19.41							
		9/13/2010	7.79	18.37							
		3/11/2011	7.46	18.70							
		6/14/2011	**6.72**	**19.44**							
BH-21B	25.88	9/9/2009	6.43	19.45	109						
		12/23/2009	6.63	19.25	77/65.5 [1]						
		3/19/2010	5.72	20.16							
		9/13/2010	6.24	19.64							
		3/11/2011	5.86	20.02							
		6/14/2011	**5.07**	**20.81**							
BH-26A	28.98	9/9/2009	9.29	19.69	3.8						
		12/23/2009	8.27	20.71							
		3/19/2010	7.88	21.10							
		6/22/2010	7.51	21.47							
		9/13/2010	9.28	19.70							
		3/11/2011	7.25	21.73							
		6/14/2011	**7.20**	**21.78**							
BH-26B	26.62	9/9/2009	6.88	19.74	31.8						
		12/23/2009	6.98	19.64							
		3/19/2010	6.10	20.52							
		6/22/2010	5.47	21.15							
		9/13/2010	6.75	19.87							
		3/11/2011	6.17	20.45							
		6/14/2011	**5.44**	**21.18**							
BH-29A	27.64	9/9/2009	9.65	17.99	389						
		12/23/2009	9.91	17.73	400/372 [1]						
		3/19/2010	8.96	18.68							
		6/22/2010	8.29	19.35							
		9/13/2010	9.52	18.12	230						23
		3/11/2011	9.09	18.55							
		6/14/2011	**8.17**	**19.47**							
BH-29B	27.8	9/9/2009	8.59	19.21	3						
		12/23/2009	8.80	19.00							
		3/19/2010	7.85	19.95							
		6/22/2010	7.19	20.61							
		9/13/2010	6.42	21.38							
		3/11/2011	8.01	19.79							
		6/14/2011	**7.15**	**20.65**							

Notes:

[1] Results from ICP/MS analysis and Arsenic Hydride analysis

[2] Cleanup levels and performance standards identified in Performance Monitoring Plan (Aspect, in progress) and are based as follows:

Arsenic: Cleanup level based on natural background concentration of arsenic in groundwater.

Zinc: Cleanup level based on current ARARs for fresh water, superceeding the previous cleanup level of 105 ug/L identified in Independent Remedial Action Plan (Hart Crowser 2000).

TPH: Cleanup level based on MTCA Method A cleanup level for unrestricted use.

Iron: Performance standard is for the PAZ to not significantly elevate natural concentrations, which are naturally elevated due to reducing conditions created by peat deposits in Site soils.

Copper and Lead: Performance standard for PAZ is to not result in exceedance of surface water standard listed in table.

[3] Iron concentrations in samples collected prior to the PAZ being installed are not compared to the performance criteria.

[4] Iron concentrations in samples collected upgradient of the PAZ are not compared to the performance criteria.

[5] Results are for total/dissolved concentrations.

U =not detected at indicated reporting limit

bold = data collected during this reporting period

Blue italics indicates baseline sample from location closest to current sample location, as follows:

existing location	baseline location
CMW-1	AZ-16
CMW-2S	AZ-3
CMW-2D	AZ-18
CMW-3	RMW-01
CMW-4S	AZ-5
CMW-4D	HCMW-01D
CMW-5	AZ-11
CMW-6	AZ-9
WP-1A	WP-1B
PW-CMW-2	PW-M
PW-CMW-3	PW-N
PW-CMW-4	PW-WP1B

highlighted cells indicate exceedance of cleanup levels

Table 2 - Performance and Compliance Monitoring Schedule

DRAFT

Barbee Mill Groundwater Remediation Project

	Monitoring Year [1]									
Well	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
PAZ Compliance Wells										
CMW-1	**Q** - As, Fe	**B** - As, Fe	**B** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
CMW-2S	**Q** - As, Fe	**B** - As, Fe	**B** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
CMW-2D	**Q** - As, Fe	**B** - As, Fe	**B** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
CMW-3	**Q** - As, Fe	**B** - As, Fe	**B** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
CMW-4S	**Q** - As, Fe	**B** - As, Fe	**B** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
CMW-4D	**Q** - As, Fe	**B** - As, Fe	**B** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
CMW-5	**Q** - As, Fe	**B** - As, Fe	**B** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
CMW-6	**Q** - As, Fe	**B** - As, Fe	**B** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
Wells and Well Points on Quendall Terminals										
BH-29A	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
WP-1A	**Q** - As, Fe	**B** - As, Fe	**B** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
WP-8	**Q** - As, Fe	**B** - As, Fe	**B** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe	**A** - As, Fe
Groundwater Extraction Wells and Piezometers										
EW-1	**Q** - As, Fe	**B** - As, Fe [2]	**B** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]
EW-2	**Q** - As, Fe	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]
EW-3	**Q** - As, Fe	**B** - As, Fe [2]	**B** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]
EW-4	**Q** - As, Fe	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]
EW-5	**Q** - As, Fe	**B** - As, Fe [2]	**B** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]
EW-6	**Q** - As, Fe	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]
EW-7	**Q** - As, Fe	**B** - As, Fe [2]	**B** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]
EW-8	**Q** - As, Fe	**B** - As, Fe [2]	**B** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]	**A** - As, Fe [2]
PZ-1	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]
PZ-2	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]

Notes:

[1] Monitoring begins in September of indicated year.

[2] Assumes pump-and-treat operation ends in August 2011 and is not restarted.

[3] Piezometers wil be monitored for water levels only in conjunction with site monitoring events.

[4] When the pump-and-treat system is not operating, a subset of extraction wells will be monitored to evaluate concentrations upgradient of the PAZ.

Q Quarterly (every 3 months)
B Biannual (every 6 months)
A Annual
-- No monitoring planned

Quarterly monitoring to be conducted in June, September, December, and March
Biannual and annual monitoring event seasons will be based on quarterly monitoring results
Field parameters (temperature, conductivity, pH, dissolved oxygen, ORP) and water levels collected during each monitoring event
The monitoring program will be reevaluated after 10 years

As Arsenic
Fe Iron

Table 3 - Summary of Field Parameter Data

DRAFT

Barbee Mill 050004
Renton, WA

		Deg C	µs/cm	mg/L		mv	NTU
Well	Date	Temperature	Specific Conductance	Dissolved Oxygen	pH	Eh ORP	Turbidity
AVERAGE	Upgradient	14.02	387.29	1.64	7.00	118.33	
	Downgradient	13.24	284.65	0.41	7.80	161.57	
MIN	Upgradient	9.10	236.00	0.04	2.97	1.70	
	Downgradient	9.66	66.00	0.03	6.26	13.80	
MAX	Upgradient	18.70	661.00	10.16	10.08	469.80	
	Downgradient	18.72	537.00	1.51	10.17	424.70	
Downgradient							
CMW-2S	4/30/2009	12.82	250	0.23	8.67	2.9	4.9
	9/8/2009	16.98	244	0.08	8.50	408.1	0.5
	12/22/2009	14.38	262	0.12	7.29	96.9	3.0
	3/19/2010	12.69	235	0.20	7.83	163.9	0.4
	6/21/2010	13.42	303	0.46	7.42	343.4	2.7
	9/14/2010	16.01	276	0.06	7.18	90.5	2.1
	12/23/2010	13.85	362	0.21	8.57	33.5	4.8
	3/11/2011	11.67	366	1.09			
	6/13/2011	12.60	419	1.02	7.38	153.7	9.7
CMW-2D	4/30/2009	13.99	537	0.57	7.65	16.3	4.9
	9/8/2009	15.08	533	0.36	9.20	394.7	2.0
	12/22/2009	13.67	491	0.26	6.89	75.9	3.0
	3/19/2010	14.10	531	0.29	7.26	106.9	0.5
	6/21/2010	13.84	490	0.93	7.01	372.3	3.0
	9/14/2010	14.69	466	0.07	7.03	84.1	6.3
	12/23/2010	13.50	519	0.24	8.06	13.8	2.5
	3/11/2011	12.95	513		9.00	27.4	
	6/13/2011	13.60	506	1.07	7.06	90.3	
CMW-3	4/30/2009	11.88	82	0.13	9.67	36.8	8.0
	9/8/2009	18.72	66	0.65	9.40	308.0	2.5
	12/22/2009	12.60	227	0.09	8.57	250.0	1.6
	3/19/2010	11.45	187		8.50	202.7	0.5
	6/21/2010	13.27	147	0.35	8.65	373.0	3.0
	9/14/2010	17.33	123	0.03	7.89	107.1	2.4
	12/23/2010	12.50	217	0.16	9.78	89.9	3.1
	3/11/2011	9.66	260	0.81	7.40		
	6/13/2011	12.20	216	0.75	8.87	309.5	14.8
CMW-4S	4/30/2009	11.35	212	0.24	8.10	30.6	4.8
	9/8/2009	15.60	192	0.31	7.74	413.2	7.8
	12/22/2009	11.82	300	0.18	6.58	78.5	11.7
	3/19/2010	10.65	286	0.04	6.96	73.8	4.4
	6/21/2010	12.11	220	0.46	6.26	367.7	2.1
	9/27/2010	15.48	206	0.19	6.38	39.3	11.7
	12/23/2010	11.63	275	0.21	8.48	42.1	2.9
	3/11/2011	9.93	308	0.76	6.80		
	6/13/2011	11.40	179	1.00	6.76	89.2	11.8
CMW-4D	4/30/2009	13.34	251	0.12	8.31	25.7	2.5
	9/8/2009	14.54	225	0.28	8.24	424.7	1.0
	12/22/2009	12.01	353	0.26	6.71	86.7	3.5
	3/19/2010	12.58	320	0.07	7.11	62.6	0.6
	6/21/2010	13.00	376	0.42	6.55	374.6	2.7
	9/27/2010	14.00	393	0.13	7.03	78.8	6.1
	12/23/2010	12.34	326	0.20	8.42	57.3	4.0
	3/11/2011	11.77	256	1.51	6.40		
	6/13/2011	12.60	222	0.93	6.96	93.0	7.5

Table 3 - Summary of Field Parameter Data

Barbee Mill 050004
Renton, WA

CMW-5	5/5/2009	11.84	191	0.33	8.27	32.0	3.7
	9/8/2009	15.47	142	0.23	9.77	357.7	2.5
	12/22/2009	12.54	192	0.26	6.75	62.3	3.1
	3/18/2010	11.84	101	0.04	7.23	139.0	1.6
	6/21/2010	13.12	132	0.52	6.91	395.7	3.0
	9/27/2010	17.13	169	0.07	7.95	113.1	7.4
	12/27/2010	13.18	228	0.17	10.17	42.2	0.8
	3/11/2011	11.54	220	0.83	7.00		
	6/14/2011	12.50	267	1.40	8.73	285.7	9.0
Upgradient							
CMW-1	5/5/2009	11.39	395	0.46	7.61	45.0	18.8
	9/8/2009	17.00	415	0.39	7.53	421.3	0.5
	12/23/2009	13.28	459	0.09	6.48	77.1	9.5
	3/18/2010	12.57	546	0.09	6.65	81.7	0.9
	6/21/2010	12.95	550	2.16	6.36	314.9	2.2
	9/14/2010	16.20	508	0.19	6.24	26.0	1.8
	12/23/2010	13.31	473	0.32	8.06	1.7	3.2
	3/10/2011	11.59	463	0.69	6.50	25.1	
	6/13/2011	12.90	446	2.18	6.51	99.0	11.6
CMW-6	5/1/2009	13.03	439	0.14	8.74	50.8	1.0
	9/8/2009	15.12	434	0.34	7.25	362.2	1.1
	12/23/2009	12.44	534	0.36	6.55	78.6	1.9
	3/18/2010	12.50	618	0.51	6.69	97.2	0.2
	6/21/2010	13.43	542	0.78	6.36	435.9	2.0
	9/15/2010	15.30	478	0.15	7.14	40.8	1.2
	12/27/2010	12.60	533	0.30	9.19	35.2	0.5
	3/11/2011	12.25	535	1.81	6.40		
	6/14/2011	12.90	513	2.39	6.42	51.5	9.7
EW-1	9/9/2009	18.70	236	10.16	6.67	119.3	
	12/23/2009	14.97	352	0.05	6.35	58.1	
	3/19/2010	12.61	399	0.60	6.86	72.8	
	6/22/2010	14.62	328	0.85	6.27	440.8	4.5
	9/15/2010	16.70	338	0.26	6.10	15.2	
	12/27/2010	13.61	301	0.17	8.90	25.0	
	3/11/2011	11.82	317	0.49	7.09	9.9	4.3
	6/14/2011	13.90	319	2.03	6.55	80.5	82.1
EW-2	9/9/2009	18.58	273	9.65	5.85	138.4	
	12/23/2009	14.94	362	0.04	6.40	56.8	
	3/19/2010	13.07	417	0.66	6.89	72.8	
	6/22/2010	16.06	279	0.27	6.39	323.7	13.8
	9/15/2010	17.50	416	0.18	6.42	68.1	
	12/27/2010	12.32	321	0.21	2.97	36.2	
	3/11/2011	9.88	264	0.40	7.35	52.4	19.9

Table 3 - Summary of Field Parameter Data

Barbee Mill 050004
Renton, WA

	6/14/2011	14.20	356	2.10	6.54	77.5	40.9
EW-3	9/9/2009	18.11	458	8.28	6.49	214.7	
	12/23/2009	14.23	358	0.06	6.37	39.9	
	3/19/2010	13.29	414	0.96	6.87	81.2	
	6/22/2010	15.83	515	0.50	6.48	379.3	11.6
	9/15/2010	17.29	467	0.07	6.81	62.7	
	12/27/2010	11.14	361	0.20	8.28	20.0	
	3/11/2011	11.19	288	0.26	7.15	16.2	5.9
	6/14/2011	14.20	470	1.99	6.55	101.2	9.8
EW-4	9/8/2009	15.59	384	1.60	9.06	315.0	17.0
	12/22/2009	13.23	368	0.09	7.96	125.6	2.6
	3/19/2010	13.15	349	0.57	7.75	112.2	1.0
	6/22/2010	14.00	305	0.32	8.01	338.9	4.1
	9/15/2010	16.39	424	0.04	7.50	94.1	3.6
	12/27/2010	12.53	351	0.21	10.08	47.6	0.9
	3/11/2011	11.77	295	0.17	7.51	8.1	3.9
	6/14/2011	13.50	327	0.55	8.03	110.9	8.9
EW-5	9/9/2009	17.73	277	8.25	6.82	223.2	
	12/23/2009	14.35	270	0.21	6.34	4.4	
	3/19/2010	12.09	282	0.96	6.96	91.9	
	6/22/2010	13.44	246	0.27	6.42	402.1	13.0
	9/15/2010	18.30	297	4.61	6.50	21.8	
	12/27/2010	10.08	399	5.76	9.03	32.4	
	3/11/2011	9.10	309	6.62	6.91	19.4	
	6/14/2011	17.90	661	1.88	6.92	152.1	214.0
EW-6	9/9/2009	18.61	312	0.81	6.71	300.2	
	12/23/2009	14.96	322	0.07	6.35	24.5	
	3/19/2010	11.17	248	5.05	6.83	50.0	
	6/22/2010	15.06	270	0.20	6.60	469.8	6.1
	9/15/2010	17.61	310				
	12/27/2010	13.16	380	0.21	8.54	24.9	
	3/11/2011	9.15	297	3.81	6.90	42.1	60.5
	6/14/2011	14.20	430	1.88	6.52	83.8	77.2
EW-7	9/9/2009	17.88	354	1.05	6.87	308.7	
	12/23/2009	14.82	431	0.10	6.37	45.6	
	3/19/2010	11.68	352	2.45	6.91	61.1	
	6/22/2010	13.89	323	0.26	6.32	357.9	2.4
	9/15/2010	16.86	401	0.20	6.41	7.6	
	12/27/2010	13.94	447	0.14	8.42	16.0	
	3/11/2011	10.40	420	0.59	6.97	33.3	22.0
	6/14/2011	13.50	450	1.95	6.63	99.4	13.3
EW-8	9/9/2009	16.46	350	9.25	7.58	106.4	
	12/23/2009	13.86	384	0.20	6.52	70.3	
	3/19/2010	11.28	317	9.22	6.97	35.1	
	6/22/2010	15.06	318	0.23	6.59	300.2	2.1
	9/15/2010	17.73	339	1.60	6.49	32.4	
	12/27/2010	11.08	397	2.33	8.90	7.7	
	3/11/2011	10.18	454	3.19	7.16	6.8	6.4
	6/14/2011	14.30	417	1.77	6.56	76.1	12.1

Table 4 - Cumulative Discharge Volume and Estimated Arsenic Removal

Groundwater Pump & Treat System, Former Barbee Mill Site 050004-008-02

	Monthly	[As]	Arsenic	Cumulative Removal		Pumps Turned "On"[(1)]							
	Discharge	in	Removed	Water	Arsenic	EW-1	EW-2	EW-3	EW-5	EW-6	EW-7	EW-8	
Month	in gal	mg/L	in lb	in Mgal	in lb								Notes
Jun-09	873,521	0.11	0.80	0.87	0.80					X	X		2
Jul-09	702,173	0.12	0.70	1.58	1.50					X	X		
Aug-09	707,895	0.16	0.95	2.28	2.45					X	X		4
Sep-09	614,318	0.23	1.18	2.90	3.63					X	X		
Oct-09	595,907	0.90	4.48	3.49	8.10					X	X		
Nov-09	1,005,099	0.062	0.52	4.50	8.62	X	X	X	X		X		
Dec-09	1,204,335	0.12	1.21	5.70	9.83	X	X	X		X	X	X	5
Jan-10	1,103,228	0.15	1.38	6.81	11.2	X	X	X		X	X	X	6
Feb-10	750,525	0.57	3.57	7.56	14.8	X	X	X		X	X	X	
Mar-10	808,335	0.39	2.63	8.37	17.4	X	X	X		X	X	X	
Apr-10	859,028	0.068	0.49	9.22	17.9	X	X	X		X	X	X	
May-10	1,000,603	0.087	0.73	10.2	18.6	X				X	X	X	7
Jun-10	661,023	0.45	2.48	10.9	21.1				X	X	X		8
Jul-10	721,541	0.11	0.66	11.6	21.8				X	X	X		
Aug-10	435,691	0.066	0.24	12.0	22.0				X	X	X		
Sep-10	379,150	0.37	1.17	12.4	23.2				X	X	X		
Oct-10	439,640	1.13	4.13	12.9	27.3				X	X	X		9
Nov-10	0	-	0	12.9	27.3								
Dec-10	187,146	0.88	1.37	13.0	28.7				X	X	X		10
Jan-11	564,889	0.99	4.67	13.6	33.3				X	X	X		
Feb-11	424,065	0.22	0.78	14.0	34.1				X	X	X		
Mar-11	354,675	0.040	0.12	14.4	34.2	X	X		X	X	X		11
Apr-11	247,212	0.66	1.36	14.6	35.6	X	X		X	X	X		12
May-11	0	-	0	14.6	35.6								
Jun-11	352,342	0.33	0.97	15.0	36.6	X					X	X	13

Notes:

1) An "X" indicates that a pump was turned "on" during the majority of the system operating period for the indicated month. However, flow contributions from individual wells were not measured.
2) The pump-and-treat system began operation on 6/3/09. Startup testing revealed that the line from well EW-8 did not produce water, apparently due to a line break.
3) When installed in May 2009, the pumps were set such that their tops were approximately 1.5 feet below the water table. On 8/10/09, the pumps in wells EW-6 and EW-7 were reset such that their bottoms were approximately 1.5 feet above the well bottom. On 9/9/09, the remaining well pumps were reset in the same manner.
4) The flow meter stopped working sometime between site visits on 8/10/09 and 9/1/09, apparently due to fouling of the in-line paddlewheel sensor. After cleaning the sensor on 9/2/09, flow meter function was restored. The volume of water pumped during this period was estimated, and the sensor was subsequently inspected on a monthly basis.
5) The break in the EW-8 line was located and repaired in early December 2009, and pumping from that well was initiated on 12/8/09.

6) The flow meter stopped working sometime between site visits on 12/8/09 and 12/22/09. The cause was determined on 1/15/10 - the inside of the 2-inch-diameter pipe housing the sensor was fouled to the point that the paddlewheel was shielded from the water flow. After cleaning the pipe, flow meter function was restored. Discharge flow rate was measured manually on 1/5/10, and the volume of water pumped between 12/8/09 and 1/15/10 was estimated. Subsequent monthly fouling inspections included the pipe as well as the paddlewheel sensor.
7) The system automatically shut down on 5/2/10 (est.) due to a clogged settling tank discharge line. The shutdown was discovered on 5/6/10. The discharge line was snaked out and the system restarted on 5/7/10.
8) The system was shut down on 6/8/10 after manual flow rate testing determined that the electronic flow totalizer was programmed incorrectly, resulting in low reporting of flow volumes. The totalizer was re-programmed and the system restarted on 6/15/10. KCIW was notified on 6/21/10, and issued a Notice of Permit Violation for Exceeding Maximum Daily Discharge Volume dated 9/14/10. The discharge volumes shown in this table have been corrected.
9) The system was shut down on 10/26/10 after an exceedence of the Daily Average limit for arsenic was received from the laboratory. A composite sample was collected immediately prior to system shutdown, and KCIW was notified. The arsenic concentration shown represents the average of the two October 2010 samples.
10) The system was restarted on 12/23/10 after a letter was received from KCIW regarding the October 2010 exceedence.
11) High arsenic results in December 2010 and January 2011 prompted the decision to clean out the settling tank. Accumulated sediment was removed from the tank on 3/10/11 and disposed of as non-hazardous waste.
12) The system was shut down on 4/15/11 after an exceedence of the Daily Average limit for arsenic was received from the laboratory. A grab sample was collected immediately prior to system shutdown, and KCIW was notified. The arsenic concentration shown represents the average of the two April 2011 samples.
13) After visiting the site, KCIW recommended that a "tee" be installed inside the settling tank on the gravity discharge line, and that additional monthly inspection and maintenance steps be completed. The "tee" was installed, and the system was re-started on 6/14/11 after approval was received from KCIW.

NOTES:

1. VERTICAL DATUM: NAVD 88.

2. PLAT DETAILS BASED ON SITE PLAN PROVIDED BY OTAK ON 9/25/06.

3. GROUNDWATER ELEVATIONS AT ACTIVE EXTRACTION WELLS NOT USED TO DEVELOP GROUNDWATER CONTOURS.

4. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED AND HITCHINGS, INC DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH 2002.

BH-21B
BH-21A
BH-29A
BH-29B
WP-8
PW-CMW-4
WP-1A
BH-16
BH-26A
BH-26B
CMW-5
CMW-6
CMW-4S/4D
Property Boundary
EW-8
PW-CMW-3
CMW-3
EW-5
EW-6
EW-7
N 42ND PL
EW-4
PZ-2
Excavation Footprint
EW-3
PW-CMW-2
CMW-2S/2D
EW-2
EW-1
MILL POND
CMW-1
PW-Control
Remediation System Vault Area
N 41ST PL
PZ-1
Ordinary High Water Mark prior to December 2005 Habitat Restoration
Western extent of emplaced beach gravel or sand/gravel mix, December 2005
LAKE WASHINGTON
WILLIAMS AVE N
MAY CREEK
LAKE WASHINGTON BOULEVARD
BNSF RAILROAD
N 43RD ST

Legend

- Passive Attenuation Zone
- WP-6 — Well Point
- CMW-1 — Monitoring Well Location
- EW-7 — Extraction Well Location
- PZ-1 — Piezometer Location
- PW-CMW-2 — Porewater Sampling Location
- RS — Remediation System Utilities

N

0 100 200

Feet

Aspect CONSULTING

Site Plan

Barbee Mill
4101 Lake Washington Blvd. North, Renton, Washington

DATE: August 2011	PROJECT NO. 050004
DESIGNED BY: JJP	
DRAWN BY: PMB	FIGURE NO. 1
REVISED BY:	

Q:\Barbee Mill\050004 Barbee Mill\2011-08\050004-01.dwg

NOTES:

1. VERTICAL DATUM: NAVD 88.

2. PLAT DETAILS BASED ON SITE PLAN PROVIDED BY OTAK ON 9/25/06.

3. GROUNDWATER ELEVATIONS AT ACTIVE EXTRACTION WELLS NOT USED TO DEVELOP GROUNDWATER CONTOURS.

4. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED AND HITCHINGS, INC DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH 2002.

5. THE GROUNDWATER ELEVATION MEASURED AT CMW-6 WAS NOT USED TO DEVELOP GROUNDWATER CONTOURS. CMW-6 WILL BE RE-DEVELOPED PRIOR TO THE NEXT GROUNDWATER SAMPLING EVENT TO REMOVE ANY FINES AND/OR PRECIPITATES FROM THE WELL SCREEN.

