

Remedial Investigation
Former Arkema Mound Site
3009 Taylor Way
Tacoma, Washington

Prepared for

PORT OF TACOMA

Dalton, Olmsted & Fuglevand, Inc. *Environmental Consultants*

September 2015

Dalton, Olmsted & Fuglevand, Inc.

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1.0 INTRODUCTION

This Remedial Investigation (RI) report was prepared to evaluate the nature and extent of residual arsenic and lead concentrations in soil and groundwater after completion of two interim remedial actions. The interim actions included the following and are discussed further below:

- Removal of a woodwaste and slag containment cell (containment cell) at the former Arkema log sort yard facility at 3009 Taylor Way, Tacoma, Washington (Site). The containment cell was removed in 2008 and 2009.
- Removal of soil containing remnant arsenic and physical stabilization of site soils in the period August 2013 to February 2015 (herein termed “2013 IA”).

This report was prepared by Dalton, Olmsted & Fuglevand, Inc. (DOF) on behalf of the Port of Tacoma (Port) in accordance with the Statement of Work (SOW) of Agreed Order No. DE 6129 (Agreed Order) between the State of Washington Department of Ecology (Ecology) and the Port of Tacoma (Port). The Port purchased the former Arkema properties along the Hylebos Waterway known as 2901 Taylor Way and 3009 Taylor Way, Tacoma, Washington in June 2007. The Port assumed responsibility for remediation associated with those properties, including those associated with a woodwaste/slag containment cell at 3009 Taylor Way.

In the following discussion, "*site north*" is assumed to be towards the mouth of the Hylebos Waterway, approximately parallel to the existing shoreline. True north is 41 degrees in a counter-clockwise direction from site north. True north is shown on the report figures.

1.1 Site Description

The Arkema Mound site consists of approximately 15 acres located adjacent to a portion of the Hylebos Waterway shoreline (Figures 1-1 and 1-2) and is currently being used to store and stage semi-truck trailers. The site is bounded by Taylor Way to the west, the Kaiser Ditch to the south, the (former) East-West Ditch to the north and the Hylebos Waterway to the east. The site is relatively flat with elevations ranging between approximately 17 and 20 feet Mean Lower Low Water (MLLW). Existing (2015) site features are illustrated on Figure 1-2. Near surface materials (upper 27 inches) currently consist of an engineered fill (cover) section consisting of the following (top to bottom):

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Site Cover

- 12-inch thick compacted crushed rock layer
- Tensar-triaxial geogrid
- 15-inch thick compacted crushed rock layer
- Tensar-triaxial geogrid
- Woven geotextile fabric
- Compacted subgrade (consisting mostly of imported fill)

The Hylebos shoreline was stabilized during the 2013 IA by an engineered section consisting of the following materials (top to bottom). Typical sections are illustrated on Figure 1-3.

Shoreline Stabilization Section

- Habitat mix (sand and gravel)
- Shoreline protection rock (2-ft. thick minimum)
- Filter rock (0.5-ft. thick minimum)
- Filter fabric (placed over key trench and graded slope)

The site is graded to drain surface storm water to a series of catch basins across the site, connected with buried piping installed mostly within the Cover. Storm water collected by the catch basins is routed through oil-water separators, then directed to a biofiltration swale constructed within the former East-West Ditch alignment, and then, discharged to the Hylebos Waterway through a pipe equipped with a tide gate.

The site was the location of a former log sort yard that used ASARCO slag as ballast material. As discussed below, the yard was remediated in the early 1990s. Part of the remediation included consolidating mixed woodwaste and slag materials in a lined and covered containment cell (Figure 1-4). The cell was removed from the site in 2008/2009.

The log yard included a concrete ramp along the shoreline that extended into the intertidal area of Hylebos waterway where floating log rafts were moved to the upland. The location of the ramp is shown on Figure 1-2 (*“Former Log Ramp”*).