LAKE WASHINGTON

NS01-C1

WD02

WD01

VB8

VB4

WP-8
430

WP-1A
330

BH-29A
19.35

BH-29B
20.61

BH-21B
20.81

BH-21A
19.41

BH-26A
21.47

BH-26B
21.15

CMW-5
19.73
9.3

CMW-6
17.63
200

CMW-4S/4D
19.08 / 19.36
200 / 740

CMW-3
19.64
ND

CMW-2S/2D
18.99 / 19.18
2 / 74

CMW-1
19.20
40

EW-8
20.39
360

EW-5
21.06
62

EW-6
20.64
190

EW-7
21.02
200

EW-4
20.98

EW-3
20.10
97

EW-2
20.97
150

EW-1
21.15
180

PZ-2
21.46

PZ-1
21.06

RS

Property Boundary

N 42ND PL

N 41ST PL

N 43RD ST

BNSF RAILROAD

LAKE WASHINGTON BOULEVARD

WILLIAMS AVE N

MAY CREEK

MILL POND

Excavation Footprint

Remediation System Vault Area

Ordinary High Water Mark prior to December 2005 Habitat Restoration

Western extent of emplaced beach gravel or sand/gravel mix, December 2005

20

21

19

Legend

- Passive Attenuation Zone
- WP-6 — Well Point
- CMW-1 — Monitoring Well Location
- EW-1 — Extraction Well Location
- PZ-1 — Piezometer Location
- RS — Remediation System Utilities
- 200 — Groundwater/Porewater Arsenic Concentration in ug/L (June 2010)
- 17.63 — Groundwater Elevation (June 2010)
- 21 — Groundwater Elevation Contour (June 2010)

N

0 100 200

Feet

Aspect CONSULTING

Summary of Arsenic Monitoring Data June 2010

Barbee Mill

4101 Lake Washington Blvd. North, Renton, Washington

DATE: August 2011	PROJECT NO. 050004
DESIGNED BY: JJP	
DRAWN BY: PMB	FIGURE NO. 2
REVISED BY:	

Q:\Barbee Mill\050004 Barbee Mill\2011-08\050004-02.dwg

NOTES:

1. VERTICAL DATUM: NAVD 88.
2. PLAT DETAILS BASED ON SITE PLAN PROVIDED BY OTAK ON 9/25/06.
3. GROUNDWATER ELEVATIONS AT ACTIVE EXTRACTION WELLS NOT USED TO DEVELOP GROUNDWATER CONTOURS.
4. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED AND HITCHINGS, INC DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH 2002.

NS01-C1
WP-8 560
BH-29A 18.12 230
BH-29B 21.38
BH-21B 19.64
BH-21A 18.37
PW-CMW-4
WP-1A 48
WD02
WD01
VB8
PW-CMW-3
CMW-4S/4D 17.97/18.31 200/320
CMW-3 18.40 ND
CMW-5 18.92 7.9
CMW-6 18.84 210
BH-26A 19.70
BH-26B 19.87
BH-16
Property Boundary
EW-8 18.95 290
EW-5 19.10 29
EW-6 17.30 180
EW-7 19.03 830
EW-4 19.31 76
EW-3 18.85 7.7
EW-2 19.54 190
EW-1 19.88 200
N 42ND PL
PZ-2 19.67
Excavation Footprint
PW-CMW-2
CMW-2S/2D 17.85/18.07 2.1/78
VB4
LAKE WASHINGTON
MILL POND
CMW-1 18.18 45
PW-Control
Remediation System Vault Area
N 41ST PL
PZ-1 19.76
WILLIAMS AVE N
MAY CREEK
BNSF RAILROAD
LAKE WASHINGTON BOULEVARD
N 43RD ST
Ordinary High Water Mark prior to December 2005 Habitat Restoration
Western extent of emplaced beach gravel or sand/gravel mix, December 2005

Legend

- Passive Attenuation Zone
- WP-6 — Well Point
- CMW-1 — Monitoring Well Location
- EW-7 — Extraction Well Location
- PZ-1 — Piezometer Location
- PW-CMW-2 — Porewater Sampling Location
- RS — Remediation System Utilities
- VB8 — Vibracore and Porewater/Sediment Sampling Location
- NS-01-SS — Sediment Sampling Location
- 830 — Groundwater/Porewater Arsenic Concentration in ug/L (September 2010)
- 19.03 — Groundwater Elevation (September 2010)
- 19 — Groundwater Elevation Contour (September 2010)

N

0 100 200

Feet

Aspect CONSULTING

Summary of Arsenic Monitoring Data September 2010

Barbee Mill

4101 Lake Washington Blvd. North, Renton, Washington

DATE: August 2011	PROJECT NO. 050004
DESIGNED BY: JJP	
DRAWN BY: PMB	FIGURE NO. 3
REVISED BY:	

Q:\Barbee Mill\050004 Barbee Mill\2011-08\050004-03.dwg

NOTES:

1. VERTICAL DATUM: NAVD 88.
2. PLAT DETAILS BASED ON SITE PLAN PROVIDED BY OTAK ON 9/25/06.
3. GROUNDWATER ELEVATIONS AT ACTIVE EXTRACTION WELLS NOT USED TO DEVELOP GROUNDWATER CONTOURS.
4. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED AND HITCHINGS, INC DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH 2002.

NS01-C1
WP-8 610
BH-21B
BH-21A
BH-29A
BH-29B
PW-CMW-4
WP-1A 210
WD02
WD01
VB8
PW-CMW-3
CMW-4S/4D 17.78/18.15 190/1000
CMW-3 18.61 ND
CMW-5 18.98 6.9
CMW-6 20.24 240
BH-26A
BH-26B
Property Boundary
EW-8 19.72 810
EW-5 20.48 55
EW-6 20.49 170
EW-7 20.47 240
EW-4 20.31 26
EW-3 19.21 130
EW-2 19.80 180
EW-1 20.07 170
PZ-2 20.98
Excavation Footprint
PW-CMW-2
CMW-2S/2D 17.32/17.64 1.6/98
VB4
CMW-1 17.76 48
PW-Control
MILL POND
Remediation System Vault Area
PZ-1 20.47
Ordinary High Water Mark prior to December 2005 Habitat Restoration
Western extent of emplaced beach gravel or sand/gravel mix, December 2005
LAKE WASHINGTON
N 42ND PL
N 41ST PL
WILLIAMS AVE N
MAY CREEK
BNSF RAILROAD
LAKE WASHINGTON BOULEVARD
N 43RD ST
18
19
20

Legend

- Passive Attenuation Zone
- WP-6 — Well Point
- CMW-1 — Monitoring Well Location
- EW-7 — Extraction Well Location
- PZ-1 — Piezometer Location
- PW-CMW-2 — Porewater Sampling Location
- RS — Remediation System Utilities
- VB8 — Vibracore and Porewater/Sediment Sampling Location
- 240 — Groundwater/Porewater Arsenic Concentration in ug/L (December 2010)
- 20.47 — Groundwater Elevation (December 2010)
- 19 — Groundwater Elevation Contour (December 2010)

N

0 100 200
Feet

Aspect CONSULTING

Summary of Arsenic Monitoring Data December 2010

Barbee Mill
4101 Lake Washington Blvd. North, Renton, Washington

DATE: August 2011	PROJECT NO. 050004
DESIGNED BY: JJP	
DRAWN BY: PMB	FIGURE NO. 4
REVISED BY: -	

Q:\Barbee Mill\050004 Barbee Mill\2011-08\050004-04.dwg

NOTES:

1. VERTICAL DATUM: NAVD 88.

2. PLAT DETAILS BASED ON SITE PLAN PROVIDED BY OTAK ON 9/25/06.

3. GROUNDWATER ELEVATIONS AT ACTIVE EXTRACTION WELLS NOT USED TO DEVELOP GROUNDWATER CONTOURS.

4. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED AND HITCHINGS, INC DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH 2002.

NS01-C1
WP-8 490
BH-29A 18.55
BH-29B 19.79
BH-21B 20.02
BH-21A 18.70
PW-CMW-4
WP-1A 25
WD02
WD01
VB8
CMW-4S/4D 18.39/10.69 140/910
CMW-5 19.40 8.8
CMW-6 20.47 180
BH-26A 20.73
BH-26B 20.45
BH-16
Property Boundary
PW-CMW-3
CMW-3 19.18 ND
EW-8 19.93 670
EW-5 20.60 70
EW-6 20.55 64
EW-7 20.59 130
EW-4 27
EW-3 19.52 23
EW-2 20.11 31
EW-1 20.30 130
N 42ND PL
PZ-2
Excavation Footprint
PW-CMW-2
CMW-2S/2D 17.98/18.27 1.3/99
VB4
LAKE WASHINGTON
MILL POND
CMW-1 43
PW-Control
Remediation System Vault Area
N 41ST PL
PZ-1 20.80
WILLIAMS AVE N
BNSF RAILROAD
LAKE WASHINGTON BOULEVARD
MAY CREEK
N 43RD ST
Ordinary High Water Mark prior to December 2005 Habitat Restoration
Western extent of emplaced beach gravel or sand/gravel mix, December 2005

Legend

- Passive Attenuation Zone
- WP-6 — Well Point
- CMW-1 — Monitoring Well Location
- EW-7 — Extraction Well Location
- PZ-1 — Piezometer Location
- PW-CMW-2 — Porewater Sampling Location
- RS — Remediation System Utilities
- VB8 — Vibracore and Porewater/Sediment Sampling Location
- 240 — Groundwater/Porewater Arsenic Concentration in ug/L (March 2011)
- 20.47 — Groundwater Elevation (March 2011)
- 19 — Groundwater Elevation Contour (March 2011)

N

0 100 200

Feet

Aspect CONSULTING

Summary of Arsenic Monitoring Data March 2011

Barbee Mill
4101 Lake Washington Blvd. North, Renton, Washington

DATE:	PROJECT NO.
August 2011	050004
DESIGNED BY: JJP	
DRAWN BY: PMB	FIGURE NO. 5
REVISED BY: -	

Q:\Barbee Mill\050004 Barbee Mill\2011-08\050004-05.dwg

NOTES:

1. VERTICAL DATUM: NAVD 88.
2. PLAT DETAILS BASED ON SITE PLAN PROVIDED BY OTAK ON 9/25/06.
3. GROUNDWATER ELEVATIONS AT ACTIVE EXTRACTION WELLS NOT USED TO DEVELOP GROUNDWATER CONTOURS.
4. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED AND HITCHINGS, INC DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH 2002.

NS01-C1
WP-8 480
BH-21B 20.81
BH-21A 19.44
BH-29A 19.47
BH-29B 20.65
PW-CMW-4
WD02
WD01
WP-1A 270
BH-16
BH-26A 21.78
BH-26B 21.18
Property Boundary
CMW-5 20.05 5.1
CMW-6 20.93 210
CMW-4S/4D 19.20/19.59 190/580
VB8
EW-8 20.64 460
PW-CMW-3
CMW-3 20.31 ND
EW-5 21.35 260
EW-6 21.38 390
EW-7 21.36 410
N 42ND PL
EW-4 21.17 12
PZ-2 21.63
Excavation Footprint
EW-3 20.20 140
PW-CMW-2
CMW-2S/2D 19.03/19.26 3.2/90
VB4
EW-2 20.84 130
EW-1 21.91 150
MILL POND
LAKE WASHINGTON
BNSF RAILROAD
N 43RD ST
HCMW-05S/ HCMW-05D
AMW-2
LAKE WASHINGTON BOULEVARD
CMW-1 19.22 47
PW-Control
Remediation System Vault Area
N 41ST PL
WILLIAMS AVE N
PZ-1 20.71
RMW-05
MAY CREEK
Ordinary High Water Mark prior to December 2005 Habitat Restoration
Western extent of emplaced beach gravel or sand/gravel mix, December 2005
RMW-02

Legend

- Passive Attenuation Zone
- WP-6 — Well Point
- CMW-1 — Monitoring Well Location
- EW-7 — Extraction Well Location
- PZ-1 — Piezometer Location
- PW-CMW-2 — Porewater Sampling Location
- RS — Remediation System Utilities
- VB8 — Vibracore and Porewater/Sediment Sampling Location
- 21.36 — Groundwater Elevation (June 2011)
- 410 — Groundwater/Porewater Arsenic Concentration in ug/L (June 2011)
- 20 — Groundwater Elevation Contour (June 2011)

N

0 100 200

Feet

Aspect CONSULTING

Summary of Arsenic Monitoring Data June 2011

Barbee Mill
4101 Lake Washington Blvd. North, Renton, Washington

DATE: August 2011	PROJECT NO. 050004
DESIGNED BY: JJP	
DRAWN BY: PMB	FIGURE NO. 6
REVISED BY: -	

Q:\Barbee Mill\050004 Barbee Mill\2011-08\050004-06.dwg

Figure 7 - Trends in Total Arsenic Concentrations in Groundwater at Monitoring Wells

Red line represents site cleanup level for dissolved Arsenic (20 ug/L)
Dashed Green Line represents PAZ installation, and solid green line represents startup of the Groundwater Pump and Treat System

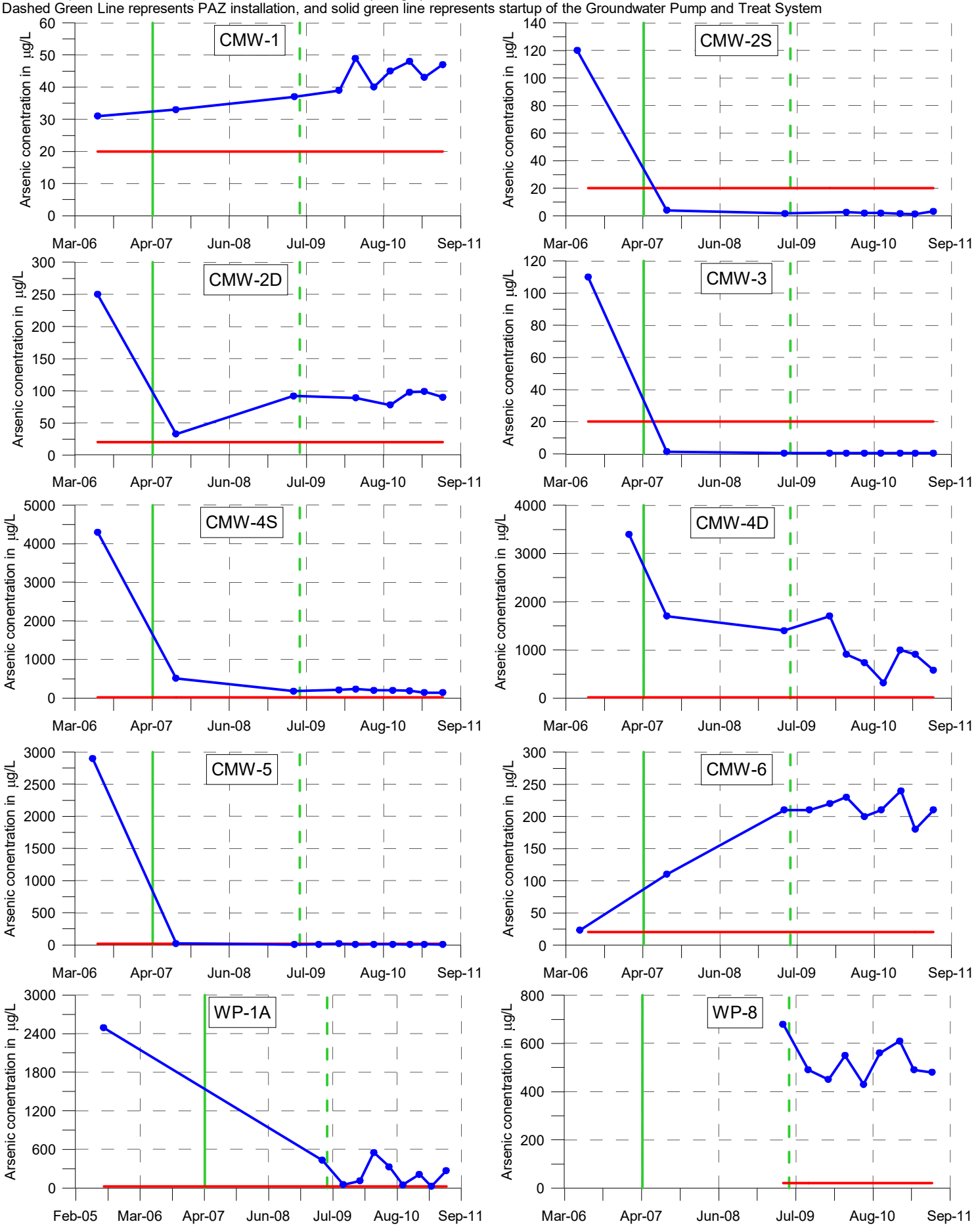


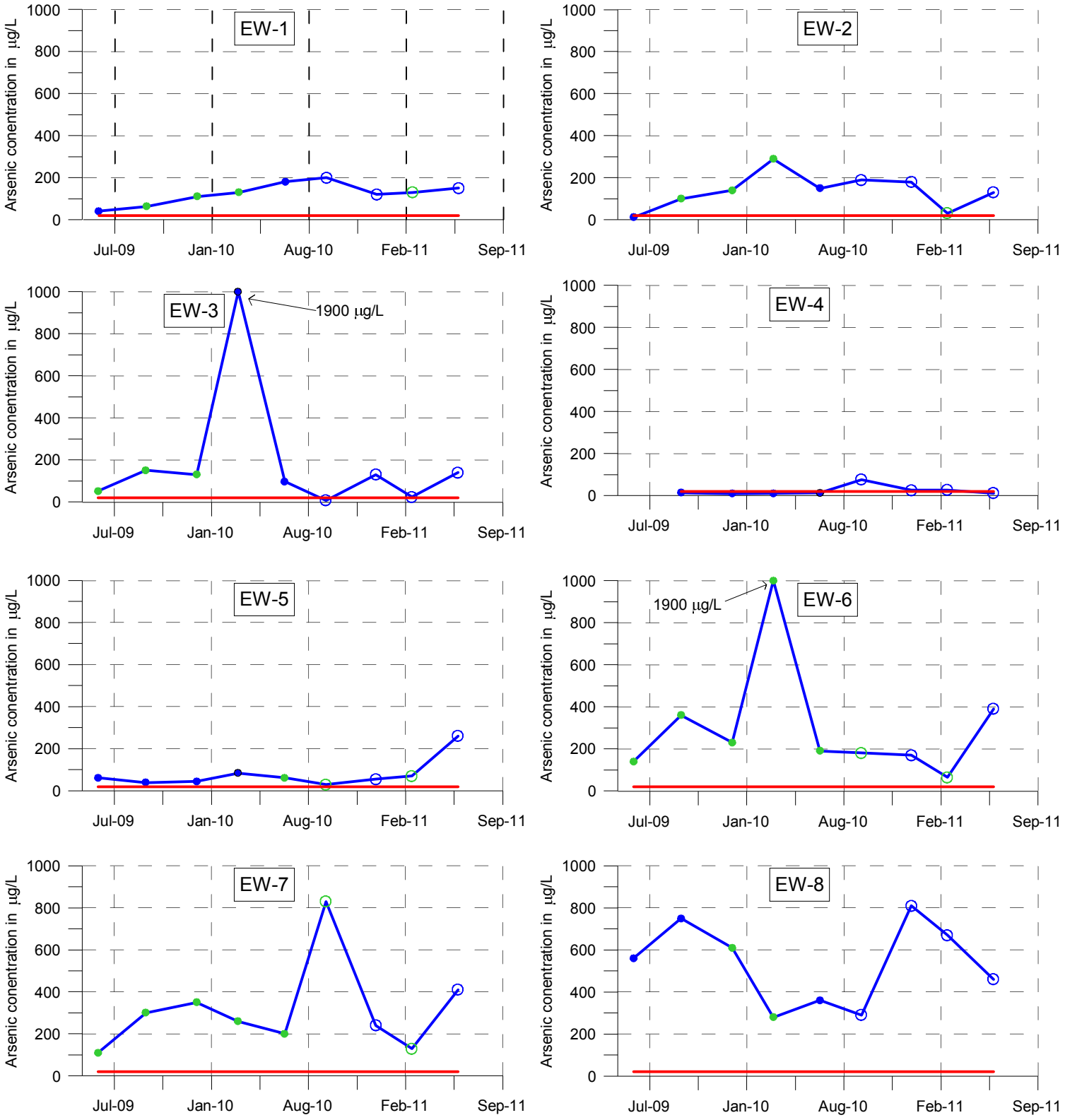
Figure 8 - Trends in Total Arsenic Concentrations in Groundwater at Extraction Wells

Red line represents site cleanup level for dissolved Arsenic (20 ug/L)

Solid symbols indicate total arsenic results (9/09 to 6/10), hollow symbols indicate dissolved arsenic results (9/10 to present)

Blue symbols represent samples collected while extraction well had not been operating during the month preceding sampling

Green symbols represent samples collected when extraction well had been operating during the month preceding sampling



NOTES:

1. VERTICAL DATUM: NAVD 88.
2. PLAT DETAILS BASED ON SITE PLAN PROVIDED BY OTAK ON 9/25/06.
3. GROUNDWATER ELEVATIONS AT ACTIVE EXTRACTION WELLS NOT USED TO DEVELOP GROUNDWATER CONTOURS.
4. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED AND HITCHINGS, INC DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH 2002.

370 µg/L

250 µg/L

MILL POND

Property Boundary

Excavation Footprint

Remediation System Vault Area

Ordinary High Water Mark prior to December 2005 Habitat Restoration

Western extent of emplaced beach gravel or sand/gravel mix, December 2005

NS01-C1 WP-8 BH-29A BH-29B BH-21B BH-21A FW-CMW-4 WP-1A WD02 WD01 CMW-4S/4D CMW-5 CMW-6 BH-26A BH-26B VB8 CMW-3 PW-CMW-3 EW-8 EW-5 EW-6 EW-7 EW-4 EW-3 EW-2 EW-1 PZ-2 PW-CMW-2 CMW-2S/2D VB4 CMW-1 PW-Control RMW-02 PZ-1 RMW-05 HCMW-05S/ HCMW-05D AMW-2

N 42ND PL N 41ST PL N 43RD ST BNSF RAILROAD LAKE WASHINGTON BOULEVARD WILLIAMS AVE N MAY CREEK LAKE WASHINGTON

SW 1/4 SEC 08 TWN 29 RGE 5E

0 100 200 Feet

Legend

- Passive Attenuation Zone
- WP-6 Well Point
- CMW-1 Monitoring Well Location
- EW-7 Extraction Well Location
- PZ-1 Piezometer Location
- PW-CMW-2 Porewater Sampling Location
- RS Remediation System Utilities
- VB8 Vibracore and Porewater/Sediment Sampling Location

Initial Conditions-Restoration Time Frame Modeling
(Average Arsenic Concentrations - June 2011)
Barbee Mill
4101 Lake Washington Blvd. North, Renton, Washington

Aspect Consulting	AUG-2011	BY: SM/SCC	FIGURE NO. 9
	PROJECT NO. 050004	REV BY: -	

CAD Path: Q:\Barbee Mill\050004 Barbee Mill\2011-07 Barbee Mill June 2011\050004-03.dwg Figure 1 (11x17) || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Aug 11, 2011 9:22am || User: scudd

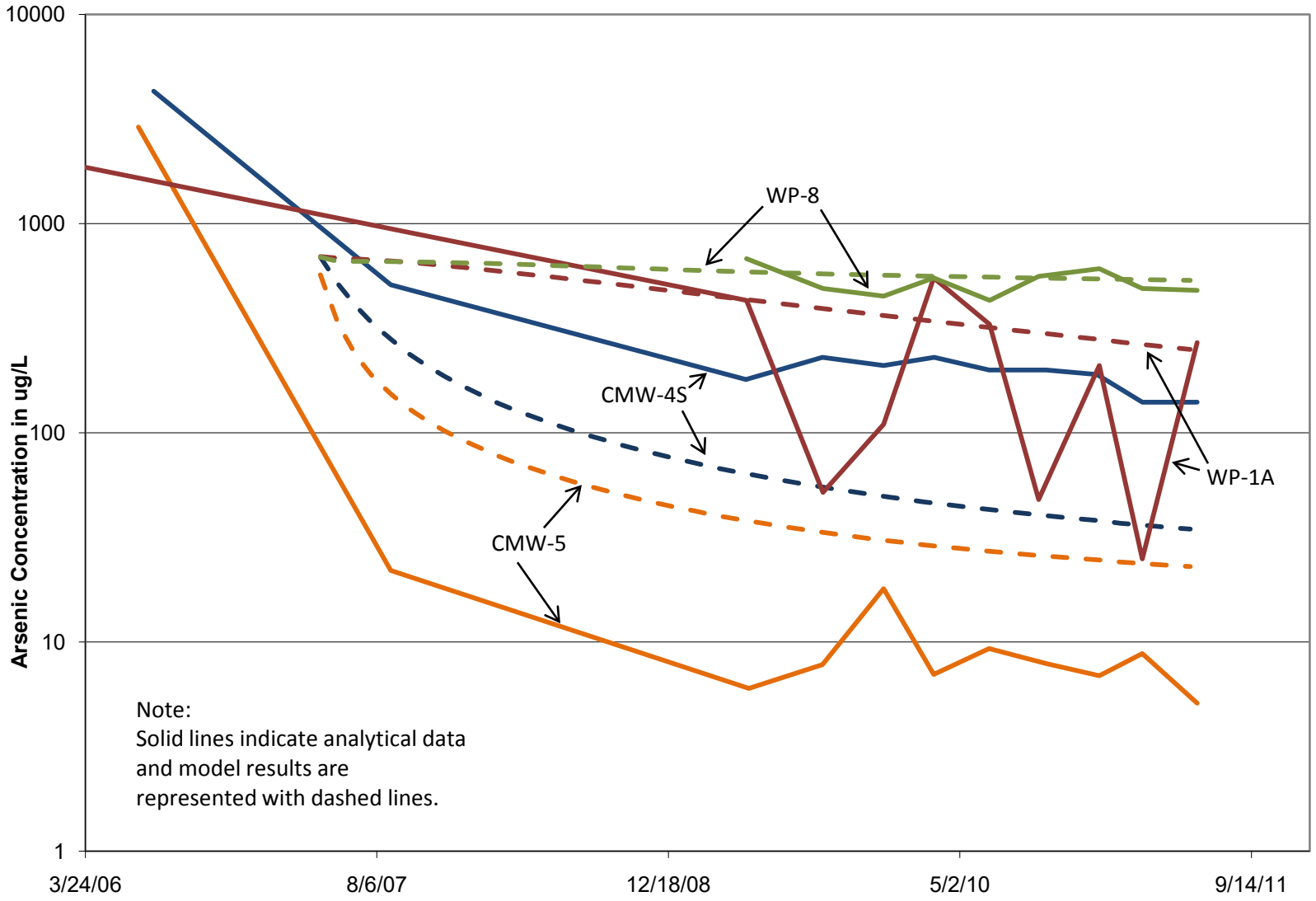


Figure 10
Comparison of Observed and Model-Predicted Arsenic Concentrations Downgradient of PAZ
Barbee Mill

Aspect Consulting
August 11, 2011
V:\050004 Barbee Mill\PAZ Monitoring\Annual Report\8-11-11\Resto Timeframe Analysis3 072711

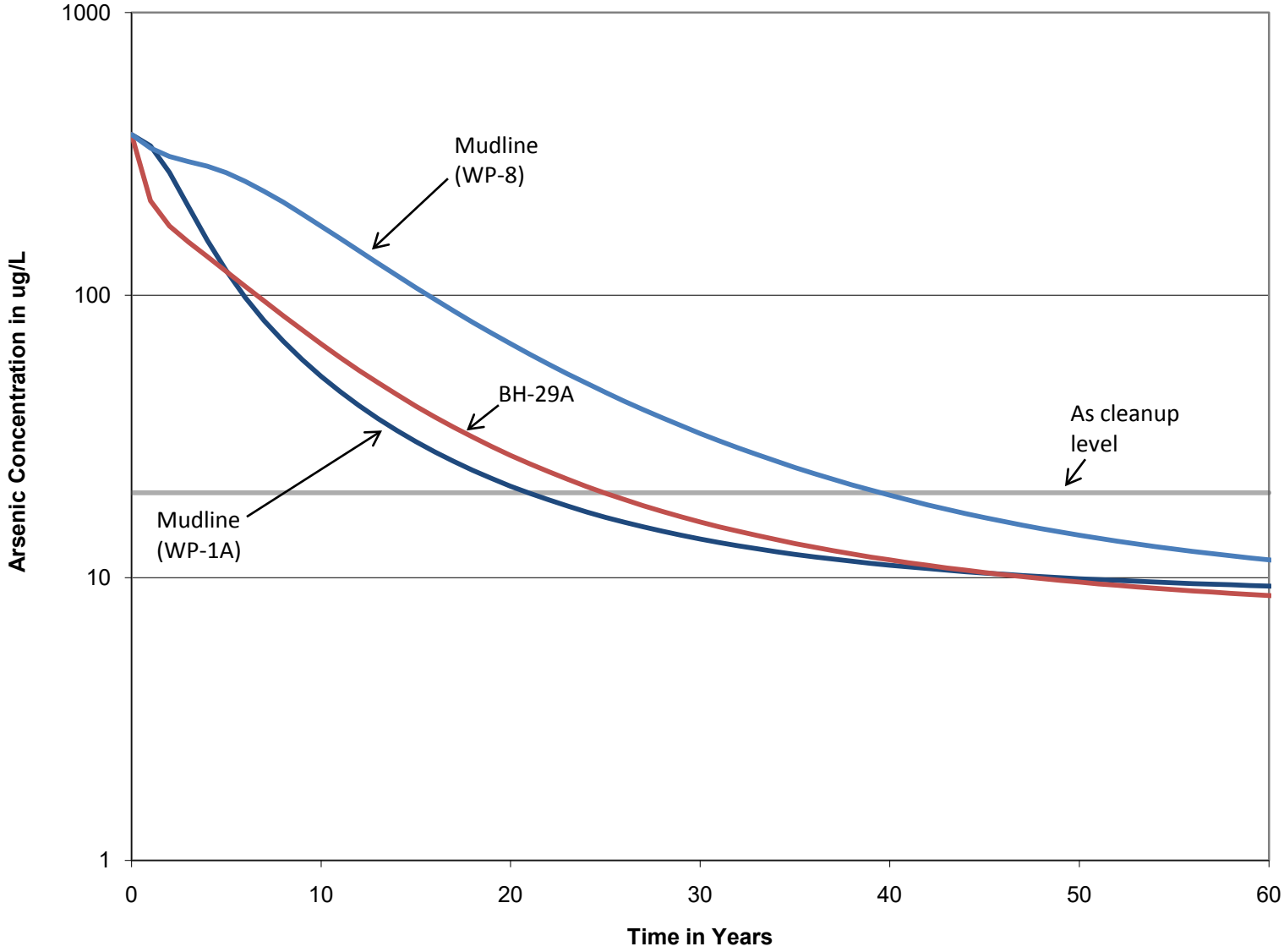


Figure 11
Predicted Restoration Timeframe Downgradient of PAZ
Barbee Mill

Aspect Consulting
August 11, 2011
V:\050004 Barbee Mill\PAZ Monitoring\Annual Report\8-11-11\Resto Timeframe Analysis3 072711

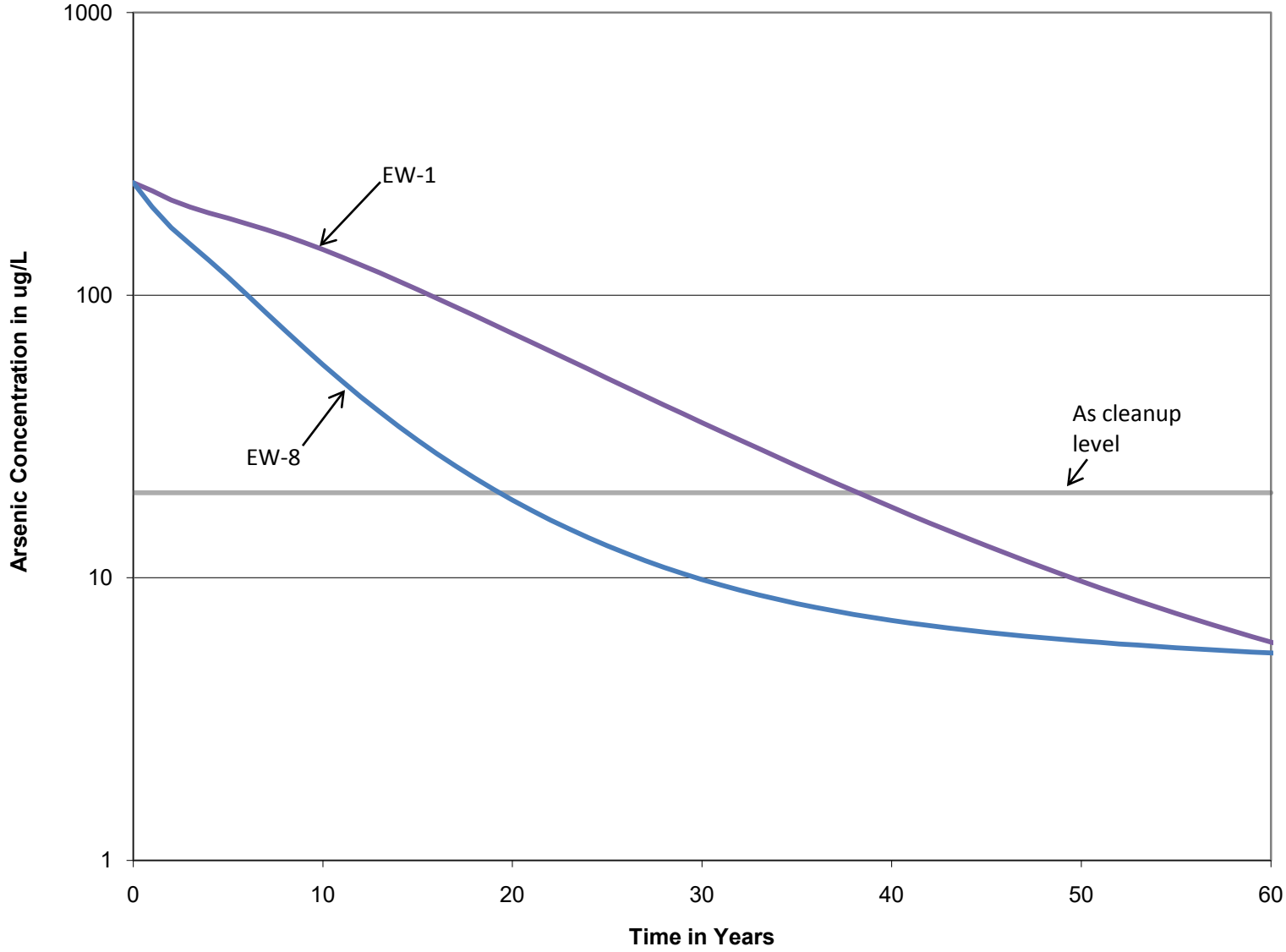


Figure 12
Predicted Restoration Timeframe Upgradient of PAZ
Barbee Mill

Aspect Consulting
August 11, 2011
V:\050004 Barbee Mill\PAZ Monitoring\Annual Report\8-11-11\Resto Timeframe Analysis3 072711

APPENDIX K

Attachment K3

Barbee Mill – Groundwater Model Update for RI/FS Report and Restoration Time Frame Analysis, March 2, 2023.

DRAFT MEMORANDUM

Project No. 050004

March 2, 2023

To: Robert Cugini, Barbee Mill Co., Inc.

From:

Peter Bannister, PE
Senior Associate Engineer
pbannister@aspectconsulting.com

Re: **Barbee Mill – Groundwater Model Update for RI/FS Report and Restoration Time Frame Analysis**

This memo summarizes modifications to the groundwater model developed for the Barbee Mill Site (Site) and results of a restoration time frame analysis for remedial alternatives identified in the Remedial Investigation/Feasibility Study (RI/FS) Report. The purpose of the model updates was to more closely match conditions observed at wells exhibiting slower attenuation than predicted by the previous version of the model.

Numerical Groundwater Transport Model Description

Groundwater conditions at the Site were simulated using an existing numerical model. The conceptual model development and construction/calibration of the numerical model were previously documented (Aspect, 2019)[1]. The existing numerical model was refined to support this Feasibility Study by simulating alternative arsenic cleanup approaches. The influences of cleanup and redevelopment of the adjacent Quendall Terminals site (Quendall Site) on the Site was also simulated.

Baseline model refinements were made to better reflect the conceptual site model, including the following:

- Assigning source dissolved-phase concentrations based on available data following the excavation and the Passive Attenuation Zone (PAZ) remediation actions.

[1] Aspect Consulting, LLC (Aspect), 2019, Revised Remedial Investigation Report, Barbee Mill. Prepared on behalf of Barbee Mill Co. Inc. for submittal to Washington State Department of Ecology, Review Draft (Updates to draft 2012 RI), May 3, 2019.

- Assigning source solid-phase concentrations based on a distribution coefficient (K_d) of 29 liters per kilogram (L/kg), using the standard value available in the Washington State Department of Ecology's Cleanup Levels and Risk Calculation (CLARC) table.

- Assigning the excavation and the PAZ parameters to the appropriate depths.

- Extending the model time frame from 100 to 200 years.

Model Validation and Rationale for Adjusting Model Results

The base model condition was simulated for a period starting in May 2007 following the excavation and PAZ cleanup actions. The calculated dissolved-phase arsenic concentrations were compared with observed conditions from April 2009 through January 2022. Model calibration of arsenic transport was not conducted as part of this Feasibility Study. Instead, model results were interpreted within the context of contaminant transport mechanisms. Major differences between observed and calculated conditions may be explained one or more complex transport mechanisms not well simulated in the model. These complex transport mechanisms include the following:

- Source concentrations were assigned in the model using the available data and do not reflect the natural variability in actual site conditions.

- Groundwater flow conditions were simulated assuming steady-state boundaries and relatively uniform aquifer parameters and do not reflect natural variability in actual site conditions.

- The model does not simulate changes in geochemical conditions influencing arsenic mobility.

A comparison of model results with empirical data, and the rationale for post-model adjustments, are as follows:

- Decreasing concentrations at CMW-4S aligned well with calculated values. Calculated values were used without adjustment to estimate the cleanup time frame at this location.

- Decreasing concentrations at some locations (e.g, CMW-4D) did not align with calculated values. These differences may be explained by complex transport mechanisms not simulated in the model, such as changes in reduction-oxidation conditions influencing arsenic mobility. The rate and offset of calculated values could reasonably be adjusted using regression analysis to estimate the cleanup time frame at these locations.

- Variable concentrations at some locations (e.g., EW-1) did not align with calculated values. Calculated values were offset based on the average difference, and the calculated rate of decreasing concentrations was not adjusted to estimate cleanup time frames at these locations.

- Rising or stable concentrations were observed at CMW-1 and were not simulated. Calculated values were used without adjustment to estimate the cleanup time frame at this location.

- Observed concentrations at some locations are below the preliminary cleanup level. These locations were not used to estimate cleanup time frames.

Potential Effect of Remediation and Development at the Quendall Site

To assess the influence of cleanup and redevelopment activities at the Quendall Site, the model setup used for Alternative 1 was modified to simulate remediation via *in-situ* solidification (ISS) of impacted soils and preparation of a hypothetical "Ground Improvement Area"[2] along the shoreline. Solidification and ground improvement was assumed to reduce hydraulic conductivity to $1x10^{-6}$ centimeters per second (cm/sec) over the area targeted for treatment in the Quendall Site Record of Decision (ROD; EPA, 2020[3])[4] and a hypothetical ground improvement area extending 70 feet below ground surface along the Quendall Site shoreline, and dissolved arsenic concentrations within the solidified area were assumed to be 5 micrograms per liter (ug/L). The findings were that the Barbee arsenic plume would not be pushed to the south due to potential Quendall Site activities.

Remediation Alternatives Description

The base model case includes ongoing operation of the PAZ and predicts attenuation time frames for Alternative 1. The long-term effects of other remediation alternatives for the Site were simulated for the period starting in July 2024. The initial concentrations (dissolved-phase and solid-phase) for these simulations were assigned based on Year 17 results of the Alternative 1 (base case) model. These models incorporated ISS over the Quendall Site treatment area, but not the Ground Improvement Area. Model assumptions for each alternative were as follows:

- For Alternative 2, an area of *in situ* chemical reduction was simulated to be 80 percent effective at immobilizing arsenic present in soil and groundwater.

- For Alternative 3, the PAZ extension was simulated as extending across the southern shoreline of the Quendall Site to the edge of the Barbee plume and treating dissolved arsenic concentrations to 5 ug/L.

- For Alternative 4, the shallow plume extent was simulated as stabilized, resulting in lower hydraulic conductivity and treated dissolved arsenic concentrations of 5 ug/L.

- For Alternative 5, the shallow and deep plume extent was simulated as stabilized, resulting in lower hydraulic conductivity and treated dissolved arsenic concentrations of 5 ug/L.

[2] To support development of the Quendall Site, a possible action to prevent lateral spreading during an earthquake is solidification of liquifiable soils (ground improvement) near the shoreline. This would create a low-permeability barrier to groundwater flow. The most likely design would be partial penetration into the Deeper Alluvium, which could direct groundwater flow downward and/or around the ground improvement area.

[3] Treatment is planned using two technologies: ISS and *in situ* smolderable combustion. Areas not treated by ISS would retain their native hydraulic conductivity; therefore, this analysis which assumed all areas treated by ISS is conservative.

[4] Environmental Protection Agency (EPA), 2020, Record of Decision, Quendall Terminals Superfund Site Operable Units 1 and 2, Renton, Washington. US EPA Region 10. July 2020.

Remedial Alternative Simulation Results Summary

The results indicate that groundwater cleanup time frames are dictated by the slow process of dissolution on the upgradient portion of the plume and precipitation on the downgradient portion of the plume. The maximum cleanup time frames for existing monitoring locations upgradient of the PAZ range were simulated at just over 200 years for all alternatives. The cleanup time frames for existing monitoring locations downgradient of the PAZ along the shoreline was generally less than approximately 100 years, although Alternatives 2 and 3 resulted in cleanup time frames of less than approximately 25 years on the Quendall Property as the result of additional treatment and Alternative 5 resulted in a longer time frame due to stagnation downgradient of the ISS area. Table 1 shows the estimated time to achieve preliminary cleanup levels at each Site well. Figures showing the model-predicted concentrations over time with adjustments to match empirical data for wells CMW-1, EW-1, EW-8, and WP-8 are attached (Figure 1).

Limitations

Work for this project was performed for the Barbee Mill Co., Inc. (Client), and this memorandum was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This memorandum does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

Attachments: Table 1 – Estimated Time to Achieve Preliminary Cleanup Levels
Figure 1 – Model-Predicted Attenuation Time Frames – CMW-1, EW-1, EW-8, and WP-8

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Table 1. Estimated Time to Achieve Preliminary Cleanup Levels

DRAFT

Project No. 050004, Barbee Mill, Renton, Washington

Well Number	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
CMW-1	90	88	88	89	104
CMW-2S	Calculated values below the PCUL				
CMW-2D	Calculated values below the PCUL				
CMW-3	Calculated values below the PCUL				
CMW-4S	35		5	5	5
CMW-4D	19		4	3	
CMW-5	Calculated values below the PCUL				
CMW-6	118	128	138	56	332
EW-1	192	188	186	178	175
EW-2	220	215	216	207	206
EW-3	193	198	197	198	194
EW-4	179	175	176	191	188
EW-5	159	159	158	199	197
EW-6	259	280	274	274	269
EW-7	Observed less than PCUL.				
EW-8	106	106	104	152	149
WP-1A	Observed less than PCUL.				
WP-8	83	11	21	75	121
BH-31B	Calculated values below the PCUL				

Note:
PCUL = Preliminary Cleanup Level
All time frames are shown in years.

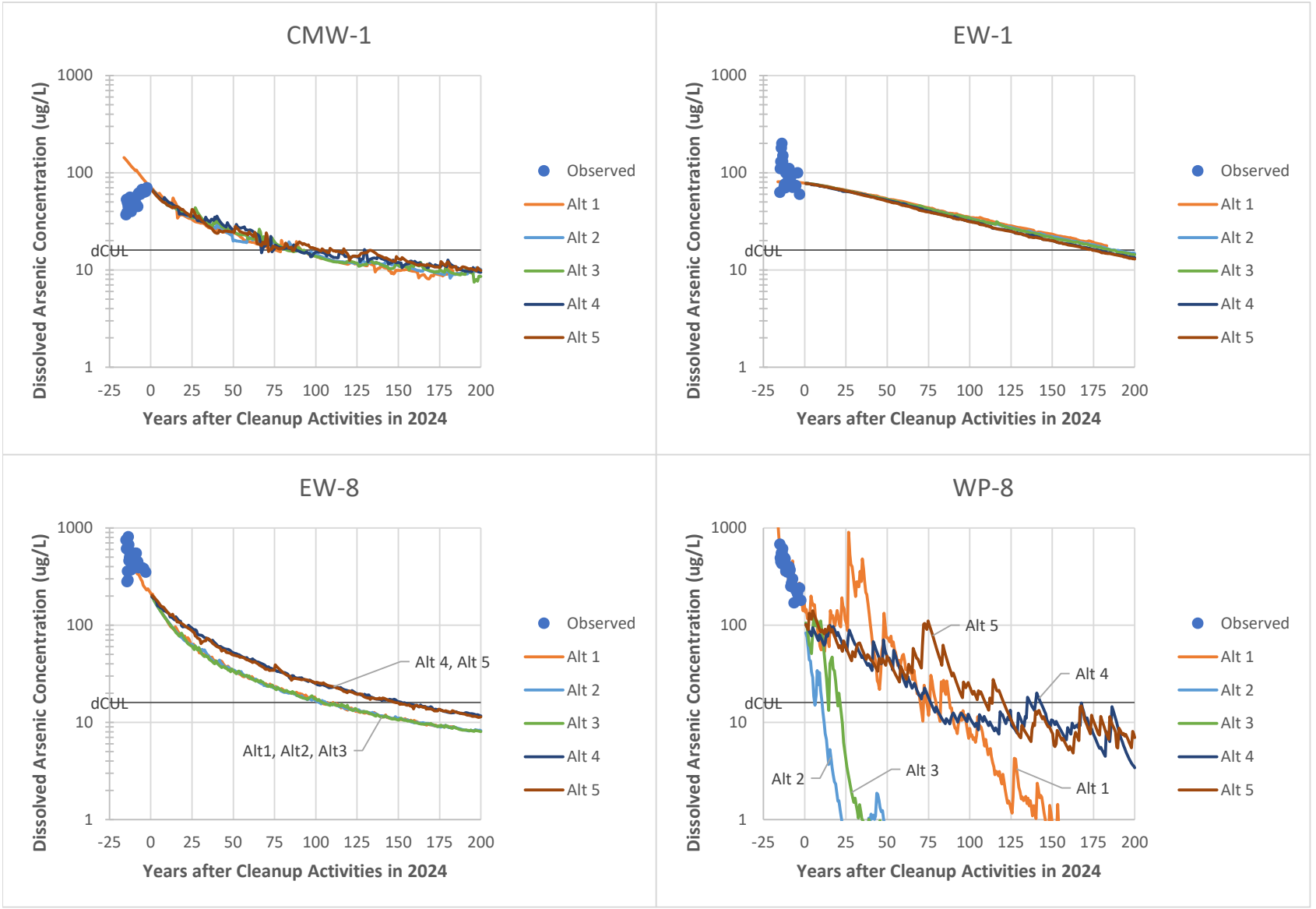

Figure 1

Model-Predicted Attenuation Time Frames – CMW-1, EW-1, EW-8, and WP-8

Aspect Consulting
3/22/2023
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Project No. 050004
Barbee Mill

APPENDIX L

Ambient cPAHs Concentrations in Lake Washington Surface Sediments

APPENDIX L

Ambient cPAHs Concentrations in Lake Washington Surface Sediments

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engineers | scientists | innovators

REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT

APPENDIX L: AMBIENT cPAHs IN LAKE WASHINGTON SURFACE SEDIMENTS

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ACRONYMS AND ABBREVIATIONS

µg/kg	micrograms per kilogram
ALW	ambient Lake Washington
AO	Agreed Order
Aspect	Aspect Consulting, LLC
Barbee	Barbee Mill Co., Inc.
BTV	background threshold values
COPC	contaminant of potential concern
cPAHs	carcinogenic polyciclic aromatic hydrocarbons
CSL	cleanup screening level
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management System
FS	Feasibility Study
Geosyntec	Geosyntec Consultants, Inc.
ID	identification number
RI	Remedial Investigation
SCO	sediment cleanup objective
SCUM II	Sediment Cleanup User's Manual II
SRI	Sediment Remedial Investigation
TEQ	toxic equivalents
the Site	Barbee Mill Sediment site
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
UTL	upper threshold limit

1. INTRODUCTION

This appendix is part of the *Remedial Investigation and Feasibility Study* (RI/FS) *Report* prepared by Aspect Consulting, LLC (Aspect) and Geosyntec Consultants, Inc. (Geosyntec) on behalf of the Barbee Mill Co., Inc. (Barbee) for the Barbee Mill Site (Site). Barbee is conducting an RI/FS for the Site under an Agreed Order (AO; No. DE 5396), including the first and second amendments, with the Washington State Department of Ecology (Ecology). This appendix presents an evaluation of ambient carcinogenic polycyclic aromatic hydrocarbon (cPAH) concentrations in Site surface sediment in comparison to current Lake Washington surface sediment to support the human health and ecological (bioaccumulative) risk evaluation performed in the RI/FS. Results are expressed in micrograms per kilogram toxic equivalent units (µg/kg TEQ).

1.1 Background

The Sediment Remedial Investigation (SRI) Work Plan (Appendix B of the *Final Remedial Investigation Work Plan* [Aspect, 2021]) does not list cPAHs as a Site-related contaminant of potential concern (COPC) because there are no significant historical sources and pathways from the upland to sediment. However, results of investigations conducted in 2021 and 2022 showed that concentrations of cPAHs in Site surface sediment exceeded the bioaccumulative sediment cleanup objectives (SCO) based on natural background (21 µg/kg TEQ) and some Site samples also exceeded the bioaccumulative cleanup screening level (CSL) based on the Lake Washington regional background for cPAH of 210 µg/kg TEQ (Ecology, 2017). Therefore, cPAHs are considered a COPC but they are not Site-related, as clarified in Section 5.2.2.2 of the RI/FS.