1.2 Description of Interim Actions

1.2.1 Removal of Containment Cell

The woodwaste/slag containment cell was constructed by Arkema (formerly Atochem North America, Incorporated) in 1992 on the south eastern portion of the 3009 Taylor Way property (Figure 1-4). The 1992 remedial work was completed in accordance with

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Consent Decree No. 92-2-11351-7¹ (Consent Decree). The purpose of the 1992 remedial work was to isolate and contain woodwaste, slag and soil containing arsenic with a multi-layer impermeable cap system. A finding of fact in the Consent Decree states that shallow groundwater is not a current or potential future source of drinking water due to its natural salinity. The Consent Decree also required institutional controls to protect and maintain the integrity of the containment cell and restrict public access.

The completed containment cell extended approximately 25 feet above grade, covered approximately 4 acres, and contained approximately 70,000 cubic yards (cy) of woodwaste mixed with soil and slag material from the former log yard operation. Construction of the containment cell was documented in the Final Construction Quality Assurance / Quality Control Report (ENSR, 1993a).

The 1992 Final Cleanup Action Plan, Exhibit A to the Consent Decree, set forth the site cleanup objectives for the removal action, as presented below in Table 1-1. These objectives consisted of numerical cleanup levels (CULs) to be achieved in soil and groundwater and are presented herein to provide context for the 1992 remedial work.

Table 1-1. 1992 Cleanup Objectives

Parameter	Groundwater (ug/l)	Soil (mg/kg)
Arsenic	40	200
Copper	10	
Lead	10	1,000
Zinc	100	
Phenol	5,800	

In October 2009, the Port entered into Agreed Order No.DE 6129 with Ecology. The Agreed Order required the Port to remove the containment cell, to prepare a post-removal Remedial Investigation (RI) and Feasibility Study (FS), and to prepare a draft Cleanup Action Plan (DCAP) for the site.

In December 2008, the Port initiated removal of the containment cell with Ecology's December 1, 2008 approval of an Interim Action Work Plan (IAWP). The removal action continued through the winter and into the spring of 2009. The final load of woodwaste/slag and containment cell liner and leachate collection system components was hauled to the LRI landfill on March 13, 2009. A total of 95,121 tons of material was disposed in the landfill in 2,998 truckloads (truck and trailer). The removal action was completed on June 8, 2009, in accordance with the Ecology approved construction plans and specifications, with placement of a final layer of crushed rock surfacing. The

¹Consent Decree entered in the Superior Court of the State of Washington for Pierce County, State of Washington, Department of Ecology, plaintiff, v. ASARCO Incorporated, Dunlap Towing, Company, Echo Lumber Company, and Elf Atochem North America, incorporated, defendants, dated December 11, 1992.

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containment cell removal is documented in the August 2, 2009 “*As-Built*” Report (DOF 2009b).

1.2.2 “2013” Interim Action

Following removal of the containment cell, a draft RI report was prepared and submitted to Ecology in May 2011 (DOF 2011). Testing indicated that the direct-contact arsenic industrial soil screening level - SL (88 mg/kg) was exceeded and that approximately 5,000 cy of soil with remnant arsenic remained on the site at three isolated locations. Groundwater testing also indicated that shallow arsenic concentrations were above the SL (5 ug/l dissolved arsenic) beneath localized portions of the site. Based on these data, the Port decided, with Ecology concurrence, to delay completion of the RI and conduct a second interim action. The scope of the second interim action (2013 IA) was set forth in the 2013 IAWP Addendum (DOF 2013) as follows:

1. Remove soil from defined zones that contained arsenic concentrations greater than two times (176 mg/kg), the direct-contact industrial land use CUL of 88 mg/kg, and from defined shoreline areas that contained soil with concentrations greater than 57 mg/kg, the Commencement Bay Sediment Quality Objective (SQO).
2. Stabilize the Hylebos shoreline and the East-West Ditch bank.
3. Place a gravel cover over the site to protect against future disturbance of residual soil containing elevated arsenic by reasonably anticipated port industrial activities.
4. Install buried utilities to avoid disturbance of the protective gravel cover when the site is redeveloped for future industrial use.
5. Decommission existing monitoring wells.