In accordance with the *Sediment Cleanup User's Manual II* (SCUM II [Ecology, 2021]) and Washington Administrative Code 173-204-560[2][a][ii], site-specific factors need to be evaluated to assess the ability to achieve and maintain the SCO after cleanup (in this case, the interim action completed at Barbee Mill). The cleanup levels can be adjusted upward to no higher than the bioaccumulative CSL in cases where the bioaccumulative SCO (natural background) cannot be maintained because of higher ambient concentrations from diffuse regional sources, as described in Section 7.2.3.2 of SCUM. However, prior to adjustment of the SCO, a technical possibility evaluation must be performed to assess the potential to attain the SCO after cleanup.

1.2 Study Objectives and Scope

The purpose of this appendix is to (1) evaluate current cPAH concentrations in Lake Washington surface sediment, (2) assess whether differences between Site and ambient conditions are statistically significant, and (3) assess the likelihood that either the freshwater background-based SCO or CSL screening levels developed by Ecology could be achieved and or maintained at the Site. Future sediment surface conditions are expected to reflect ambient concentrations within Lake Washington, and the regional background can represent a more realistic cleanup level for cPAHs if differences between Site and ambient sediments are not significant.

Specific analyses performed included the following:

- Compilation of the available dataset of cPAH concentrations in Lake Washington surface sediments from the Environmental Information Management System (EIM) database
- Refinement of the compiled Lake Washington dataset (filtered to remove potential sources) for comparison with Site surface sediment
- Evaluation of statistical differences between cPAH concentrations in Site versus Lake Washington surface sediments

Results of this analysis will assess if cPAH concentrations in Site surface sediment are consistent with ambient concentrations and will ultimately support development of sediment cleanup levels in the RI/FS report.

2. AMBIENT DATA FOR LAKE WASHINGTON SURFACE SEDIMENT

2.1 Available Data for Lake Washington Sediment

The EIM database[1] was queried on November 14, 2022, by applying the following selection criteria:

- Analyte: cPAH (totals and individual compounds)
- Matrix: soil/sediment
- Location: Lake Washington

The initial output of the EIM query included 1,923 surface sediment samples, reported in **Attachment L-1**. The query was refined to only surface sediment data (0 to 10 centimeters) and results reported in dry weight. The second query resulted in 140 samples collected from seven studies (**Table L-1**):

- Washington DNR – South Lake Washington Shoreline Restoration Project (sample size n=10, collected in 2010), EIM study identification number (ID): "AQSLWA082010"
- Kenmore Sediment and Water Investigation (n=16 samples collected in 2012), EIM study ID: "AQ_Kenmore2012"
- King County CSO Sediment Quality Characterization for NPDES Permit No. WA-002918-1 (n=6 samples collected in 2013), EIM study ID: "KC_CSO_2013"
- Lake Union Sediment Quality Study (n=4 samples collected in 2001), EIM study ID: "FWLKUN01"
- King County Lakes Sediment Monitoring Program (n=62 collected between 2008 and 2016), EIM study ID: "KingLakeSeds"

[1] https://ecology.wa.gov/Research-Data/Data-resources/Environmental-Information-Management-database

- King County CSO Sediment Quality Characterization for NPDES Permit No. WA-002918-1 (n=8 samples collected in 2011), EIM study ID: "KC_CSO_2011"
- Lake Washington Baseline Sed Study (n=34 samples collected in 2000), EIM study ID: "LKWA00"

Individual cPAH concentrations were used to calculate total cPAH as described in the following subsection.

2.2 Calculation of Total cPAHs

Calculations for total cPAHs µg/kg TEQ were performed as described in the SRI Work Plan and as recommended in SCUM (section 6.3.3.2 and Appendix F). Totals were calculated following two procedures:

- Assumption of non-detected equal to zero (ND=0)
- Assumption of non-detected equal to half of the reporting limit (ND=1/2 RL)

The Kaplan Meier sums were calculated using the R package NADA as described in SCUM, Appendix F, section F.1.2.2

Qualifiers were carried over to the cPAH TEQ totals as follows:

- If more than 50% of the results for individual cPAH showed no detection, then the cPAH TEQ total was qualified as no detection (U flag)
- If more than 50% of the individual cPAH was detected but qualified as an estimate, then the cPAH TEQ total was qualified as an estimate (J flag)
- If more than 50% of the results for individual cPAH was qualified as "UJ" or as "U", then the cPAH TEQ total was qualified as "UJ"
- The Kaplan Meier sums were "L" qualified when more than 50% of the congeners within a sample were not detected to indicate a positive bias, and the number of censored congeners in the sample was included as per the output of the script as provided in SCUM, Appendix F, section F.1.2.2

The compiled dataset is reported in **Table L-2** and locations are shown in **Figure L-1**.

The ambient Lake Washington dataset used for comparison with the Barbee Mill dataset was compiled including only ND=0 totals. In cases when all individual cPAHs were non-detect, total cPAH TEQ was reported as half of the average of the reporting limit for benzo(a)pyrene. The compiled dataset included 140 samples and was refined by excluding outliers and applying temporal and spatial filtering, as described in the following section.

3. DATA SCREENING AND ANALYSIS

The data screening and analysis steps described below included evaluation and exclusion of outliers, assessment and refinement of the dataset based on representativeness of recent sediment

conditions, and exclusion of areas potentially under the direct influence of sites and sources. Taken together, these three screening steps were performed to exclude data not considered representative of ambient cPAH levels in Lake Washington surface sediment. Statistical analysis used to evaluate refined datasets were performed in ProUCL v5.2 (United States Environmental Protection Agency [USEPA], 2022).

3.1 Evaluation and Exclusion of Outliers

The compiled dataset was initially screened for high concentration outliers using Q-Q plots; outliers were removed to improve representativeness of the ambient conditions. Four results were identified as outliers, as shown in **Figure L-2a** and not further considered in the analysis. A Q-Q plot of the dataset screened for the four outliers is depicted in **Figure L-2b**.

The resulting dataset, referred hereinafter as ambient Lake Washington (ALW), included 136 samples; results for individual and calculated total cPAHs are reported for these samples in **Table L-2**.

3.2 Assessment and Refinement of Current Sediment Conditions

A statistical analysis was performed to identify a time range representative of current cPAH ambient conditions in Lake Washington surface sediment. The King County Lake Sediment Monitoring Program consists of data collected through eight years (2008–2016) at re-occupied sampling locations. Therefore, this dataset was used to assess the significance of different time periods on the variability of cPAH levels in Lake Washington surface sediment.

The dataset was sorted by year of sample collection and grouped into four data subsets (2008, 2009, 2010, and 2016). Descriptive statistics for each dataset are presented in **Table L-**3. Hypothesis testing was performed to evaluate the statistical significance of differences between the sampling events The analysis showed that concentrations of cPAH between 2008 and 2016 were not statistically different (**Figure L-3; Table L-3)**. This indicates that ambient cPAH concentrations in Lake Washington surface sediments were stable throughout the analyzed time period.

Based on this analysis, the Lake Washington dataset was screened to select surface sediment samples collected on or after the year 2008. After excluding data results from surface sediment samples collected prior to 2008, the ALW (after 2008) included 92 samples.

3.3 Exclusion of Potential Source Areas

The ALW dataset should be representative of ambient non-point sources. Surface sediment quality is more likely to have been affected by nearshore or upland sources at sampling stations located near the shoreline. Therefore, sampling stations that occurred within 300 feet of the shoreline were excluded to remove samples potentially influenced by upland point sources. An exclusion zone of 300 feet from shore was applied based on the technical possibility evaluation performed for the *Gas Work Park Site RI/FS Report* (GeoEngineers, 2022).

The ALW and ALW (after 2008) datasets were screened for surface sediment samples collected further than 300 feet from shore. After the screening, the ALW (300 feet from shore) dataset

included 36 samples collected at any time from 2000 and later. The combined ALW (after 2008, 300 feet from shore) dataset included 10 samples collected since 2008.

3.4 Refined ALW Datasets

Based on the refinement steps described above, there were three sub-datasets compiled for further evaluation:

1) ALW (after 2008)
2) ALW (300 feet from shore)
3) ALW (after 2008, 300 feet from shore).

Descriptive statistics for these datasets are summarized below and reported in **Table L-4** alongside the Site surface sediment descriptive statistics. Statistical results are reported in **Attachment L-2**.

- The ALW (300 feet from shore) dataset includes only results from sampling stations located more than 300 feet from the lake shores. This subset was generated with the purpose of excluding potential ongoing upland source areas and improving representativeness of Lake Washington surface sediment. It consists of 36 samples, with a 72% detection frequency. Total cPAH concentrations range from a maximum of 955 µg/kg TEQ to a minimum of 17 µg/kg TEQ with a mean of 259 µg/kg TEQ based on detected concentrations.
- The ALW (after 2008) dataset included only recent results from sampling stations sampled after 2008. This dataset consists of 92 samples, with a 70% detection frequency. Total cPAH concentrations range from a maximum of 1283 µg/kg TEQ to a minimum of 1 µg/kg TEQ with a mean of 220 µg/kg TEQ based on detected concentrations.
- The combined ALW (after 2008, 300 feet from shore) dataset include samples from stations sampled after 2008 and located more than 300 feet from the lake shores. It consists of 10 samples, with a 100% detection frequency. Total cPAH concentrations range from a maximum of 440 µg/kg TEQ to a minimum of 17 µg/kg TEQ with a mean of 196 µg/kg TEQ based on detected concentrations.

4. COMPARISON OF ALW AND BARBEE MILL DATASETS

This section describes the comparison between the ALW datasets and Barbee Mill (Site) surface sediment dataset, concentrations, and statistical methods applied to determine whether there were statistically significant differences between datasets.

4.1 Comparison of Representative Values

Differences between concentrations of cPAH in Site surface sediments and ambient Lake Washington values were first evaluated qualitatively by comparing descriptive statistics (means and 90th percentiles) and upper bound values, as discussed below and presented in **Table L-4**.

Mean Values. The mean for cPAH concentration in Site surface sediment (258 µg/kg TEQ) falls within the range of mean values among the ALW datasets (196 to 259 µg/kg TEQ). The mean concentrations in ALW datasets also are very similar to the Lake Washington regional background value (210 µg/kg TEQ; Ecology, 2017), suggesting that the regional Lake Washington background cPAH value is representative of ambient Lake Washington sediment conditions.

90th Percentile Values. The 90th percentile is the value below which 90 percent of the values in the population fall. The 90th percentiles of ambient cPAH concentrations (ranging from 395 to 424 µg/kg TEQ) are lower than the 90th percentile of Site surface sediment cPAH concentrations (469 µg/kg TEQ).

Upper Bound Values. Upper bound values can be used to estimate threshold values representative of ambient conditions, and the upper tolerance limit (UTL) is often preferred due to its high coverage and reliability. The 90|90 UTL has become the most common measure of background threshold values (BTV) according to a recent report (Interstate Technology Regulatory Council [ITRC], 2022) and thus the 90|90 UTLs were calculated using ProUCL 5.2 for the ALW and Barbee Mill datasets. Output from ProUCL 5.2 is shown in **Attachment L-3**. The 90|90 UTL is a 90% upper confidence limit (UCL) of the 90th percentile of the data distribution (population); thus, it can be described as the value higher than 90% of observations (current and future) from the target population. Ambient ALW cPAH 90|90 UTLs (ranging from 478 to 515 µg/kg TEQ) were lower than that of surface sediment at the Site (546 µg/kg TEQ).

4.2 Hypothesis Tests

Standard hypothesis testing was conducted using ProUCL 5.2 (USEPA, 2022) to evaluate if the differences between ALW and Barbee Mill datasets were statistically significant. The ProUCL output for the hypothesis tests is reported in **Attachment L-4**.

Prior to hypothesis testing, the datasets were assessed separately for normality and homogeneity (equal variance) by using the Shapiro-Wilk and Levene's test, respectively (p-values ≤ 0.05). Based on the outcomes of these tests, datasets were analyzed as follows:

- If both datasets were normally distributed and homoscedastic (variances were determined to be equal), the Student's t-test was used to determine the statistical significance of differences between Barbee Mill and ALW surface sediments.
- If both datasets were normally distributed but variances were determined to be not equal, the Welch-Satterthwaite test was used.
- If datasets were not normally distributed, the Wilcoxon-Mann-Whitney (rank sum) test was used.

Hypothesis test results are reported in **Table L-4** and shown in **Figure L-4**. Results show that cPAH concentrations in Barbee Mill surface sediments are not significantly different from ambient Lake Washington concentrations when considering samples collected more than 300 feet offshore after 2008.

5. SUMMARY AND RECOMMENDATIONS

This study evaluated ambient cPAH concentrations in Lake Washington surface sediment, and then statistically compared these results to the cPAH concentrations in Site sediments. Results of this analysis were used to assess the likelihood that either the background-based SCO or CSL screening levels developed by Ecology could be achieved and or maintained at the Site. Specific findings were as follows:

- The mean cPAH concentrations in Lake Washington ranged from 196 µg/kg TEQ, based on the most refined dataset (i.e., post-2008 and offshore data), to 259 µg/kg TEQ (for the offshore refinement only). These concentrations are similar to the regional Lake Washington cPAH background concentration of 210 µg/kg TEQ (freshwater bioaccumulative CSL). The bioaccumulative CSL, based on regional background of cPAH TEQ concentrations (210 µg/kg), falls within the range of ambient cPAH TEQ values for Lake Washington.

  Differences between the range of concentrations among the ALW datasets and regional background values could be due to different datasets; Ecology used data from 2000 to 2012 and performed many refinement steps, and this evaluation used data from 2008 to 2016, with exclusion of shoreline and older data.

- Hypothesis tests showed that there were no statistically significant differences between the most refined ALW dataset (i.e., ALW after 2008 and 300 feet from shore) and the Barbee Mill dataset, suggesting that the Site concentrations are consistent with the regional Lake Washington background cPAH concentration (210 µg/kg TEQ), which is representative of ambient Lake Washington conditions.

- Based on these findings, the bioaccumulative SCO for cPAH (21 µg/kg TEQ) will not be possible to maintain as the ambient Lake Washington concentrations are an order of magnitude higher than the bioaccumulative SCO.

Instead, the bioaccumulative CSL based on regional background of 210 µg/kg TEQ is relevant because it likely represents the bottom "floor" of cPAH concentrations that could be maintained after cleanup, as future sediment surface conditions will reflect ambient Lake Washington concentrations.

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TABLES

Table L-1. Available Datasets of cPAH TEQ in Lake Washington Surface Sediment

Study ID	Study Description	Collection Date Range	Size Dataset
AQSLWA082010	Washington DNR - South Lake Washington Shoreline Restoration Project	August 2010	10
AQ_Kenmore2012	Kenmore Sediment and Water Investigation	November 2012	16
KC_CSO_2013	King County CSO Sediment Quality Characterization 2013 - NPDES Permit No. WA-002918-1	March/April 2013	6
FWLKUN01	Lake Union Sediment Quality Study	Jul-01	4
KingLakeSeds	King County Lakes Sediment Monitoring Program. Water data can be found in Study ID KClake-1.	September 2008, September 2009, August 2010, September 2016	62
KC_CSO_2011	King County CSO Sediment Quality Characterization 2011 - NPDES Permit No. WA-002918-1	October 2011	8
LKWA00	Lake Washington Baseline Sediment Study 2000	August/September 2000	34

Acronyms:

cPAH - carcinogenic polycyclic aromatic hydrocarbons
CSO - combined sewer overflow system
DNR - Department of Natural Resources
NPDES - National Pollutant Discharge Elimination System
TEQ - toxic equivalents

Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		AQSLWA082010	AQSLWA082010	AQSLWA082010	AQSLWA082010	AQSLWA082010	AQSLWA082010	AQSLWA082010	AQSLWA082010
Location ID		COMP08102010	SLW-SS-01	SLW-SS-02	SLW-SS-03	SLW-SS-04	SLW-SS-05	SLW-SS-06	SLW-SS-07
Sample ID		SLW-FLM-COMP-01-081010	SLW-SS-01-081010	SLW-SS-02-081010	SLW-SS-03-081010	SLW-SS-04-081010	SLW-SS-05-081010	SLW-SS-06-081010	SLW-SS-07-081010
Collection Date		8/10/2010	8/10/2010	8/10/2010	8/10/2010	8/10/2010	8/10/2010	8/10/2010	8/10/2010
Sample depth (cm)		10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**								
Benz[a]anthracene	0.1	77 J	20 U	19 J	18 J	31 J	20 U	190 J	190
Benzo(a)pyrene	1	78 J	20 U	26	24	38 J	20 U	180 J	160
Benzo(b)fluoranthene	0.1	92 J	20 U	25	25	41 J	20 U	220 J	150
Benzo(k)fluoranthene	0.1	92 J	20 U	25	25	41 J	20 U	220 J	150
Chrysene	0.01	160	20 U	29	31	59 J	20 U	390 J	300
Dibenzo(a,h)anthracene	0.1	130 U	20 U	20 U	20 U	59 U	20 U	190 U	59 U
Indeno(1,2,3-cd)pyrene	0.1	130 U	20 U	19 J	21	59 U	20 U	100 J	69
cPAH TEQ as reported									
Calculated cPAH TEQ (KM sum)		120	21 L7	36	34	56	21 L7	260	220
Calculated cPAH TEQ (ND=0)		105.7 J	4.5 U	35.09	33.21	49.89 J	4.5 U	256.9 J	218.9
Calculated cPAH TEQ (ND=1/2 RL)		177.2 J	52 U	45.09	43.21	82.34 J	52 U	351.9 J	248.4

Acronyms:

µg/kg – micrograms per kilogram
cPAH - carcinogenic polycyclic aromatic hydrocarbons
J - the analyte was not detected above the reporitng limit; value shown is an estimate
KM - Kaplan Meier
L - Positive bais in the KM caluclation followed by the number of non detected congeners
ND - not detected
RL - reporting limit
TEQ - toxic equivalents
U - analyte was not detected above the method detection limit; the reporting limit is shown

Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		AQSLWA082010	AQSLWA082010	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012
Location ID		SLW-SS-08	SLW-SS-08	KNMR-HT-01	KNMR-HT-02	KNMR-HT-03	KNMR-HT-04	KNMR-HT-05	KNMR-HT-06	KNMR-HT-11
Sample ID		SLW-SS-08-081010	SLW-SS-58-081010	HT-01-S-C-121106	HT-02-S-C-121106	HT-03-S-C-121106	HT-04-S-C-121106	HT-05-S-C-121106	HT-06-S-E-121106	HT-11-S-LFP-121106
Collection Date		8/10/2010	8/10/2010	11/6/2012	11/6/2012	11/6/2012	11/6/2012	11/6/2012	11/6/2012	11/6/2012
Sample depth (cm)		10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**									
Benz[a]anthracene	0.1	23	23	4.6 U	6	75	330	10	38	4.8 U
Benzo(a)pyrene	1	31	31	4.6 U	3.3 J	57	210	5.7	42	4.8 U
Benzo(b)fluoranthene	0.1	32	31							
Benzo(k)fluoranthene	0.1	32	31							
Chrysene	0.01	41	40	4.6 U	8	110	480	18	50	2.4 J
Dibenzo(a,h)anthracene	0.1	20 U	20 U	4.6 U	4.9 U	7	23	4.6 U	5.8	4.8 U
Indeno(1,2,3-cd)pyrene	0.1	22	21	4.6 U	4.9 U	25	69	4.6 U	19	4.8 U
cPAH TEQ as reported										
Calculated cPAH TEQ (KM sum)		43	42	4.6 L5	4			7		4.80 L4
Calculated cPAH TEQ (ND=0)		42.31	42	4.5 U	3.98	68.8	257	6.88	48.78	0.02 U
Calculated cPAH TEQ (ND=1/2 RL)		52.31	52	9.43 U	6.675	68.8	257	9.41	48.78	7.46 U

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ND - not detected
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Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012	AQ_Kenmore2012
Location ID		KNMR-HT-10	KNMR-SG-10	KNMR-SG-11	KNMR-SG-12	KNMR-SG-13	KNMR-SG-13	KNMR-SG-15	KNMR-SG-01	KNMR-SG-14
Sample ID		HT-10-S-LFP-121106	SG-10-S-E-121107	SG-11-S-E-121107	SG-12-S-E-121107	SG-13-S-E-121107	SG-13-S-E-dup-121107	SG-15-S-E-121107	SG-01-S-C-121107	SG-14-S-E-121107
Collection Date		11/6/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012
Sample depth (cm)		10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**									
Benz[a]anthracene	0.1	18 J	200	200	120	150	160	4.6 J	15 J	360
Benzo(a)pyrene	1	21	190	210	110	140	120	4.1 J	15 J	250
Benzo(b)fluoranthene	0.1									
Benzo(k)fluoranthene	0.1									
Chrysene	0.01	26	290	370	210	300	240	4.9	20	550
Dibenzo(a,h)anthracene	0.1	4.8 U	34	45	36	40	26	4.7 U	4.8 U	42
Indeno(1,2,3-cd)pyrene	0.1	16 J	110	90	77	100	79	4.7 U	3.6 J	97
cPAH TEQ as reported										
Calculated cPAH TEQ (KM sum)		25						4.9	17	
Calculated cPAH TEQ (ND=0)		24.7	227.3	247.2	135.4	172	148.9	4.6	17.1 J	305.4
Calculated cPAH TEQ (ND=1/2 RL)		27.1	227.3	247.2	135.4	172	148.9	7.2	19.5 J	305.4

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ND - not detected
RL - reporting limit
TEQ - toxic equivalents
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Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		KC_CSO_2013	KC_CSO_2013	KC_CSO_2013	KC_CSO_2013	KC_CSO_2013	KC_CSO_2013	FWLKUN01	FWLKUN01	FWLKUN01	FWLKUN01
Location ID		CSO13_CSO-UR-8	CSO13_CSO-UR-9	CSO13_0537	CSO13_CSO-BV-1	CSO13_CSO-UR-11	CSO13_CSO-UR-10	FWLKUN-21645-1	FWLKUN-21645-2	FWLKUN-21645-3	FWLKUN-21689-11
Sample ID		L57645-1	L57645-2	L57645-3	L57645-8	L57797-2	L57797-1	21645-1	21645-2	21645-3	21689-11
Collection Date		3/27/2013	3/27/2013	3/27/2013	3/27/2013	4/23/2013	4/23/2013	7/30/2001	7/30/2001	7/30/2001	7/30/2001
Sample depth (cm)		10	10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**										
Benz[a]anthracene	0.1	31.5	30.1	123	335	740	394				
Benzo(a)pyrene	1	32.6	26.1	120 J	316	920	458	16.9	34.3	6.77	3570
Benzo(b)fluoranthene	0.1							11.8	29.9	6 UJ	4550
Benzo(k)fluoranthene	0.1							4.9	17.2	6 UJ	2230
Chrysene	0.01	42.7	53.6	149	391	988	530	10.1	30.1	8 U	5530
Dibenzo(a,h)anthracene	0.1	7.2 U	8.2 U	63 U	60 U	250 U	61 U	11 J	12 J	14 UJ	557
Indeno(1,2,3-cd)pyrene	0.1	20.8	10 J	63 U	97 J	430 J	147	14 J	21.2	18 UJ	1160
cPAH TEQ as reported											
Calculated cPAH TEQ (KM sum)		38	31	130	360	1100	520	21	43	6.8 L5	12000
Calculated cPAH TEQ (ND=0)		38.3	30.6	133.8	363.1	1046.9	517.4	21.2	42.6	6.8 UJ	4475
Calculated cPAH TEQ (ND=1/2 RL)		41.9	34.7	168.4	393.1	1171.9	547.9	21.2	42.6	13.0 UJ	4475

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ND - not detected
RL - reporting limit
TEQ - toxic equivalents
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Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds
Location ID		KCM-CHSMCNTR	KCM-CHSMNORTH	KCM-COZYCOVE	KCM-YRRWCRKMTH	KCM-EYRRWCRKMTH	KCM-SHOUTNBCH	KCM-NHOUTNBCH	KCM-MRSHPKS	KCM-MRSHPKN
Sample ID		L51549-4	L51549-6	L51549-12	L51549-14	L51549-16	L51549-22	L51549-20	L51549-26	L51549-24
Collection Date		8/23/2010	8/23/2010	8/23/2010	8/23/2010	8/23/2010	8/23/2010	8/23/2010	8/23/2010	8/23/2010
Sample depth (cm)		10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**									
Benz[a]anthracene	0.1	713.8	5.1 U	23.6 J	25.5 U	779.0	21.8	4.4 U	5.3 U	12.4
Benzo(a)pyrene	1	208.1	5.1 U	13.9 U	319.7	677.9	20.8	4.4 U	5.3 U	14.3
Benzo(b)fluoranthene	0.1	362.6	5.1 U	26.4 J	396.8	771.5	25.7	4.4 U	5.3 U	14.7
Benzo(k)fluoranthene	0.1	427.6	5.1 U	24.0 J	351.6	790.3	14.3	4.4 U	5.3 U	14.7
Chrysene	0.01	697.6	5.1 U	37.8	25.5 U	1078.7	26.1	4.4 U	5.5 J	19.8
Dibenzo(a,h)anthracene	0.1	45.0	5.1 U	13.9 U	25.5 U	218.4	5.3 J	4.4 U	5.3 U	5.2 U
Indeno(1,2,3-cd)pyrene	0.1	15.7	5.1 U	13.9 U	211.5	501.9	12.5	4.4 U	5.3 U	9.2 J
cPAH TEQ as reported										
Calculated cPAH TEQ (KM sum)			5.4 L7	22 L	420		29	4.7 L7	5.7 L6	20
Calculated cPAH TEQ (ND=0)		371.6	4.5 U	7.8	415.7	994.8	29.0	4.5 U	0.1 U	19.6
Calculated cPAH TEQ (ND=1/2 RL)		371.6	13.3 U	22.4	453.9	994.8	29.0	11.5 U	11.3 U	22.2