The 2013 IA was completed in the period August 2013 to February 2015 and included the following components:

- Excavation and removal of approximately 24, 560 tons of interior and bank soils from three areas designated as the “*Northeast*”ⁱⁱ, “*P10*” and “*SB7*” Areas (Figure 1-5). The disposal volume also included soil and sediment removed from the former E-W ditch alignment as part of construction of the storm water biofiltration swale. Excavated materials were disposed at the LRI landfill.
- Placement/compaction of sand and gravel imported fill to prepare the subgrade for installation of subsurface utilities and an engineered cover. The subgrade was placed to a nominal elevation of approximately 17 to 17.25 feet MLLW.

ⁱⁱ In the 2013 IA report the Northeast Area is referred to as the “*Northwest Area*”. As noted above, this report uses a “*Site North*” as parallel to the site shoreline to be consistent with other Port owned properties.

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- Installation of an engineered cover (nominal thickness 27-inches), drainage system (catch basins and piping) and other buried utilities (power, water and sanitary sewer lines). The utilities were either installed within the engineered cover or within trenches excavated within subgrade materials. Trench bedding and backfill materials consisted of uncontaminated imported fill.
- Construction of a biofiltration swale in the former E-W ditch with associated oil water separators and storm water outfall.
- Constructing a stabilized Hylebos shoreline.

The 2013 IA is documented in the As-Built Report (DOF 2015). Wells decommissioned during the second interim action are listed below in Table 1-2.

Table 1-2 – Wells Decommissioned During 2013IA

MW-1	MW-D	MW-K	147-2
MW-3	MW-E	MW-L	MW-AK1
MW-4	MW-F	MW-M	MW-AK2
MW-A	MW-G	MW-N	Unknown
MW-A2	MW-G2	RRI-B-117	
MW-B	MW-H	RRI-B-146S	
MW-C	MW-J	RRI-B0147S	

1.3 Organization of Report

This report is organized as follows:

- Section 1 – Introduction
- Section 2 - Summary
- Section 3 – Hydrogeology
- Section 4 – Historical Soil, Water, and Sediment Data
- Section 5 – Soil Analytical Data – 2009 to 2011
- Section 6 – Groundwater Analytical Data – 2008 to 2011
- Section 7 – Contaminants of Potential Concern (COPCs)
- Section 8 – Recommendations for Groundwater Monitoring
- Section 9 – References

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2.0 SUMMARY

The site was formerly used as a log sort yard. The log yard used ASARCO slag containing arsenic, lead and other metals that were introduced to soil and leached into groundwater. Between the early 1990s and the present, a number of interim actions were conducted under agreements with and, oversight of, the Washington State Department of Ecology (Ecology). These actions included the following:

- Consolidation and containment of woodwaste and slag in a contaminant cell (Consent Decree No. 92-2-11351-7). This action was completed in the early 1990s. Arkema maintained the containment cell until the Port purchased the property in 2007 and assumed environmental liability for the site.
- The containment cell was removed by the Port in 2008 and 2009 (Agreed Order DE6129). Woodwaste, slag, containment liner etc. were disposed off-site.
- Removal of remnant arsenic in soil, installation of an engineered cover (including utilities), stabilization of the Hylebos Waterway shoreline and construction of a biofiltration swale to treat storm water were completed between August 2013 and February 2015. This interim action (2013 IA) was completed as an amendment to Agreed Order DE6129.
- The interim actions completed by the Port reduced the overall metal concentrations (including arsenic) in site soils to concentrations below industrial direct contact SLs that are based on conservative cleanup levels (CULs) developed using MTCA default exposure assumptions.
- The interim actions also eliminated all but one possible migration pathway; the migration of arsenic in groundwater to surface water. Concentrations of metals associated with ASARCO slag are below surface water SLs in most well samples and in seep sample collected adjacent to the waterway. Pre-interim action dissolved arsenic concentrations were above SLs in two localized upland areas including the northeast corner (referred to as the “*Northwest Area*” in the as-built report) and along the southwest site boundary near the head of the Kaiser Ditch. Data from a seep sampler in the Northeast Area where the highest arsenic soil concentrations were detected show that arsenic in groundwater discharging to the Hylebos Waterway were below the SL, even before the 2013 IA was completed.
- Completion of the 2013 IA reduced the overall soil arsenic concentrations by two-thirds and substantially more in the areas where soil was removed. Removal of the remnant arsenic should reduce the potential for arsenic leaching and migration above SLs to surface water.