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TEQ - toxic equivalents
U - analyte was not detected above the method detection limit; the reporting limit is shown

Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds
Location ID		KCM-CHSMSWMBCH	KCM-MDNBRSWMBCH	KCM-CLYDSWMBCH	KCM-HOUTNSWMBCH	KCM-MARINAPSDS	KCM-0826	KCM-WAVRLYPSDS	KCM-0890	KCM-0852SBN
Sample ID		L51549-2	L51549-10	L51549-8	L51549-18	L51549-28	L51549-34	L51549-30	L51549-36	L66132-32
Collection Date		8/24/2010	8/24/2010	8/24/2010	8/24/2010	8/24/2010	8/24/2010	8/24/2010	8/24/2010	9/14/2016
Sample depth (cm)		10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**									
Benz[a]anthracene	0.1	4.7 U	4.6 U	9.3	4.6 U	4.7 U	50.2	4.4 U	37.3 J	13.7
Benzo(a)pyrene	1	4.7 U	4.6 U	11.8	4.6 U	4.7 U	75.6	4.4 U	48.8	17
Benzo(b)fluoranthene	0.1	4.7 U	4.6 U	12.0	4.6 U	4.7 U	102.0	4.4 U	66.5	
Benzo(k)fluoranthene	0.1	4.7 U	4.6 U	17.4	4.6 U	4.7 U	65.4	4.4 U	56.5	
Chrysene	0.01	4.7 U	4.6 U	20.3	4.6 U	4.7 U	93.2	4.4 U	66.0	23.5
Dibenzo(a,h)anthracene	0.1	4.7 U	4.6 U	4.6 U	4.6 U	4.7 U	19.5 U	4.4 U	23.9 J	4.7 UJ
Indeno(1,2,3-cd)pyrene	0.1	4.7 U	4.6 U	8.2 J	4.6 U	4.7 U	54.1	4.4 U	42.8	4.7 UJ
cPAH TEQ as reported										
Calculated cPAH TEQ (KM sum)		5 L7	4.9 L7	17	4.9 L7	4.9 L7	100	4.7 L7	72	19
Calculated cPAH TEQ (ND=0)		4.5 U	4.5 U	16.7	4.5 U	4.5 U	103.7	4.5 U	72.2	18.6
Calculated cPAH TEQ (ND=1/2 RL)		12.3 U	12.1 U	19.0	12.1 U	12.1 U	113.5	11.5 U	72.2	19.1

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ND - not detected
RL - reporting limit
TEQ - toxic equivalents
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Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds
Location ID		KCM-0864A	KCM-0864STNSAY	KCM-0818THCM	KCM-0806JCM	KCM-0805STEDS	KCM-08UNBAYNE	KCM-0805STEDN	KCM-0804INGWET	KCM-LOGBOOM	KCM-08UNBAYNW
Sample ID		L66132-40	L66132-38	L66132-20	L66132-6	L66132-10	L66132-26	L66132-12	L66132-14	L66132-16	L66132-28
Collection Date		9/14/2016	9/14/2016	9/14/2016	9/14/2016	9/14/2016	9/14/2016	9/14/2016	9/14/2016	9/14/2016	9/14/2016
Sample depth (cm)		10	10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**										
Benz[a]anthracene	0.1	1010	7 U	16.3	4.4 U	4.4 U	19 U	4.4 U	119	17.1	94.5
Benzo(a)pyrene	1	7.7 U	7 U	17.6	4.4 U	4.4 U	707	4.4 U	99.5	10.3	98.5
Benzo(b)fluoranthene	0.1										
Benzo(k)fluoranthene	0.1										
Chrysene	0.01	391	7 U	21.4	4.4 U	4.4 U	1330	4.4 U	130	22.8	105
Dibenzo(a,h)anthracene	0.1	28 J	7 UJ	4.4 UJ	4.4 UJ	4.4 UJ	19 UJ	4.4 UJ	17 UJ	4.7 UJ	20 UJ
Indeno(1,2,3-cd)pyrene	0.1	101 J	8.1 J	8.1 J	4.4 UJ	4.4 UJ	189 J	4.4 UJ	30 J	4.7 UJ	20 UJ
cPAH TEQ as reported											
Calculated cPAH TEQ (KM sum)		120	7.8 L4	20	4.4 L5	4.4 L5	740	4.4 L5	120	12	110
Calculated cPAH TEQ (ND=0)		117.8	0.81 U	20.3	4.5 U	4.5 U	739.2	4.5 U	115.7	12.2	109
Calculated cPAH TEQ (ND=1/2 RL)		121.7	11.66 U	20.5	7.04 U	7.04 U	749.65	7.04 U	116.6	12.7	111

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Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds
Location ID		KCM-LKWABLVD-N	KCM-LKWABLVD-C	KCM-LKWABLVD-S	KCM-BOEING-C	KCM-COUL-C	KCM-COUL-S	KCM-COUL-N	KCM-SEWBCH-N	KCM-SEWBCH-S	KCM-PRITCHBCH
Sample ID		L46506-2	L46506-4	L46506-6	L46506-22	L46506-28	L46506-26	L46506-30	L46506-14	L46506-16	L46506-20
Collection Date		9/15/2008	9/15/2008	9/15/2008	9/15/2008	9/15/2008	9/15/2008	9/15/2008	9/16/2008	9/16/2008	9/16/2008
Sample depth (cm)		10	10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**										
Benz[a]anthracene	0.1	2.6 U	3.2 U	3.0 U	2.7 U	89.6	204.9	195.7	2.5 U	3.6 J	2.5 U
Benzo(a)pyrene	1	2.6 U	3.2 U	3.0 U	2.7 U	131.0	395.1	220.3	2.5 U	4.2 J	2.5 U
Benzo(b)fluoranthene	0.1	2.6 U	3.2 U	3.0 U	2.7 U	119.0	329.1	172.5	2.5 U	4.4 J	2.5 U
Benzo(k)fluoranthene	0.1	2.6 U	3.2 U	3.0 U	2.7 U	168.4	402.0	208.0	2.5 U	2.9 U	2.5 U
Chrysene	0.01	2.6 U	3.2 U	3.3 J	2.7 U	157.4	479.8	272.0	2.5 U	4.6 J	2.5 U
Dibenzo(a,h)anthracene	0.1	2.6 U	3.2 U	3.0 U	2.7 U	37.1	110.3	60.0	2.5 U	2.9 U	2.5 U
Indeno(1,2,3-cd)pyrene	0.1	2.6 U	3.2 U	3.0 U	2.7 U	89.0	269.5	150.9	2.5 U	2.9 U	2.5 U
cPAH TEQ as reported											
Calculated cPAH TEQ (KM sum)		2.8 L7	3.4 L7	3.2 L6	2.9 L7				2.6 L7	5.1	2.7 L7
Calculated cPAH TEQ (ND=0)		4.5 U	4.5 U	0.03 U	4.5 U	182.9	531.4	301.7	4.5 U	5.0 J	4.5 U
Calculated cPAH TEQ (ND=1/2 RL)		6.8 U	8.3 U	6.3 U	7.0 U	182.9	531.4	301.7	6.4 U	8.0 J	6.5 U

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Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds
Location ID		KCM-MARTHAWAPK	KCM-SEWPK-E	KCM-SEWPK-N	KCM-SEWPK-W	KCM-0890	KCM-0826	KCM-COULBCH	KCM-NEWCBCH-S	KCM-COALCRKMTH	KCM-MERSLOU-S1
Sample ID		L46506-18	L46506-12	L46506-10	L46506-8	L46506-36	L46506-34	L46506-24	L49021-6	L49021-20	L49021-22
Collection Date		9/16/2008	9/16/2008	9/16/2008	9/16/2008	9/16/2008	9/16/2008	9/17/2008	9/28/2009	9/28/2009	9/28/2009
Sample depth (cm)		10	10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**										
Benz[a]anthracene	0.1	6.5	9.8	2.8 U	3.6 U	74.1	109.3	2.5 U	8.9	27.6	623.2
Benzo(a)pyrene	1	8.2	15.1	2.8 U	3.6 U	123.8	207.7	2.5 U	3.4 J	31.5	873.2
Benzo(b)fluoranthene	0.1	6.1	20.2	2.8 U	3.6 U	133.7	198.4	2.5 U	7.8	40.4	1154.9
Benzo(k)fluoranthene	0.1	5.9	13.9	2.8 U	3.6 U	140.9	236.1	2.5 U	6.2	36.5	1084.5
Chrysene	0.01	7.8	19.3	2.8 U	5.3 J	140.4	197.3	2.5 U	11.7	42.4	957.7
Dibenzo(a,h)anthracene	0.1	2.9 U	6.0 J	2.8 U	3.6 U	46.5	66.7	2.5 U	2.7 U	8.1	347.2
Indeno(1,2,3-cd)pyrene	0.1	4.1 J	9.7	2.8 U	4.0 J	117.1	172.7	2.5 U	2.7 U	22.7	788.7
cPAH TEQ as reported											
Calculated cPAH TEQ (KM sum)		11	21	3 L7	4.3 L5			2.6 L7	6	110	
Calculated cPAH TEQ (ND=0)		10.5	21.3	4.5 U	0.5 U	176.5	287.9	4.5 U	5.8	45.4	1282.7
Calculated cPAH TEQ (ND=1/2 RL)		12.0	21.3	7.4 U	7.9 U	176.5	287.9	6.5 U	7.3	45.4	1282.7

Acronyms:

µg/kg – micrograms per kilogram
cPAH - carcinogenic polycyclic aromatic hydrocarbons
J - the analyte was not detected above the reporitng limit; value shown is an estimate
KM - Kaplan Meier
L - Positive bais in the KM caluclation followed by the number of non detected congeners
ND - not detected
RL - reporting limit
TEQ - toxic equivalents
U - analyte was not detected above the method detection limit; the reporting limit is shown

Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds
Location ID		KCM-MERSLOU-S2	KCM-MERSLOUMTH	KCM-MERSLOU-N	KCM-NEWCSWMBCH	KCM-ENATBCHPK	KCM-0826	KCM-0890	KCM-KENNYBCHPK	KCM-MAYCRKMTH
Sample ID		L49021-24	L49021-26	L49021-28	L49021-18	L49021-30	L49021-34	L49021-36	L49021-2	L49021-4
Collection Date		9/28/2009	9/28/2009	9/28/2009	9/29/2009	9/29/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009
Sample depth (cm)		10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**									
Benz[a]anthracene	0.1	216.4	255.9	295.0	5.0 J	9.2	57.6	9.8 U	162.5	9.3
Benzo(a)pyrene	1	386.2	367.7	479.3	3.0 U	3.2 J	132.4	99.5	228.0	9.5
Benzo(b)fluoranthene	0.1	569.8	476.4	647.9	5.6 J	4.3 J	112.4	138.5	275.0	12.6
Benzo(k)fluoranthene	0.1	403.4	428.3	516.5	6.2	7.1	142.9	102.0	271.3	10.9
Chrysene	0.01	435.3	497.6	489.3	8.7	15.6	116.7	98.5	278.0	12.1
Dibenzo(a,h)anthracene	0.1	164.7	150.4	175.2	3.0 U	2.4 U	40.4	41.9	74.4	2.7 U
Indeno(1,2,3-cd)pyrene	0.1	424.1	379.5	438.8	3.0 U	2.4 U	119.0	102.9	187.5	6.2
cPAH TEQ as reported										
Calculated cPAH TEQ (KM sum)					4.9 L	5.7		140	810	14
Calculated cPAH TEQ (ND=0)		568.4	541.7	691.6	1.8	5.4	180.8	139.0	327.9	13.5
Calculated cPAH TEQ (ND=1/2 RL)		568.4	541.7	691.6	4.9	6.7	180.8	143.9	327.9	14.9

Acronyms:

µg/kg – micrograms per kilogram
cPAH - carcinogenic polycyclic aromatic hydrocarbons
J - the analyte was not detected above the reporitng limit; value shown is an estimate
KM - Kaplan Meier
L - Positive bais in the KM caluclation followed by the number of non detected congeners
ND - not detected
RL - reporting limit
TEQ - toxic equivalents
U - analyte was not detected above the method detection limit; the reporting limit is shown

Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KingLakeSeds	KC_CSO_2011	KC_CSO_2011	KC_CSO_2011
Location ID		KCM-NEWCBCH-C1	KCM-NEWCBCH-C2	KCM-NEWCBCH-C3	KCM-NEWCBCH-N1	KCM-NEWCBCH-N2	CSO11_CSO-UR-1	CSO11_CSO-UR-2	CSO11_CSO-UR-3
Sample ID		L49021-8	L49021-10	L49021-12	L49021-14	L49021-16	L55155-1	L54227-9	L54227-10
Collection Date		9/30/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009	10/10/2011	10/10/2011	10/10/2011
Sample depth (cm)		10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**								
Benz[a]anthracene	0.1	19.9	2.7 U	3.2 J	2.8 U	2.3 U	650	123	430
Benzo(a)pyrene	1	5.7 J	2.7 U	2.6 U	2.8 U	2.3 U	551	183	536
Benzo(b)fluoranthene	0.1	32.1	3.7 J	4.9 J	2.8 U	2.3 U			
Benzo(k)fluoranthene	0.1	28.7	3.6 J	4.1 J	2.8 U	2.3 U			
Chrysene	0.01	26.9	6.6 J	5.9	2.8 U	2.3 U	1030	192	653
Dibenzo(a,h)anthracene	0.1	2.8 U	2.7 U	2.6 U	2.8 U	2.3 U	71.8	38.5	144
Indeno(1,2,3-cd)pyrene	0.1	7.0	2.7 U	2.6 U	2.8 U	2.3 U	305	95.7	273
cPAH TEQ as reported									
Calculated cPAH TEQ (KM sum)		15	3.7 L4	4 L	2.9 L7	2.5 L7			
Calculated cPAH TEQ (ND=0)		14.7	0.8 U	1.3	4.5 U	4.5 U	664.0	210.6	627.2
Calculated cPAH TEQ (ND=1/2 RL)		16.1	4.9 U	4.0	7.2 U	6.1 U	664.0	210.6	627.2

Acronyms:

µg/kg – micrograms per kilogram
cPAH - carcinogenic polycyclic aromatic hydrocarbons
J - the analyte was not detected above the reporitng limit; value shown is an estimate
KM - Kaplan Meier
L - Positive bais in the KM caluclation followed by the number of non detected congeners
ND - not detected
RL - reporting limit
TEQ - toxic equivalents
U - analyte was not detected above the method detection limit; the reporting limit is shown

Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		KC_CSO_2011	KC_CSO_2011	KC_CSO_2011	KC_CSO_2011	KC_CSO_2011	LKWA00	LKWA00	LKWA00	LKWA00
Location ID		CSO11_CSO-UR-4	CSO11_CSO-UR-5	CSO11_CSO-UR-6	CSO11_CSO-UR-7	CSO11_BKGD-UB	LKWA000801A	LKWA00804	LKWA00826	LKWA00852
Sample ID		L54227-11	L54227-12	L54227-13	L54227-14	L54227-22	L18493-1	L18493-2	L18493-3	L18493-4
Collection Date		10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	8/7/2000	8/7/2000	8/7/2000	8/7/2000
Sample depth (cm)		10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**									
Benz[a]anthracene	0.1	226	115	156	250	165	120	190	130	470
Benzo(a)pyrene	1	258	127	150	338	410	150	280	210	750
Benzo(b)fluoranthene	0.1						220 J	460 J	310 J	700 J
Benzo(k)fluoranthene	0.1						120 U	170	220 U	340
Chrysene	0.01	258	137	173	326	120	210	340	230	690
Dibenzo(a,h)anthracene	0.1	52.1	25 J	36.5	71.3	29.4	120 UJ	140 UJ	220 UJ	250 UJ
Indeno(1,2,3-cd)pyrene	0.1	141	57.8	68.3	167	97.2	110 J	220 J	160 J	470 J
cPAH TEQ as reported							190 J	350 J	250 J	900 J
Calculated cPAH TEQ (KM sum)			150				210	390	290	960
Calculated cPAH TEQ (ND=0)		302.5	148.2	177.8	390.1	440.4	197.1	387.4	272.3	954.9
Calculated cPAH TEQ (ND=1/2 RL)		302.5	148.2	177.8	390.1	440.4	263.1	394.4	393.3	967.4

Acronyms:

µg/kg – micrograms per kilogram
cPAH - carcinogenic polycyclic aromatic hydrocarbons
J - the analyte was not detected above the reporitng limit; value shown is an estimate
KM - Kaplan Meier
L - Positive bais in the KM caluclation followed by the number of non detected congeners
ND - not detected
RL - reporting limit
TEQ - toxic equivalents
U - analyte was not detected above the method detection limit; the reporting limit is shown

Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00
Location ID		LKWA00861	LKWA00861	LKWA00840	LKWA00890	LKWA00890	LKWA00831	LKWA00S0025	LKWA000814B	LKWA000425A	LKWA000817A
Sample ID		L18493-5	L18493-6	L18493-10	L18493-7	L18493-8	L18493-9	L18656-1	L18656-10	L18656-2	L18656-3
Collection Date		8/7/2000	8/7/2000	8/8/2000	8/8/2000	8/8/2000	8/8/2000	8/21/2000	8/21/2000	8/21/2000	8/21/2000
Sample depth (cm)		10	10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**										
Benz[a]anthracene	0.1	140	180	150	100	110	68	37 U	78	39	240
Benzo(a)pyrene	1	210	210	310	140 U	160	80	62 U	120 U	61 U	360
Benzo(b)fluoranthene	0.1	350 J	390 J	410 J	230 UJ	280 J	130 UJ	98 UJ	190 UJ	98 UJ	480 J
Benzo(k)fluoranthene	0.1	230 U	230 U	190	230 U	220 U	130 U	98 U	190 U	98 U	250
Chrysene	0.01	260	270	290	180	200	110	43	130	59	390
Dibenzo(a,h)anthracene	0.1	230 UJ	230 U	180 UJ	230 UJ	220 UJ	130 UJ	98 UJ	190 U	98 UJ	130 UJ
Indeno(1,2,3-cd)pyrene	0.1	210 J	280 J	200 J	140 UJ	160 J	80 UJ	62 UJ	120 UJ	61 UJ	280 J
cPAH TEQ as reported		270 J	290 J	370 J	10.1 U	210 J	86 U	0.043 U	7.8 U	3.8 U	450 J
Calculated cPAH TEQ (KM sum)		310	320	420	180 L5	240	100 L4	65 L6	150 L5	74 L5	490
Calculated cPAH TEQ (ND=0)		282.6	297.7	407.9	11.8 UJ	217	87.9 UJ	0.43 UJ	9.1 UJ	4.49 UJ	488.9
Calculated cPAH TEQ (ND=1/2 RL)		409.1	527.7	416.9	226.8 UJ	338	169.9 UJ	111.83 UJ	274.6 UJ	96.84 UJ	495.4

Acronyms:

µg/kg – micrograms per kilogram
cPAH - carcinogenic polycyclic aromatic hydrocarbons
J - the analyte was not detected above the reporitng limit; value shown is an estimate
KM - Kaplan Meier
L - Positive bais in the KM caluclation followed by the number of non detected congeners
ND - not detected
RL - reporting limit
TEQ - toxic equivalents
U - analyte was not detected above the method detection limit; the reporting limit is shown

Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00
Location ID		LKWA004901A	LKWA000807A	LKWA00862	LKWA00862	LKWA00A422A	LKWA00544	LKWA00560	LKWA00834	LKWA00SD017A	LKWA00832
Sample ID		L18656-4	L18656-5	L18656-6	L18656-7	L18656-9	L18812-1	L18812-2	L18812-3	L18812-4	L18812-5
Collection Date		8/21/2000	8/22/2000	8/22/2000	8/22/2000	8/22/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000
Sample depth (cm)		10	10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**										
Benz[a]anthracene	0.1	71	55	27	23 U	95	28 U	75	280	97	190
Benzo(a)pyrene	1	92	67 U	39 U	39 U	100 U	48 U	81	360	130	230
Benzo(b)fluoranthene	0.1	150 J	110 UJ	62 UJ	62 UJ	180 J	76 UJ	120 J	560 J	190 J	320 J
Benzo(k)fluoranthene	0.1	110 U	110 U	62 U	62 U	160 U	76 U	97 U	330	110 U	160
Chrysene	0.01	110	78	26	23 U	140	28 U	100	490	170	320
Dibenzo(a,h)anthracene	0.1	110 UJ	110 UJ	62 UJ	62 UJ	160 UJ	76 U	97 U	240 U	110 U	96 U
Indeno(1,2,3-cd)pyrene	0.1	82 J	67 UJ	39 UJ	39 UJ	150 J	48 UJ	70 J	270 J	90 J	120 J
cPAH TEQ as reported		121 J	5.4 U	2.7 U		40 J		106 J	460 J	160 J	280 J
Calculated cPAH TEQ (KM sum)		130	86 L5	48 L5	40 L7	160 L	50 L7	120	510	180	320
Calculated cPAH TEQ (ND=0)		123.4	6.28 UJ	2.96 UJ	4.5 U	43.9	4.5 U	108.5	508.9	169.4	312.2
Calculated cPAH TEQ (ND=1/2 RL)		183.9	109.13 UJ	61.61 UJ	81.65 U	181.9	134.2 U	205.5	628.9	279.4	360.2

Acronyms:

µg/kg – micrograms per kilogram
cPAH - carcinogenic polycyclic aromatic hydrocarbons
J - the analyte was not detected above the reporitng limit; value shown is an estimate
KM - Kaplan Meier
L - Positive bais in the KM caluclation followed by the number of non detected congeners
ND - not detected
RL - reporting limit
TEQ - toxic equivalents
U - analyte was not detected above the method detection limit; the reporting limit is shown

Table L-2. Retained Lake Washington Surface Sediment Samples and cPAH Results

Study ID		LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00	LKWA00
Location ID		LKWA000829A	LKWA00SD007A	LKWA000864B	LKWA000864A	LKWA00SD007A	LKWA00SD007A	LKWA004903A	LKWA004903A	LKWA004903A	LKWA00SD007B
Sample ID		L18812-6	L18862-1	L18862-10	L18862-2	L18862-3	L18862-4	L18862-5	L18862-6	L18862-7	L18862-9
Collection Date		9/13/2000	9/25/2000	9/25/2000	9/25/2000	9/25/2000	9/25/2000	9/25/2000	9/25/2000	9/25/2000	9/25/2000
Sample depth (cm)		10	10	10	10	10	10	10	10	10	10
Analytes in ug/kg	**TEF**										
Benz[a]anthracene	0.1	38 U	59	87	590	90	74	3500	2400	2800	130
Benzo(a)pyrene	1	64 U	51 U	82	710	110	80	4600	3500	3700	220
Benzo(b)fluoranthene	0.1	100 UJ	82 UJ	100 J	680 J	100 J	88 J	3600 J	2800 J	3200 J	130 J
Benzo(k)fluoranthene	0.1	100 U	82 U	100 U	730	92 U	86 U	5300	3800	3800	190
Chrysene	0.01	50	76	110	1300	130	93	4800	3600	3900	250
Dibenzo(a,h)anthracene	0.1	100 U	82 U	100 U	110 U	92 U	86 U	390	300	310	90 U
Indeno(1,2,3-cd)pyrene	0.1	64 UJ	51 UJ	89 J	330 J	58 UJ	54 UJ	1600 J	1300 J	1300 J	69 J
cPAH TEQ as reported		0.049 U	5.8 U	108 J	860 J	119 U	96 U	5700 J	4400 J	4600 J	250 J
Calculated cPAH TEQ (KM sum)		67 L6	66 L5	120	970	140	100	6100	4600	4900	280
Calculated cPAH TEQ (ND=0)		0.5 U	6.66 UJ	110.7	956	130.3	97.13	6087	4596	4880	274.4
Calculated cPAH TEQ (ND=1/2 RL)		159.7 U	120.81 UJ	210.7	1011	225.2	185.83	6087	4596	4880	319.4

Acronyms:

µg/kg – micrograms per kilogram
cPAH - carcinogenic polycyclic aromatic hydrocarbons
J - the analyte was not detected above the reporitng limit; value shown is an estimate
KM - Kaplan Meier
L - Positive bais in the KM caluclation followed by the number of non detected congeners
ND - not detected
RL - reporting limit
TEQ - toxic equivalents
U - analyte was not detected above the method detection limit; the reporting limit is shown

Table L-3. Time Comparison of King County Dataset

King County Study 2008-2016 Comparison of cPAH TEQ (µg/kg)								
Year	**Observations**	**ND**	**Range**	**Mean**	**Median**	**Distribution**	**90|90 UTL**	**Recommended 90|90 UTL**
2008	17	9	0.03 - 531	92	4.5	Normal	351	KM 90|90 UTL
2009	17	3	0.8 - 1283	225	14.7	Normal	826	KM 90|90 UTL
2010	17	8	0.05 - 995	121	7.8	Normal	577	KM 90|90 UTL
2016	11	4	0.8 - 739	104	18.6	Gamma	626	WH Gamma 90|90 UTL
Kruskal Wallis test (α=0.05)								
p-value > 0.05 suggests that mean/median characteristics of the various groups are comparable								

Notes:

The King County dataset includes cPAH TEQ of surface sediments collected at sampling locations re-occupied during four studies that span over 8 years (2008-2016). 90|90 UTLs were evaluated using ProUCL 5.2 and following the software technical guidance. In summary, the KM 90|90 UTL was selected for normally distributed datasets (2008-2010); the WH approximation was selected for the 2016 gamma distributed datasets, as considered appropriate for low skewed data (k*<0.5).

Acronyms:

µg/kg – micrograms per kilogram
cPAH - carcinogenic polycyclic aromatic hydrocarbons
KM - Kaplan Meyer
ND - no detection
TEQ - toxic equivalents
UTL - upper tolerance limit
WH - Wilson-Hilferty approximation

Table L-4. Descriptive Statistics for Barbee Mill and ALW Datasets

Surface sediment (0-10 cm) cPAH TEQ (ND=0) in µg/kg	Barbee Mill	ALW (300 feet from shore)	ALW (after 2008)	ALW (after 2008, 300 feet from shore)
No. Observations	27	36	92	10
No. Detected	27	26	64	10
No. Non Detected	0	10	28	0
FOD	100%	72%	70%	100%
Minimum Detected	60	17	1	17
Maximum Detected	674	955	1283	440
Mean Detected	258	259	220	196
Distribution	Normal	Gamma	Gamma	Normal
90th Percentile	469	424	530	395
Distribution	Normal	Gamma	Gamma	Normal
90|90 UTL	546	515	506	478
Recommended 90|90 UTL	KM 90|90 UTL	KM 90|90 UTL	WH Gamma 90|90 UTL	KM 90|90 UTL

Notes:

1. Lake Washington datasets were compiled with data retrieved from the EIM database in 2022. The EIM query was performed by using the following criteria: analyte-cPAHs, matrix-surface sediment (0-10 cm), area of interest- Lake Washington.
2. Dataset includes summation of cPAH TEQ with ND (for individual PAHs) included as null value. When all individual PAHs were non-detect, total cPAH TEQ was reported as ½ MDL of benzo(a)pyrene. The compiled Lake Washington dataset (n = 140) was tested for outliers, and four outliers were identified and removed for this analysis.

Acronyms:

µg/kg - micrograms per kilogram
ALW - Ambient Lake Washington
cm - centimeter
cPAH - carcinogenic polycyclic aromatic hydrocarbons
EIM - Environmental Information Management System
FOD - frequency of detection
KM - Kaplan Meyer
MDL - method detection limit
ND - no detection
TEQ - toxic equivalents
UTL - upper tolerance limit
WH - Wilson-Hilferty approximation

Table L-5. Comparison of cPAH TEQ in Site Sediment and ALW

	Barbee Mill Site (µg/kg)	ALW (300 feet from shore) (µg/kg)	ALW (after 2008) (µg/kg)	ALW (after 2008, 300 feet from shore) (µg/kg)
Mean Detected	258	259	220	196
90th Percentile	469	424	530	395
90|90 UTL	546	515	506	478
Hypothesis Test Results		Lake Washington = Barbee Mill	Lake Washington ≠ Barbee Mill	Lake Washington = Barbee Mill

Differences between datasets are statistically significant

Differences between datasets are not statistically significant

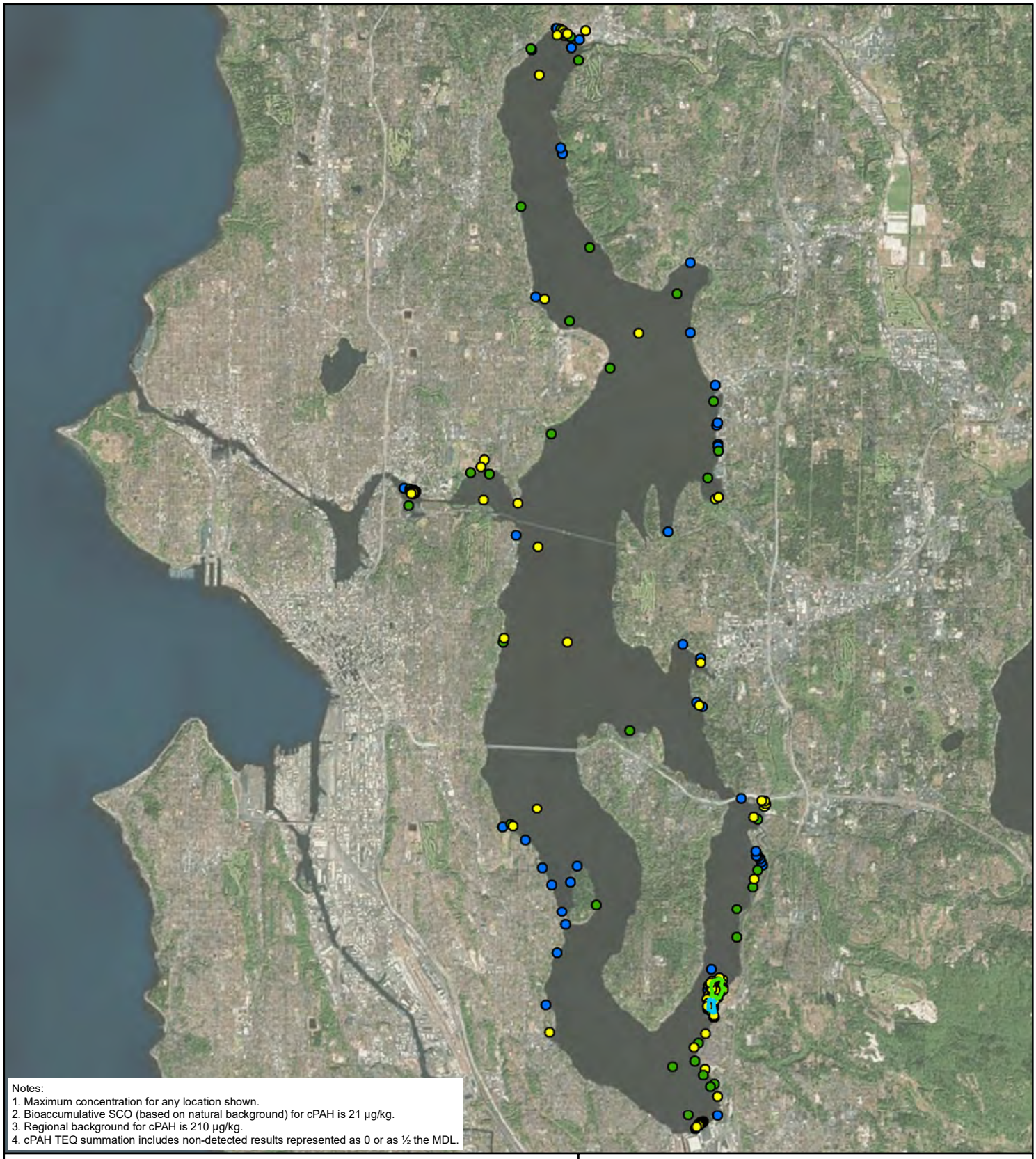
Notes:

1. Lake Washington datasets were compiled with data retrieved from the EIM database in 2022. The EIM query was performed by using the following criteria: analyte- cPAHs, matrix-surface sediment (0-10 cm), area of interest- Lake Washington. Dataset includes summation of cPAH TEQ with ND (for individual PAHs) included as null value.When all individual PAHs were non-detect, total cPAH TEQ was reported as ½ MDL of benzo(a)pyrene. The compiled Lake Washington dataset (n = 140) was tested for outliers, and 4 outliers were identified and removed for this analysis.
2. The 90|90 UTLs were evaluated using ProUCL 5.2 and following the software technical guidance. In summary, the KM 90|90 UTL was selected for normally distributed datasets (2008-2010); the WH approximation was selected for the 2016 gamma distributed datasets, as considered appropriate for low skewed data (k*<0.5)
3. Hypothesis tests were performed using ProUCL 5.2 and following the software technical guidance. In summary, the Student's t-test was used when compared datasets were normally distributed and variances were equal; the Satterthwaite's t-test was used when compared dataset were normally distributed but variances were not equal; the Wilcoxon-Mann-Whitney test was used when compared datasets were not normally distributed.

Acronyms:

µg/kg - micrograms per kilogram
ALW - Ambient Lake Washington
cm - centimeters
cPAH - carcinogenic polycyclic aromatic hydrocarbons
EIM - Environmental Information Management System
KM - Kaplan Meyer
MDL - method detection limit
ND - no detection
TEQ - toxic equivalents
UTL - upper tolerance limit
WH - Wilson-Hilferty approximation

FIGURE



Notes:
1. Maximum concentration for any location shown.
2. Bioaccumulative SCO (based on natural background) for cPAH is 21 µg/kg.
3. Regional background for cPAH is 210 µg/kg.
4. cPAH TEQ summation includes non-detected results represented as 0 or as ½ the MDL.

Legend

cPAH Concentration (µg/kg)

- < 21 (NB)
- 21 (NB) - 210 (RB)
- 210.000001 - 6087.000000
- Quendall Sediment Cleanup Area
- Preliminary Sediment Site Boundary

N

2,000 Feet

Lake Washington cPAH Concentrations in Surface Sediment

Appendix L RIFS Report
Barbee Mill Sediment Site,
Renton, WA

Geosyntec consultants

PNG0869 | March 2023

Figure L-1a

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Figure 99a cPAH Concentration Lakewide.mxd 11/15/2022 6:08:29 AM

Notes:
1. Maximum concentration for any location shown.
2. Bioaccumulative SCO (based on natural background) for cPAH is 21 µg/kg.
3. Regional background for cPAH is 210 µg/kg.
4. cPAH TEQ summation includes non-detected results represented as 0 or as ½ the MDL.

Legend

Quendall Sediment Cleanup Area

Preliminary Sediment Site Boundary

cPAH Concentration (µg/kg)

- < 21 (NB)
- 21 (NB) - 210 (RB)
- 210.000001 - 6087.000000

N

0 2,200 Feet

North Lake Washington cPAH Concentrations in Surface Sediment

Appendix L RIFS Report
Barbee Mill Sediment Site,
Renton, WA

Geosyntec consultants

PNG0869 | March 2023

Figure L-1b

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Figure 99b cPAH Concentration Lakewide.mxd 11/15/2022 4:45:56 AM

North-Central Lake Washington cPAH Concentrations in Surface Sediment

Appendix L RIFS Report
Barbee Mill Sediment Site,
Renton, WA

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Figure L-1c

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Figure 99c cPAH Concentration Lakewide.mxd 11/15/2022 4:52:04 AM

LKWA00SD007B
LKWA00SD007A
LKWA00861
KCM-CLYDSWMBCH
KCM-MDNBRSWMBCH
LKWA00834
KCM-CHSMNORTH
KCM-CHSMCNTR
KCM-CHSMSWMBCH
LKWA00SD017A
LKWA00890
KCM-0890
KCM-0890
LKWA000864B
LKWA000864A
KCM-0864A
KCM-0864STNSAY
KCM-LKWABLVD-N
KCM-LKWABLVD-C
KCM-SEWPK-N
KCM-LKWABLVD-S
KCM-SEWPK-W
KCM-SEWPK-E
KCM-SEWBCH-N
KCM-SEWBCH-S
KCM-MARTHAWAPK
LKWA00840
bing

Notes:
1. Maximum concentration for any location shown.
2. Bioaccumulative SCO (based on natural background) for cPAH is 21 µg/kg.
3. Regional background for cPAH is 210 µg/kg.
4. cPAH TEQ summation includes non-detected results represented as 0 or as ½ the MDL.

Legend

Quendall Sediment Cleanup Area

Preliminary Sediment Site Boundary

cPAH Concentration (µg/kg)

- < 21 (NB)
- 21 (NB) - 210 (RB)
- 210.000001 - 6087.000000

N

0 2,200 Feet

South-Central Lake Washington cPAH Concentrations in Surface Sediment

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Barbee Mill Sediment Site,
Renton, WA

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Figure L-1d

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Figure 99d cPAH Concentration Lakewide.mxd 11/15/2022 6:11:08 AM

Notes:
1. Maximum concentration for any location shown.
2. Bioaccumulative SCO (based on natural background) for cPAH is 21 µg/kg.
3. Regional background for cPAH is 210 µg/kg.
4. cPAH TEQ summation includes non-detected results represented as 0 or as ½ the MDL.

Legend

- Quendall Sediment Cleanup Area
- Preliminary Sediment Site Boundary

cPAH Concentration (µg/kg)

- < 21 (NB)
- 21 (NB) - 210 (RB)
- > 210 (RB)

N

0 2,200 Feet

South Lake Washington cPAH Concentrations in Surface Sediment

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Barbee Mill Sediment Site,
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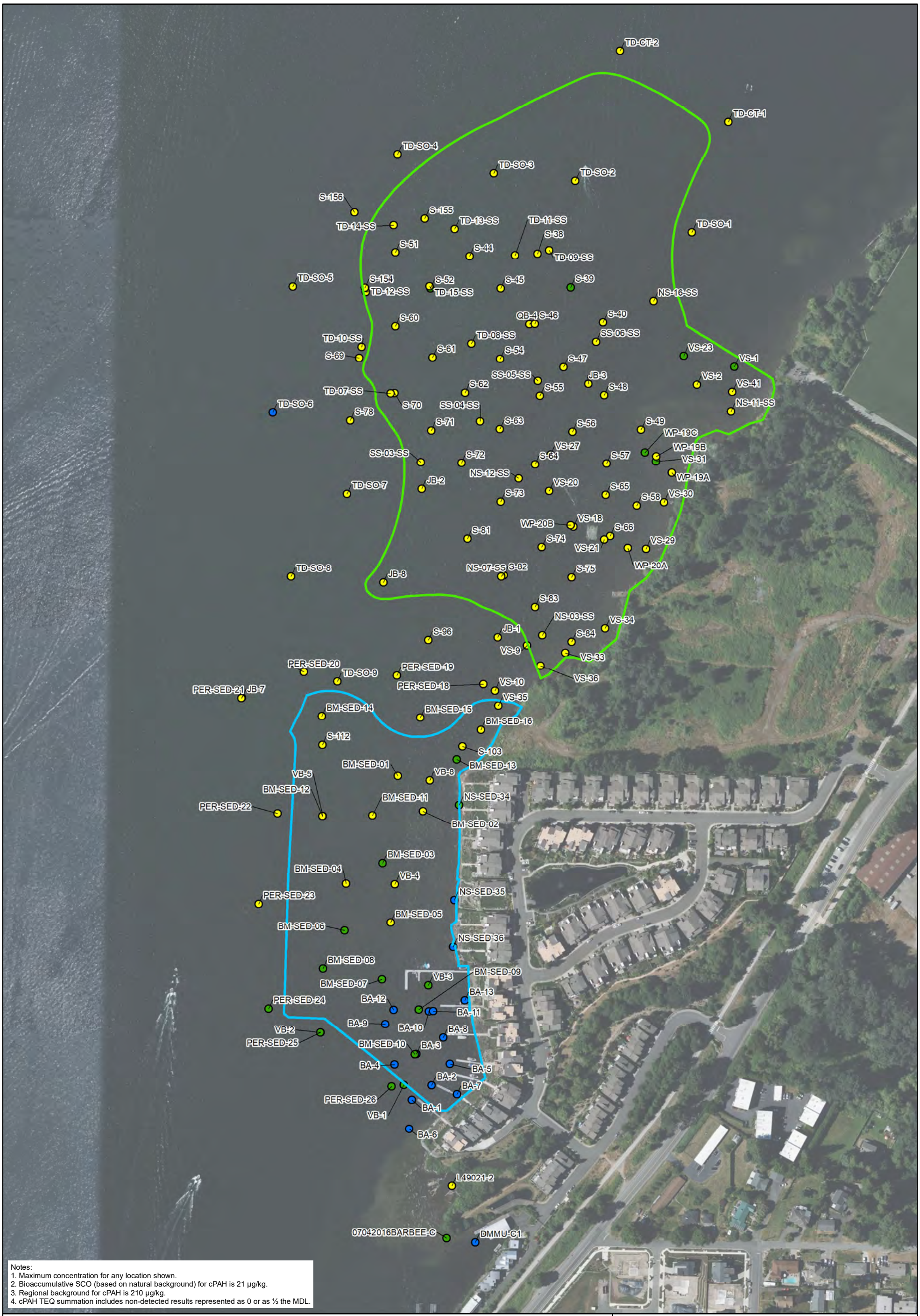
Figure L-1e

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Figure 99e cPAH Concentration Lakewide.mxd 11/15/2022 5:50:38 AM



Notes:
1. Maximum concentration for any location shown.
2. Bioaccumulative SCO (based on natural background) for cPAH is 21 µg/kg.
3. Regional background for cPAH is 210 µg/kg.
4. cPAH TEQ summation includes non-detected results represented as 0 or as ½ the MDL.

Legend

Quendall Sediment Cleanup Area

Preliminary Sediment Site Boundary

cPAH Concentration (µg/kg)

- < 21 (NB)
- 21 (NB) - 210 (RB)
- > 210 (RB)

N

0 250 Feet

cPAH Concentrations in Site Surface Sediment

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Barbee Mill Sediment Site,
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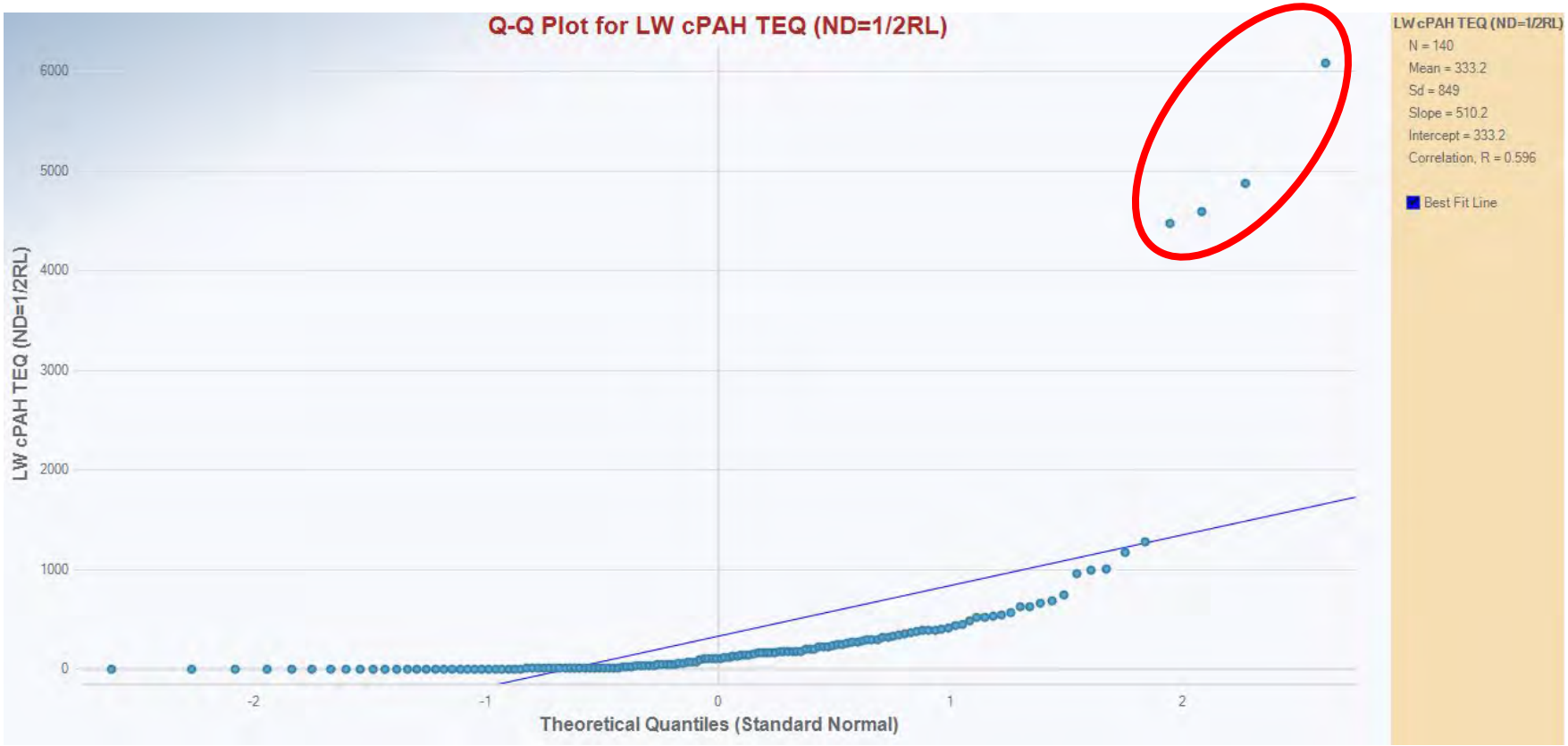
Figure L-1f

P:\Projects\Barbee Mill\900 GIS and CAD\920 GIS\MXDs\RI Report\Figure 99f cPAH Concentration Lakewide.mxd 11/15/2022 5:59:27 AM



Detected Observation

Non-Detected Observation

Best fit line fitting Normal Distribution

1. A Q–Q plot depicts quantiles of a data distribution. The pattern of points in the plot is used for comparison to known distribution and to identify data points that can be considered outliers.

2. The red circle includes results identified as outliers.

3. The dataset includes concentrations of carcinogenic polycyclic aromatic hydrocarbons (cPAH) toxic equivalents (TEQ) in Lake Washington (LW) surface sediments (0 to 10 centimeters). Individual cPAHs were multiplied for respective toxicity factors and summed considering half of the reporting limit (RL) for non detected values (ND).

Q-Q Plot for Lake Washington cPAH TEQ Concentrations

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Barbee Mill Sediment Site,
Renton, WA

Geosyntec consultants

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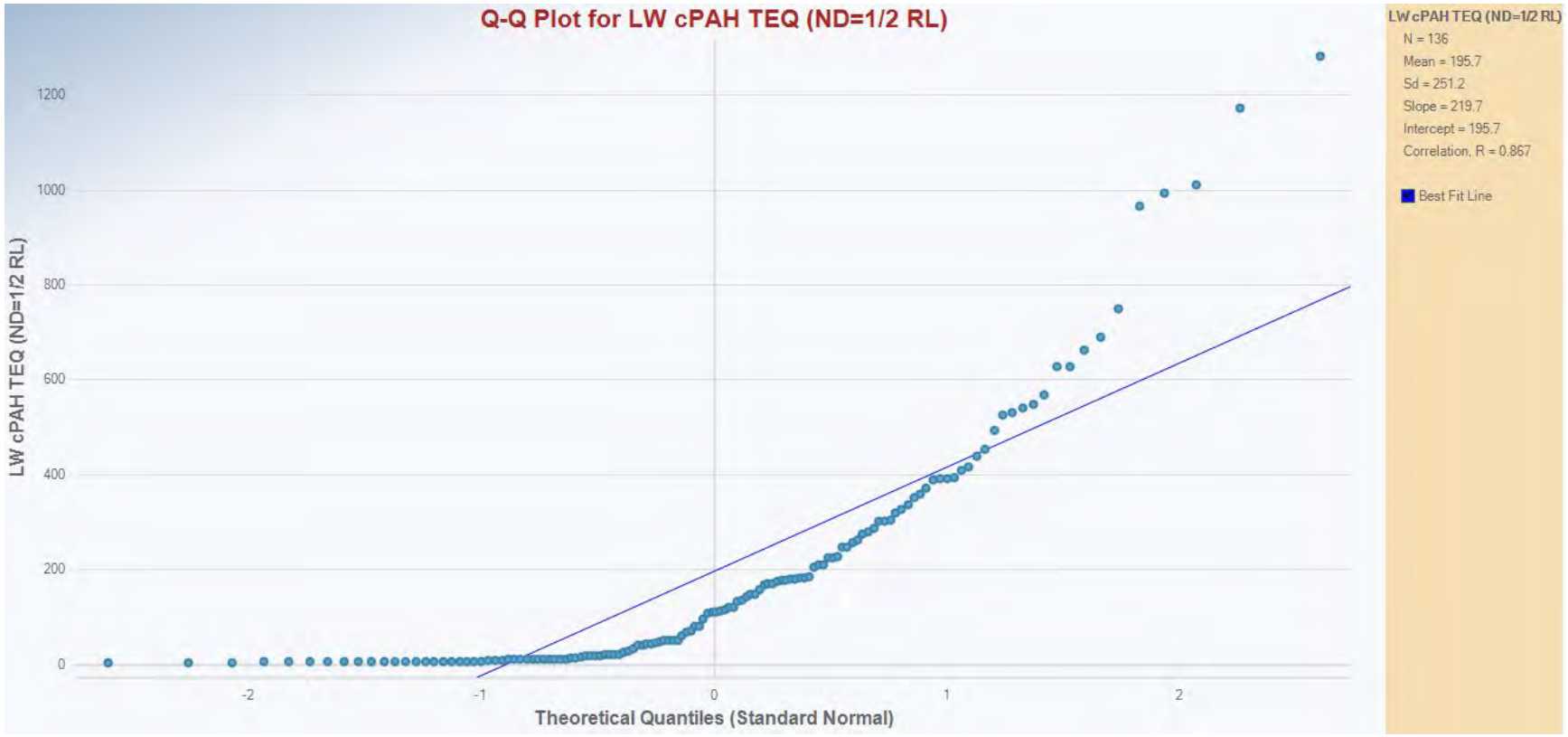
Figure
L-2a

P:\Projects\Barbee Mill\600 Deliverables - Geosyntec\L_combined RIFS Report (wip)\Appendices\Figures



Detected Observation

Non-Detected Observation

Best fit line fitting Normal Distribution

1. A Q–Q plot depicts quantiles of a data distribution. The pattern of points in the plot is used for comparison to known distribution and to identify data points that can be considered outliers.

2. The red circle includes results identified as outliers.

3. The dataset includes concentrations of carcinogenic polycyclic aromatic hydrocarbons (cPAH) toxic equivalents (TEQ) in Lake Washington (LW) surface sediments (0 to 10 centimeters). Individual cPAHs were multiplied for respective toxicity factors and summed considering half of the reporting limit (RL) for non detected values (ND). Dataset wasscreened to remove outliers identified in Figure L-2a.

Q-Q Plot for screened Lake Washington cPAH TEQ Concentrations

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Barbee Mill Sediment Site,
Renton, WA

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Figure
L-2b

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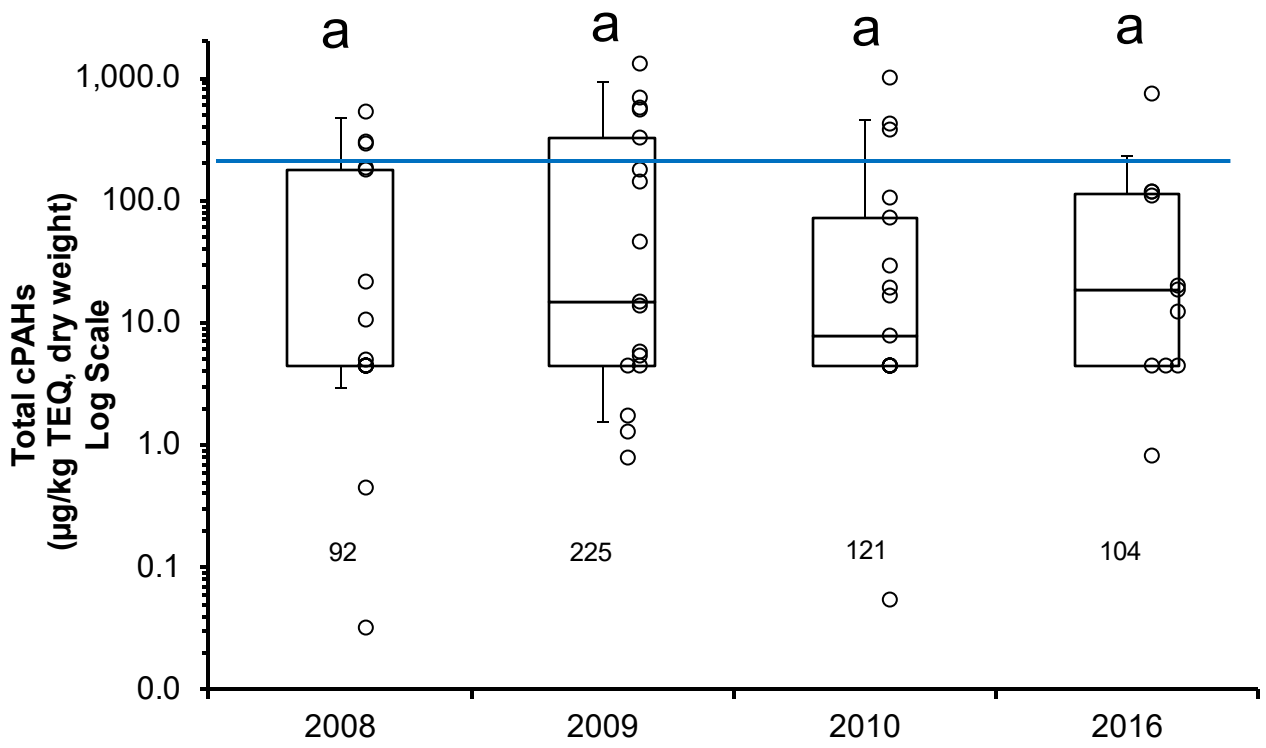
P:\Projects\Barbee Mill\600 Deliverables - Geosyntec\L_combined RIFS Report (wip)\Appendices\Figures



Discrete Observation ○

Arithmetic Mean 17

Regional Lake Washington Background

1. The Box and Whiskers plot shows the distribution of the dataset along the median (central horizontal line). Boxes represent the interquartile range, including values between ± 25% of the median. Whiskers extending from the top and the bottom represents the bottom and top 25% of the data values excluding outliers.

2. Dataset includes bulk surface sediment concentrations from 0 to 10 cm at sampling locations from the King County Lake Monitoring Program. The county conducted repeated sampling at the same stations over time.

3. The "a" letters on top of the boxplots indicate populations are not statistically significant different (Kruskal Wallis test, $p \leq 0.05$)

cPAH Results for King County Lake Washington Monitoring Program

Appendix L RIFS Report

Barbee Mill Sediment Site,
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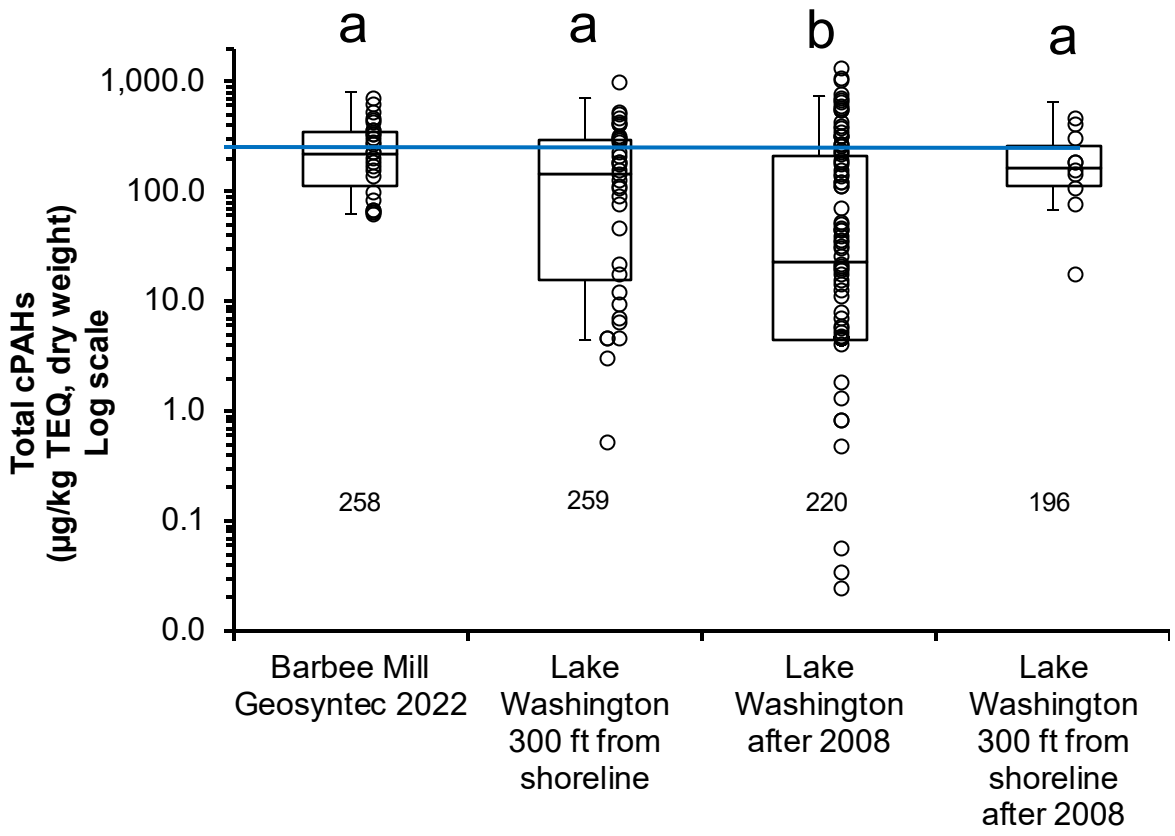
Figure
L-3

P:\Projects\Barbee Mill\600 Deliverables - Geosyntec\L_combined RIFS Report (wip)\Appendices\Figures



Discrete Observation ○

Arithmetic Mean 17

Regional Lake Washington Background ——

1. The Box and Whiskers plot shows the distribution of the dataset along the median (central horizontal line). Boxes represent the interquartile range, including values between ± 25% of the median. Whiskers extending from the top and the bottom represents the bottom and top 25% of the data values excluding outliers.

2. Dataset includes ambient Lake Washington concentrations screened for temporal variability (after 2008) and to remove nearshore point sources (300 feet from shoreline).

3. The "a" letters on top of the boxplots indicate populations are not statistically significant different, and the "b: letter indicates significant difference (Wilcoxon-Mann-Whitney test, $p \leq 0.05$)

Comparison of Barbee Mill and ALW cPAH Datasets

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Barbee Mill Sediment Site,
Renton, WA

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Figure
L-4

P:\Projects\Barbee Mill\600 Deliverables - Geosyntec\i_combined RIFS Report (wip)\Appendices\Figures

ATTACHMENT L-1
EIM OUTPUT
PROVIDED ELECTRONICALLY

ATTACHMENT L-2
PROUCL OUTPUT – DESCRIPTIVE STATISTICS

Attachment L-2
ProUCL Output - Descriptive Statistics

General Statistics on Uncensored Data

Date/Time of Computation	ProUCL 5.2 3/2/2023 10:08:59 AM
User Selected Options	
From File	ProUCL input filters.xls
Full Precision	OFF

From File: ProUCL input filters.xls

General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method

Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
BM cPAH TEQ	27	0	27	0	0.00%	N/A	N/A	257.8	29331	171.3	0.664
LW cPAH TEQ (ND=0)	136	0	96	40	29.41%	0.024	87.9	165.3	60452	245.9	1.487
LW cPAH TEQ (ND=0) 300ft	36	0	26	10	27.78%	0.5	87.9	187.9	41384	203.4	1.082
LW cPAH TEQ (ND=0) 300ft 2008	10	0	10	0	0.00%	N/A	N/A	195.6	18650	136.6	0.698
LW cPAH TEQ (ND=0) 2008	92	0	64	28	30.43%	0.024	4.5	153.3	65049	255	1.663

General Statistics for Raw Data Sets using Detected Data Only

Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
BM cPAH TEQ	27	0	59.86	673.6	257.8	216.8	29331	171.3	190.5	0.758	0.664
LW cPAH TEQ (ND=0)	96	0	1.269	1283	233.8	143.6	70405	265.3	184.5	1.777	1.135
LW cPAH TEQ (ND=0) 300ft	26	0	17.06	954.9	259.6	207.1	40355	200.9	149.7	1.7	0.774
LW cPAH TEQ (ND=0) 300ft 2008	10	0	17.06	440.4	195.6	162.3	18650	136.6	110.3	0.773	0.698
LW cPAH TEQ (ND=0) 2008	64	0	1.269	1283	220.1	112.4	80096	283	153	1.832	1.286

Percentiles using all Detects (Ds) and Non-Detects (NDs)

Variable	NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
BM cPAH TEQ	27	0	63.11	83.6	112.7	216.8	349.4	392.4	468.5	570.8	654.4
LW cPAH TEQ (ND=0)	136	0	4.5	4.5	4.5	43.27	249.6	297.7	498.9	670.9	1029
LW cPAH TEQ (ND=0) 300ft	36	0	4.5	9.1	15.75	143.6	290.4	312.2	424.1	493.9	798.8
LW cPAH TEQ (ND=0) 300ft 2008	10	0	66.65	97.4	112.5	162.3	261.1	308.4	395.1	417.7	435.8
LW cPAH TEQ (ND=0) 2008	92	0	4.5	4.5	4.5	22.98	212.7	257	530	676.4	1068

ATTACHMENT L-3
PROUCL OUTPUT – UTLS

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.2 12/12/2022 7:39:04 AM
From File	ProUCL input filters.xls
Full Precision	OFF
Confidence Coefficient	90%
Coverage	90%
Different or Future K Observations	1
Number of Bootstrap Operations	2000

BM cPAH TEQ

General Statistics

Total Number of Observations	27	Number of Distinct Observations	27
Minimum	59.86	First Quartile	112.7
Second Largest	599.8	Median	216.8
Maximum	673.6	Third Quartile	349.4
Mean	257.8	SD	171.3
Coefficient of Variation	0.664	Skewness	0.758
Mean of logged Data	5.304	SD of logged Data	0.763

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	1.682	d2max (for USL)	2.52

Normal GOF Test

Shapiro Wilk Test Statistic	0.923	**Shapiro Wilk GOF Test**
1% Shapiro Wilk Critical Value	0.894	Data appear Normal at 1% Significance Level
Lilliefors Test Statistic	0.124	**Lilliefors GOF Test**
1% Lilliefors Critical Value	0.194	Data appear Normal at 1% Significance Level

Data appear Normal at 1% Significance Level

Background Statistics Assuming Normal Distribution

90% UTL with	90% Coverage	545.9	90% Percentile (z)	477.3
	90% UPL (t)	487.2	95% Percentile (z)	539.5
	90% USL	689.4	99% Percentile (z)	656.2

Gamma GOF Test

A-D Test Statistic	0.406	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.756	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.107	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.17	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.163	k star (bias corrected MLE)	1.947
Theta hat (MLE)	119.2	Theta star (bias corrected MLE)	132.4
nu hat (MLE)	116.8	nu star (bias corrected)	105.1
MLE Mean (bias corrected)	257.8	MLE Sd (bias corrected)	184.8

Background Statistics Assuming Gamma Distribution

90% Wilson Hilferty (WH) Approx. Gamma UPL	513.2	90% Percentile	504.6
90% Hawkins Wixley (HW) Approx. Gamma UPL	521.3	95% Percentile	616.7
90% WH Approx. Gamma UTL with 90% Coverage	616.4	99% Percentile	865.9
90% HW Approx. Gamma UTL with 90% Coverage	635.5		
90% WH USL	924.6	90% HW USL	993.3

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk Lognormal GOF Test**
10% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.118	**Lilliefors Lognormal GOF Test**
10% Lilliefors Critical Value	0.153	Data appear Lognormal at 10% Significance Level

Data appear Approximate Lognormal at 10% Significance Level

Background Statistics assuming Lognormal Distribution

90% UTL with	90% Coverage	725.8	90% Percentile (z)	534.7
	90% UPL (t)	558.7	95% Percentile (z)	705.6
	90% USL	1376	99% Percentile (z)	1187

Nonparametric Distribution Free Background Statistics

Data appear Normal at 1% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, order		27	90% UTL with 90% Coverage	673.6
Approx, f used to compute achieved CC		1.444	Approximate Actual Confidence Coefficient achieved by UTL	0.767
			Approximate Sample Size needed to achieve specified CC	22
90% Percentile Bootstrap UTL with	90% Coverage	599.8	90% BCA Bootstrap UTL with 90% Coverage	599.8
	90% UPL	522.4	90% Percentile	468.5
	90% Chebyshev UPL	781	95% Percentile	570.8
	95% Chebyshev UPL	1018	99% Percentile	654.4
	90% USL	673.6		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

ALW cPAH TEQ (ND=0) 300ft

General Statistics

Total Number of Observations	36	Number of Missing Observations	0
Number of Distinct Observations	35		
Number of Detects	26	Number of Non-Detects	10
Number of Distinct Detects	26	Number of Distinct Non-Detects	9
Minimum Detect	17.06	Minimum Non-Detect	0.5
Maximum Detect	954.9	Maximum Non-Detect	87.9
Variance Detected	40355	Percent Non-Detects	27.78%
Mean Detected	259.6	SD Detected	200.9
Mean of Detected Logged Data	5.225	SD of Detected Logged Data	0.948

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	1.608	d2max (for USL)	2.641

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.868	**Shapiro Wilk GOF Test**
1% Shapiro Wilk Critical Value	0.891	Data Not Normal at 1% Significance Level
Lilliefors Test Statistic	0.127	**Lilliefors GOF Test**
1% Lilliefors Critical Value	0.199	Detected Data appear Normal at 1% Significance Level

Detected Data appear Approximate Normal at 1% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	187.9	KM SD	203.4
90% UTL90% Coverage	515	90% KM UPL (t)	457.3
90% KM Percentile (z)	448.6	95% KM Percentile (z)	522.6
99% KM Percentile (z)	661.2	90% KM USL	725.3

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	189.4	SD	205
90% UTL90% Coverage	519	90% UPL (t)	460.9
90% Percentile (z)	452.2	95% Percentile (z)	526.7
99% Percentile (z)	666.4	90% USL	731

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.231	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.76	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0884	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.174	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.645	k star (bias corrected MLE)	1.481
Theta hat (MLE)	157.8	Theta star (bias corrected MLE)	175.3
nu hat (MLE)	85.53	nu star (bias corrected)	77
MLE Mean (bias corrected)	259.6		
MLE Sd (bias corrected)	213.3	90% Percentile of Chisquare (2kstar)	6.191

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	187.5
Maximum	954.9	Median	143.6
SD	206.7	CV	1.103
k hat (MLE)	0.258	k star (bias corrected MLE)	0.255
Theta hat (MLE)	726.6	Theta star (bias corrected MLE)	735.1
nu hat (MLE)	18.58	nu star (bias corrected)	18.36
MLE Mean (bias corrected)	187.5	MLE Sd (bias corrected)	371.2
90% Percentile of Chisquare (2kstar)	1.529	90% Percentile	561.9
95% Percentile	902.1	99% Percentile	1805

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
90% Approx. Gamma UTL with 90% Coverage	762.7	975.4	90% Approx. Gamma UPL	571	677.1
90% Gamma USL	1818	2946			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	187.9	SD (KM)	203.4
Variance (KM)	41384	SE of Mean (KM)	34.58
k hat (KM)	0.853	k star (KM)	0.801
nu hat (KM)	61.45	nu star (KM)	57.66
theta hat (KM)	220.2	theta star (KM)	234.7
80% gamma percentile (KM)	307.1	90% gamma percentile (KM)	456.9
95% gamma percentile (KM)	609.4	99% gamma percentile (KM)	969.6

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
90% Approx. Gamma UTL with 90% Coverage	695.4	818.4	90% Approx. Gamma UPL	531.4	591.5
90% KM Gamma Percentile	509.2	561.9	90% Gamma USL	1574	2228

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**	
10% Shapiro Wilk Critical Value	0.933	Data Not Lognormal at 10% Significance Level	
Lilliefors Test Statistic	0.118	**Lilliefors GOF Test**	
10% Lilliefors Critical Value	0.156	Detected Data appear Lognormal at 10% Significance Level	

Detected Data appear Approximate Lognormal at 10% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	194.7	Mean in Log Scale	4.676
SD in Original Scale	200.2	SD in Log Scale	1.206
90% UTL90% Coverage	746.4	90% BCA UTL90% Coverage	488.9
90% Bootstrap (%) UTL90% Coverage	498.9	90% UPL (t)	530.4
90% Percentile (z)	503.7	95% Percentile (z)	780.8
99% Percentile (z)	1777	90% USL	2597

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	3.617	90% KM UTL (Lognormal)90% Coverage	3036
KM SD of Logged Data	2.738	90% KM UPL (Lognormal)	1398
90% KM Percentile Lognormal (z)	1244	90% KM USL (Lognormal)	51466

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	189.4	Mean in Log Scale	4.076
SD in Original Scale	205	SD in Log Scale	2.144
90% UTL90% Coverage	1849	90% UPL (t)	1007
90% Percentile (z)	919.3	95% Percentile (z)	2003
99% Percentile (z)	8636	90% USL	16965

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	35	90% UTL with90% Coverage	954.9
Approx, f used to compute achieved CC	1.944	Approximate Actual Confidence Coefficient achieved by UTL	0.887
Approximate Sample Size needed to achieve specified CC	22	90% UPL	454.9
90% USL	954.9	90% KM Chebyshev UPL	806.6

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

ALW cPAH TEQ (ND=0) 300ft 2008

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Minimum	17.06	First Quartile	112.5
Second Largest	390.1	Median	162.3
Maximum	440.4	Third Quartile	261.1
Mean	195.6	SD	136.6
Coefficient of Variation	0.698	Skewness	0.773
Mean of logged Data	4.978	SD of logged Data	0.94

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.066	d2max (for USL)	2.036

Normal GOF Test

Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**	
1% Shapiro Wilk Critical Value	0.781	Data appear Normal at 1% Significance Level	
Lilliefors Test Statistic	0.243	**Lilliefors GOF Test**	
1% Lilliefors Critical Value	0.304	Data appear Normal at 1% Significance Level	

Data appear Normal at 1% Significance Level

Background Statistics Assuming Normal Distribution

90% UTL with 90% Coverage	477.7	90% Percentile (z)	370.6
90% UPL (t)	393.7	95% Percentile (z)	420.2
90% USL	473.7	99% Percentile (z)	513.3

Gamma GOF Test

A-D Test Statistic	0.237	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.142	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.27	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.826	k star (bias corrected MLE)	1.345
Theta hat (MLE)	107.1	Theta star (bias corrected MLE)	145.4
nu hat (MLE)	36.51	nu star (bias corrected)	26.89
MLE Mean (bias corrected)	195.6	MLE Sd (bias corrected)	168.7

Background Statistics Assuming Gamma Distribution

90% Wilson Hilferty (WH) Approx. Gamma UPL	445.2	90% Percentile	418.6
90% Hawkins Wixley (HW) Approx. Gamma UPL	463.3	95% Percentile	528.6

90% WH Approx. Gamma UTL with	90% Coverage	626.2		99% Percentile	778.8
90% HW Approx. Gamma UTL with	90% Coverage	677.1			
	90% WH USL	616.5		90% HW USL	665.3

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk Lognormal GOF Test**	
10% Shapiro Wilk Critical Value	0.869	Data appear Lognormal at 10% Significance Level	
Lilliefors Test Statistic	0.182	**Lilliefors Lognormal GOF Test**	
10% Lilliefors Critical Value	0.241	Data appear Lognormal at 10% Significance Level	

Data appear Lognormal at 10% Significance Level

Background Statistics assuming Lognormal Distribution

90% UTL with	90% Coverage	1012		90% Percentile (z)	484.1
	90% UPL (t)	567.5		95% Percentile (z)	681.2
	90% USL	984.1		99% Percentile (z)	1293

Nonparametric Distribution Free Background Statistics

Data appear Normal at 1% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, order		10	90% UTL with	90% Coverage	440.4
Approx, f used to compute achieved CC		1.111	Approximate Actual Confidence Coefficient achieved by UTL		0.651
			Approximate Sample Size needed to achieve specified CC		22
90% Percentile Bootstrap UTL with	90% Coverage	440.4	90% BCA Bootstrap UTL with	90% Coverage	440.4
	90% UPL	435.3		90% Percentile	395.1
	90% Chebyshev UPL	625.3		95% Percentile	417.7
	95% Chebyshev UPL	819.9		99% Percentile	435.8
	90% USL	440.4			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

ALW cPAH TEQ (ND=0) 2008

General Statistics

Total Number of Observations	92	Number of Missing Observations	0
Number of Distinct Observations	71		
Number of Detects	64	Number of Non-Detects	28
Number of Distinct Detects	64	Number of Distinct Non-Detects	7
Minimum Detect	1.269	Minimum Non-Detect	0.024
Maximum Detect	1283	Maximum Non-Detect	4.5
Variance Detected	80096	Percent Non-Detects	30.43%
Mean Detected	220.1	SD Detected	283
Mean of Detected Logged Data	4.324	SD of Detected Logged Data	1.743

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	1.475	d2max (for USL)	2.995

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.761	**Normal GOF Test on Detected Observations Only**	
1% Shapiro Wilk P Value	8.593E-14	Data Not Normal at 1% Significance Level	
Lilliefors Test Statistic	0.22	**Lilliefors GOF Test**	
1% Lilliefors Critical Value	0.128	Data Not Normal at 1% Significance Level	

Data Not Normal at 1% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	153.3	KM SD	255
90% UTL90% Coverage	529.6	90% KM UPL (t)	484.4
90% KM Percentile (z)	480.2	95% KM Percentile (z)	572.8
99% KM Percentile (z)	746.7	90% KM USL	917.2

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	153.7	SD	256.2
90% UTL90% Coverage	531.7	90% UPL (t)	486.2
90% Percentile (z)	482.1	95% Percentile (z)	575.1
99% Percentile (z)	749.8	90% USL	921.1

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.663	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.809	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.123	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.117	Data Not Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.58	k star (bias corrected MLE)	0.563
Theta hat (MLE)	379.4	Theta star (bias corrected MLE)	390.7
nu hat (MLE)	74.27	nu star (bias corrected)	72.12
MLE Mean (bias corrected)	220.1		
MLE Sd (bias corrected)	293.3	90% Percentile of Chisquare (2kstar)	2.972

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	153.1
Maximum	1283	Median	22.98
SD	256.6	CV	1.675
k hat (MLE)	0.213	k star (bias corrected MLE)	0.213
Theta hat (MLE)	719.6	Theta star (bias corrected MLE)	718.6
nu hat (MLE)	39.15	nu star (bias corrected)	39.21
MLE Mean (bias corrected)	153.1	MLE Sd (bias corrected)	331.7
90% Percentile of Chisquare (2kstar)	1.289	90% Percentile	463
95% Percentile	775.8	99% Percentile	1628

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
90% Approx. Gamma UTL with 90% Coverage	506.1	561.5	90% Approx. Gamma UPL	410.3	433.7
90% Gamma USL	1995	3128			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	153.3	SD (KM)	255
Variance (KM)	65049	SE of Mean (KM)	26.8
k hat (KM)	0.361	k star (KM)	0.357
nu hat (KM)	66.5	nu star (KM)	65.66
theta hat (KM)	424.3	theta star (KM)	429.7
80% gamma percentile (KM)	243.6	90% gamma percentile (KM)	441.4
95% gamma percentile (KM)	662.4	99% gamma percentile (KM)	1225

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
90% Approx. Gamma UTL with 90% Coverage	493.6	535.4	90% Approx. Gamma UPL	402.7	418.6
90% KM Gamma Percentile	394.9	408.9	90% Gamma USL	1883	2794

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Approximate Test Statistic	0.948	**Shapiro Wilk GOF Test**	
10% Shapiro Wilk P Value	0.0182	Data Not Lognormal at 10% Significance Level	
Lilliefors Test Statistic	0.108	**Lilliefors GOF Test**	
10% Lilliefors Critical Value	0.101	Data Not Lognormal at 10% Significance Level	

Data Not Lognormal at 10% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	153.9	Mean in Log Scale	3.148
SD in Original Scale	256.1	SD in Log Scale	2.369
90% UTL90% Coverage	767.8	90% BCA UTL90% Coverage	627.2
90% Bootstrap (%) UTL90% Coverage	627.2	90% UPL (t)	504.5
90% Percentile (z)	485.3	95% Percentile (z)	1148
99% Percentile (z)	5769	90% USL	28131

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	2.228	90% KM UTL (Lognormal)90% Coverage	2017
KM SD of Logged Data	3.648	90% KM UPL (Lognormal)	1057
90% KM Percentile Lognormal (z)	995.4	90% KM USL (Lognormal)	516028

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	153.7	Mean in Log Scale	3.034
SD in Original Scale	256.2	SD in Log Scale	2.587
90% UTL90% Coverage	943.6	90% UPL (t)	596.6
90% Percentile (z)	571.9	95% Percentile (z)	1464
99% Percentile (z)	8530	90% USL	48101

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	86	90% UTL with90% Coverage	664
Approx, f used to compute achieved CC	1.365	Approximate Actual Confidence Coefficient achieved by UTL	0.825
Approximate Sample Size needed to achieve specified CC	91	90% UPL	538.7
90% USL	1283	90% KM Chebyshev UPL	922.6

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

ATTACHMENT L-4
PROUCL OUTPUT – HYPOTHESIS TESTS

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.2 12/7/2022 9:56:59 PM
From File	ProUCL input filters.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median = Sample 2 Mean/Median (2 Sided Alternative
Alternative Hypothesis	Sample 1 Mean/Median <> Sample 2 Mean/Median

Sample 1 Data: LW cPAH TEQ (ND=0) 300ft
Sample 2 Data: BM cPAH TEQ

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	36	27
Number of Non-Detects	10	0
Number of Detect Data	26	27
Minimum Non-Detect	0.5	N/A
Maximum Non-Detect	87.9	N/A
Percent Non-detects	27.78%	0.00%
Minimum Detect	17.06	59.86
Maximum Detect	954.9	673.6
Mean of Detects	259.6	257.8
Median of Detects	207.1	216.8
SD of Detects	200.9	171.3

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 = Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	1048
WMW U-Stat	382
Standardized WMW U-Stat	-1.468
Mean (U)	486
SD(U) - Adj ties	72
Lower Approximate U-Stat Critical Value (0.025)	-1.96
Upper Approximate U-Stat Critical Value (0.975)	1.96
P-Value (Adjusted for Ties)	0.142

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 = Sample 2

P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.2 12/8/2022 1:13:13 PM
From File	ProUCL input filters.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median = Sample 2 Mean/Median (2 Sided Alternative
Alternative Hypothesis	Sample 1 Mean/Median <> Sample 2 Mean/Median

Sample 1 Data: LW cPAH TEQ (ND=0) 2008
Sample 2 Data: BM cPAH TEQ

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	92	27
Number of Non-Detects	28	0
Number of Detect Data	64	27
Minimum Non-Detect	0.024	N/A
Maximum Non-Detect	4.5	N/A
Percent Non-detects	30.43%	0.00%
Minimum Detect	1.269	59.86
Maximum Detect	1283	673.6
Mean of Detects	220.1	257.8
Median of Detects	112.4	216.8
SD of Detects	283	171.3

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 = Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	4870
WMW U-Stat	592
Standardized WMW U-Stat	-4.161
Mean (U)	1242
SD(U) - Adj ties	157.6
Lower Approximate U-Stat Critical Value (0.025)	-1.96
Upper Approximate U-Stat Critical Value (0.975)	1.96
P-Value (Adjusted for Ties)	3.1673E-5

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 <> Sample 2

P-Value < alpha (0.05)

t-Test Sample 1 vs Sample 2 Comparison for Uncensored Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	ProUCL 5.2 12/7/2022 9:58:41 PM
From File	ProUCL input filters.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0.000
Selected Null Hypothesis	Sample 1 Mean = Sample 2 Mean (Two Sided Alternative)
Alternative Hypothesis	Sample 1 Mean <> Sample 2 Mean

Sample 1 Data: LW cPAH TEQ (ND=0) 300ft 2008
Sample 2 Data: BM cPAH TEQ

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	10	27
Number of Distinct Observations	10	27
Minimum	17.06	59.86
Maximum	440.4	673.6
Mean	195.6	257.8
Median	162.3	216.8
SD	136.6	171.3
SE of Mean	43.19	32.96

Sample 1 vs Sample 2 Two-Sample t-Test

H0: Mean of Sample 1 = Mean of Sample 2

Method	DF	t-Test Value	Lower C.Val t (0.025)	Upper C.Val t (0.975)	P-Value
Pooled (Equal Variance)	35	-1.031	-2.030	2.030	0.310
Welch-Satterthwaite (Unequal Variance)	20.2	-1.146	-2.086	2.086	0.265

Pooled SD: 163.047

Conclusion with Alpha = 0.050

Student t (Pooled): Do Not Reject H0, Conclude Sample 1 = Sample 2

Welch-Satterthwaite: Do Not Reject H0, Conclude Sample 1 = Sample 2

Test of Equality of Variances

Variance of Sample 1	18650
Variance of Sample 2	29331

Numerator DF	Denominator DF	F-Test Value	P-Value
26	9	1.573	0.487

Conclusion with Alpha = 0.05

Two variances appear to be equal

ATTACHMENT L-3
PROUCL OUTPUT – UTLS

ATTACHMENT L-4
PROUCL OUTPUT – HYPOTHESIS TESTS

APPENDIX M

Remedial Alternatives
Detailed Cost Estimates

Table M-1. Detailed Cost Estimate for Alternative 1

DRAFT

Project No. 050004, Barbee Mill Site, Renton, Washington

Remedial Action Description: Monitored Natural Attenuation (MNA) with Institutional Controls (IC)
Cost Estimate Accuracy: Feasibility Level (+50/-30 percent)

Key Assumptions:
Future costs are adjusted to present value using a discount rate of 2.5%

Direct Installation Costs	Quantity	Units	Unit Cost	Extension	Description
Groundwater Monitoring					
Monitoring well installation	1	LS	$7,276	$7,276	1 shoreline well on Quendall Property (CMW-7), plus brush clearing
			Direct Installation Cost (Subtotal):	$7,000	
			Contingency (20%):	$1,000	
			Sales Tax (10.1% DI):	$1,000	
			Total Direct Installation Cost (DI):	***$9,000***	

Professional Services Costs	Quantity	Units	Unit Cost	Extension	Description
Record Environmental Covenant	1	LS	$10,000	$10,000	
Project Management and Construction Oversight	20%	percent	$19,000	$3,800	Percentage of DI+Env Covenant costs
Remedial Design	20%	percent	$19,000	$3,800	Percentage of DI+Env Covenant costs. Pilot, phased implementation, EDR, contracting, Completion Report
Contingency	30%	percent	$17,600	$5,280	Percentage of DI+Env Covenant+PM+Remedial Design costs
			Total Professional Services (PS) Cost:	***$22,880***	

TOTAL CAPITAL INVESTMENT (TCI) [DI + PS]:	**$32,000**

Annual Operations and Monitoring Costs	Quantity	Units	Unit Cost	Extension	Description
Compliance Monitoring					
Annual long term groundwater monitoring (MNA) for years 1-5	5	Event	$9,504	$47,520	20 wells annually
Biennial long term groundwater monitoring (MNA) for years 6-10	3	Event	$9,504	$28,512	20 wells biennially
5-year long term groundwater monitoring (MNA) for years 11-90	16	Event	$3,448	$55,168	7 wells every 5 years
Porewater monitoring	1	Event	$20,000	$20,000	at 10 years
Confirmation groundwater sampling	1	Event	$38,016	$38,016	20 wells quarterly @ 91 years
Well decommissioning	28	ea	$500	$14,000	20 wells @ 91 years
Reporting	24	Event	$10,000	$240,000	During monitoring years
Project Management	24	Event	$5,000	$120,000	During Monitoring Years

TOTAL O&M COST :	***$563,216***

TOTAL ALTERNATIVE COST (Actual Dollars, 76 years):	***$600,000***

TOTAL ALTERNATIVE COST (NPV, 76 years):	***$310,000***

Table M-2a. Detailed Cost Estimate for Alternative 2 (ISCR)

Project No. 050004, Barbee Mill Site, Renton, Washington

Remedial Action Description: Hot Spot In-Situ Chemical Reduction (ISCR) or In Situ Solidification, including MNA and IC
Cost Estimate Accuracy: Feasibility Level (+50/-30 percent)

Key Assumptions:
Future costs are adjusted to present value using a discount rate of 2.5%

Direct Installation Costs	Quantity	Units	Unit Cost	Extension	Description
ISCR					
mobilization/demobilization	5%	percent	$627,739	$31,387	percentage of capital costs below
ISCR direct push injections	51	day	$8,000	$408,000	Direct push
ISCR reagent	42,488	pounds	$3	$127,463	Assumes ZVI is injected to meet a target of 0.25% of soil mass
Operational monitoring	1	LS	$15,000	$15,000	
Misc (makeup water)	1	LS	$20,000	$20,000	
Monitoring well installation	1	LS	$7,276	$7,276	1 shoreline well on Quendall Property (CMW-7), plus brush clearing
Performance monitoring	1	LS	$50,000	$50,000	Postconstruction performance monitoring
			Direct Installation Cost (Subtotal):	$659,000	
			Sales Tax (10.1% DI):	$67,000	
			Contingency (20% DI):	$145,000	
			Total Direct Installation Cost (DI):	***$871,000***	

Professional Services Costs	Quantity	Units	Unit Cost	Extension	Description
Record Environmental Covenant	1	LS	$10,000	$10,000	
Project Management and Construction Oversight	20%	percent	$881,000	$176,200	Percentage of DI+Env Covenant costs
Remedial Design	20%	percent	$881,000	$176,200	Percentage of DI+Env Covenant costs. Pilot, phased implementation, EDR, contracting, Completion Report
Contingency	30%	percent	$362,000	$108,600	Percentage of DI+Env Covenant+PM+Remedial Design costs
			Total Professional Services Cost (PS):	***$471,000***	

TOTAL CAPITAL INVESTMENT (TCI) [DI + PS]: $1,342,000

Annual Operations and Monitoring Costs	Quantity	Units	Unit Cost	Extension	Description
Compliance Monitoring					
Annual long term groundwater monitoring (MNA) for years 1-5	5	Event	$9,504	$47,520	20 wells annually
Biennial long term groundwater monitoring (MNA) for years 6-10	3	Event	$9,504	$28,512	20 wells biennially
5-year long term groundwater monitoring (MNA) for years 11-90	16	Event	$3,448	$55,168	7 wells every 5 years
Confirmation groundwater sampling	1	Event	$38,016	$38,016	20 wells quarterly @ 91 years
Well decommissioning	28	ea	$500	$14,000	20 wells @ 91 years
Reporting	24	Event	$10,000	$240,000	Annual for 91 years
Project Management	24	Event	$5,000	$120,000	Annual for years 1-91

TOTAL O&M COST : $543,216

TOTAL ALTERNATIVE COST (Actual Dollars, 76 years): $1,900,000

TOTAL ALTERNATIVE COST (NPV, 76 years): $1,620,000

Table M-2b. Detailed Cost Estimate for Alternative 2 (ISS)

DRAFT

Project No. 050004, Barbee Mill Site, Renton, Washington

Remedial Action Description: Hot Spot In-Situ Chemical Reduction (ISCR) or In Situ Solidification, including MNA and IC
Cost Estimate Accuracy: Feasibility Level (+50/-30 percent)

Key Assumptions:
Future costs are adjusted to present value using a discount rate of 2.5%

Quantities:				
	10,491	CY	ISS volume	Aspect estimated
	12%		Reagent Mix	
	25%		swell percentage	
	2,623		swell volume	
	1.70	tons/CY	soil density	

Direct Installation Costs	Quantity	Units	Unit Cost	Extension	Description
ISS					
mobilization/demobilization	1	LS	$175,000	$175,000	percentage of capital costs below
ISS - labor and equipment	10,491	CY	$35	$367,182	large diameter auger (6-10' dia)
ISS - reagent	1,259	CY	$190	$239,193	12% mix
Swell Earthwork	2,623	CY	$45	$118,023	move and grade outside of ISS treatment area. Load and place, grade, cure-in-place (no compaction)
Monitoring well installation	1	LS	$7,276	$7,276	1 shoreline well on Quendall Property (CMW-7), plus brush clearing
Performance monitoring	1	LS	$50,000	$50,000	Postconstruction performance monitoring
			Direct Installation Cost (Subtotal):	$957,000	
			Sales Tax (10.1% DI):	$97,000	
			Contingency (20% DI):	$211,000	
			Total Direct Installation Cost (DI):	***$1,265,000***	

Professional Services Costs	Quantity	Units	Unit Cost	Extension	Description
Record Environmental Covenant	1	LS	$10,000	$10,000	
Project Management and Construction Oversight	20%	percent	$1,275,000	$255,000	Percentage of DI+Env Covenant costs
Remedial Design	20%	percent	$1,275,000	$255,000	Percentage of DI+Env Covenant costs. Treatability testing, EDR, contracting, Completion Report
Contingency	30%	percent	$520,000	$156,000	Percentage of DI+Env Covenant+PM+Remedial Design costs
			Total Professional Services Cost (PS):	***$676,000***	

TOTAL CAPITAL INVESTMENT (TCI) [DI + PS]: $1,941,000

Annual Operations and Monitoring Costs	Quantity	Units	Unit Cost	Extension	Description
Compliance Monitoring					
Annual long term groundwater monitoring (MNA) for years 1-5	5	Event	$9,504	$47,520	20 wells annually
Biennial long term groundwater monitoring (MNA) for years 6-10	3	Event	$9,504	$28,512	20 wells biennially
5-year long term groundwater monitoring (MNA) for years 11-90	16	Event	$3,448	$55,168	7 wells every 5 years
Confirmation groundwater sampling	1	Event	$38,016	$38,016	20 wells quarterly @ 91 years
Well decommissioning	28	ea	$500	$14,000	20 wells @ 91 years
Reporting	24	Event	$10,000	$240,000	Annual for 91 years
Project Management	24	Event	$5,000	$120,000	Annual for years 1-91

TOTAL O&M COST : $543,216

TOTAL ALTERNATIVE COST (Actual Dollars, 76 years): $2,500,000

TOTAL ALTERNATIVE COST (NPV, 76 years): $2,220,000

Table M-3. Detailed Cost Estimate for Alternative 3

Project No. 050004, Barbee Mill Site, Renton, Washington

Remedial Action Description: Passive Attenuation Zone (PAZ) Extension, including MNA and IC
Cost Estimate Accuracy: Feasibility Level (+50/-30 percent)

Key Assumptions:
Future costs are adjusted to present value using a discount rate of 2.5%

Quantities: 833 CY trench volume

Direct Installation Costs	Quantity	Units	Unit Cost	Extension	Description
PAZ					
mobilization/demobilization	5%	percent	$708,581	$35,429	Percentage of capital costs below
PRB construction	833	CY	$850	$708,581	Based on recent project experience
Monitoring well installation	1	LS	$7,276	$7,276	1 shoreline well on Quendall Property (CMW-7), plus brush clearing
Performance monitoring	1	LS	$50,000	$50,000	Postconstruction performance monitoring
			Direct Installation Cost (Subtotal):	$801,000	
			Sales Tax (10.1% DI):	$81,000	
			Contingency (20% DI):	$176,000	
			Total Direct Installation Cost (DI):	***$1,058,000***	

Professional Services Costs	Quantity	Units	Unit Cost	Extension	Description
Record Environmental Covenant	1	LS	$10,000	$10,000	
Project Management and Construction Oversight	20%	percent	$1,068,000	$213,600	Percentage of DI+Env Covenant costs
Remedial Design	20%	percent	$1,068,000	$213,600	Percentage of DI+Env Covenant costs. EDR, contracting, Completion Report
Contingency	30%	percent	$437,000	$131,100	Percentage of DI+Env Covenant+PM+Remedial Design costs
			Total Professional Services Cost (PS):	***$568,300***	

TOTAL CAPITAL INVESTMENT (TCI) [DI + PS]: $1,626,300

Annual Operations and Monitoring Costs	Quantity	Units	Unit Cost	Extension	Description
Compliance Monitoring					
Annual long term groundwater monitoring (MNA) for years 1-5	5	Event	$9,504	$47,520	20 wells annually
Biennial long term groundwater monitoring (MNA) for years 6-10	3	Event	$9,504	$28,512	20 wells biennially
5-year long term groundwater monitoring (MNA) for years 11-90	16	Event	$3,448	$55,168	7 wells every 5 years
Confirmation groundwater sampling	1	Event	$38,016	$38,016	20 wells quarterly @ 91 years
Well decommissioning	28	ea	$500	$14,000	20 wells @ 91 years
Reporting	24	Event	$10,000	$240,000	Annual for 91 years
Project Management	24	Event	$5,000	$120,000	Annual for years 1-91

TOTAL O&M COST : $543,216

TOTAL ALTERNATIVE COST (Actual Dollars, 76 years): $2,180,000

TOTAL ALTERNATIVE COST (NPV, 76 years): $1,900,000

Table M-4. Detailed Cost Estimate for Alternative 4

DRAFT

Project No. 050004, Barbee Mill Site, Renton, Washington

Remedial Action Description: ISS to extent practicable across shallow plume, including MNA and IC
Cost Estimate Accuracy: Feasibility Level (+50/-30 percent)

Key Assumptions:
Future costs are adjusted to present value using a discount rate of 2.5%

Quantities:				
	36,149	CY	ISS volume	Aspect estimated
	12%		Reagent Mix	
	25%		swell percentage	
	9,037		swell volume	
	1.70	tons/CY	soil density	

Direct Installation Costs	Quantity	Units	Unit Cost	Extension	Description
ISS					
mobilization/demobilization	1	LS	$175,000	$175,000	percentage of capital costs below
ISS - labor and equipment	36,149	CY	$35	$1,265,213	large diameter auger (6-10' dia)
ISS - reagent	4,338	CY	$190	$824,196	12% mix
Swell Earthwork	9,037	CY	$45	$406,676	move and grade outside of ISS treatment area. Load and place, grade, cure-in-place (no compaction)
Monitoring well installation	1	LS	$7,276	$7,276	1 shoreline well on Quendall Property (CMW-7), plus brush clearing
Performance monitoring	1	LS	$50,000	$50,000	Postconstruction performance monitoring
			Direct Installation Cost (Subtotal):	$2,728,000	
			Sales Tax (10.1% DI):	$276,000	
			Contingency (20% DI):	$601,000	
			Total Direct Installation Cost (DI):	***$3,605,000***	

Professional Services Costs	Quantity	Units	Unit Cost	Extension	Description
Record Environmental Covenant	1	LS	$10,000	$10,000	
Project Management and Construction Oversight	15%	percent	$3,615,000	$542,250	Percentage of DI+Env Covenant costs
Remedial Design	15%	percent	$3,615,000	$542,250	Percentage of DI+Env Covenant costs. Treatability testing, EDR, contracting, Completion Report
Contingency	30%	percent	$1,095,000	$328,500	Percentage of DI+Env Covenant+PM+Remedial Design costs
			Total Professional Services Cost (PS):	***$1,423,000***	

TOTAL CAPITAL INVESTMENT (TCI) [DI + PS]: $5,028,000

Annual Operations and Monitoring Costs	Quantity	Units	Unit Cost	Extension	Description
Compliance Monitoring					
Annual long term groundwater monitoring (MNA) for years 1-5	5	Event	$9,504	$47,520	20 wells annually
Biennial long term groundwater monitoring (MNA) for years 6-10	3	Event	$9,504	$28,512	20 wells biennially
5-year long term groundwater monitoring (MNA) for years 11-90	16	Event	$3,448	$55,168	7 wells every 5 years
Confirmation groundwater sampling	1	Event	$38,016	$38,016	20 wells quarterly @ 91 years
Well decommissioning	28	ea	$500	$14,000	20 wells @ 91 years
Reporting	24	Event	$10,000	$240,000	Annual for 91 years
Project Management	24	Event	$5,000	$120,000	Annual for years 1-91

TOTAL O&M COST : $543,216

TOTAL ALTERNATIVE COST (Actual Dollars, 76 years): $5,590,000

TOTAL ALTERNATIVE COST (NPV, 76 years): $5,300,000

Table M-5. Detailed Cost Estimate for Alternative 5

DRAFT

Project No. 050004, Barbee Mill Site, Renton, Washington

Remedial Action Description: ISS to extent practicable across shallow and deep plume, including MNA and IC
Cost Estimate Accuracy: Feasibility Level (+50/-30 percent)

Key Assumptions:
Future costs are adjusted to present value using a discount rate of 2.5%

Quantities:				
	79,151	CY	ISS volume	Aspect estimated
	12%		Reagent Mix	
	25%		swell percentage	
	19,788		swell volume	
	1.70	tons/CY	soil density	

Direct Installation Costs	Quantity	Units	Unit Cost	Extension	Description
ISS					
mobilization/demobilization	1	LS	$175,000	$175,000	percentage of capital costs below
ISS - labor and equipment	79,151	CY	$35	$2,770,300	large diameter auger (6-10' dia)
ISS - reagent	9,498	CY	$190	$1,804,652	12% mix
Swell Earthwork	19,788	CY	$45	$890,453	move and grade outside of ISS treatment area. Load and place, grade, cure-in-place (no compaction)
Monitoring well installation	1	LS	$0	$0	1 shoreline well on Quendall Property (CMW-7), plus brush clearing
Performance monitoring	1	LS	$50,000	$50,000	Postconstruction performance monitoring
Pump and treat system troubleshooting/maintenance	1	LS	$15,000	$15,000	Subcontractor and equipment required to make system operational
			Direct Installation Cost (Subtotal):	$5,705,000	
			Sales Tax (10.1% DI):	$576,000	
			Contingency (20% DI):	$1,256,000	
			Total Direct Installation Cost (DI):	***$7,537,000***	

Professional Services Costs	Quantity	Units	Unit Cost	Extension	Description
Record Environmental Covenant	1	LS	$10,000	$10,000	
Project Management and Construction Oversight	15%	percent	$7,547,000	$1,132,050	Percentage of DI+Env Covenant costs
Remedial Design	15%	percent	$7,547,000	$1,132,050	Percentage of DI+Env Covenant costs. Treatability testing, EDR, contracting, Completion Report
Contingency	30%	percent	$2,274,000	$682,200	Percentage of DI+Env Covenant+PM+Remedial Design costs
			Total Professional Services Cost (PS):	***$2,956,300***	

TOTAL CAPITAL INVESTMENT (TCI) [DI + PS]: $10,493,300

Annual Operations and Monitoring Costs	Quantity	Units	Unit Cost	Extension	Description
Pump and Treat System					
Yearly O&M for years 1-5	5	Event	$35,000	$175,000	Monthly O&M visits for 5 years, self-monitoring reports
System decommissioning	1	Event	$50,000	$50,000	Year 6
Compliance Monitoring					
Annual long term groundwater monitoring (MNA) for years 1-5	5	Event	$9,504	$47,520	20 wells annually
Biennial long term groundwater monitoring (MNA) for years 6-10	3	Event	$9,504	$28,512	20 wells biennially
5-year long term groundwater monitoring (MNA) for years 11-90	16	Event	$3,448	$55,168	7 wells every 5 years
Confirmation groundwater sampling	1	Event	$38,016	$38,016	20 wells quarterly @ 91 years
Well decommissioning	28	ea	$500	$14,000	20 wells @ 91 years
Reporting	24	Event	$10,000	$240,000	Annual for 91 years
Project Management	24	Event	$5,000	$120,000	Annual for years 1-91

TOTAL O&M COST : *$768,216*

TOTAL ALTERNATIVE COST (Actual Dollars, 76 years): $11,380,000

TOTAL ALTERNATIVE COST (NPV, 76 years): $11,050,000