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- Post interim action groundwater monitoring for arsenic is recommended to assess dissolved arsenic groundwater concentrations with respect to the SL and groundwater discharge to surface water.

3.0 HYDROGEOLOGY

The project site is located on a portion of the Blair Peninsula adjacent to the Hylebos Waterway (Figure 1-1). The peninsula was generally formed by placing dredged material generated when the waterways (Blair and Hylebos) were created. The dredged materials (fill) were placed over naturally occurring tidal flat deposits.

3.1 Geology and Aquifer Units

The logs of test pits, probes and monitoring wells were used to assess the geologic conditions beneath the site. Exploration locations are shown on Figure 3-1 and available geologic logs and well construction diagrams are presented in Appendix A. The general geologic sequence (prior to completion of the 2013 IA) beneath the site is typical for the Port of Tacoma tideflats area and is illustrated by the geologic sections shown on Figure 3-2. Cross section trends are shown on Figure 3-1. The geologic units are summarized below:

- **Fill Unit** - The fill unit consists of dredged and other fills placed on the site. The unit ranged in thickness from approximately 6 to 12 feet and generally consisted of silty sand and fine to medium sand with occasional sandy gravel, wood chips and crushed rock (covering the surface). As part of the 2013 IA, the indicated surface materials and other soil were removed and imported fill was placed and compacted on the site. Imported compacted fill thicknesses range between 2.25 and over 9 feet as shown on Figure 3-3. As noted above, the upper, nominal 27 inches of fill consists of an engineered cover.
- **Tidal Marsh Deposits** - Finer grained tidal marsh deposits underlie the fill unit. This unit ranges in thickness from approximately 4.5 feet to 9.5 feet in borings that penetrated its full thickness. The materials encountered generally consisted of gray to gray-black silt, organic silt and clayey silt. Marsh grass and fibrous peat are present near the top of the unit. In places, root casts were observed.
- **Intermediate Unit** - Silty fine sand to fine to medium sand materials underlie the tidal marsh deposits. The bottom of the unit was not encountered in any of the borings (except for MW-A2) where 9 feet of fine to medium sand was present below the tidal marsh deposits and above a gray to brown silt stratum.

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Aquifer Units. The geologic units comprise three hydrostratigraphic units consisting of the following:

- **Shallow (Upper) Aquifer** - Water saturated portions of the fill unit.
- **Upper Aquitard** - Finer grained tidal marsh deposits
- **Intermediate Aquifer** - Sandy materials that lie directly beneath the tidal marsh deposits.

The thickness of the Upper Aquifer varies with season. Water level data collected between June 2009 and February 2011 (attached Table 6-2) indicate an average “wet” season thickness of approximately 6.3 feet and an average “dry” season thickness of 4.5 feet. Future Upper Aquifer thicknesses will likely be thinner than those indicated above because of placement of the engineered cover and drainage system that will significantly reduce precipitation recharge. Numerical modeling on the main Arkema site located immediately north of the mound site indicates that most groundwater recharge occurs from local precipitation (DOF 2013).

3.2 Surface Water Ditches and Drainage

- **Kaiser Ditch** - The Kaiser Ditch is located along the south side of the site. The ditch was originally constructed to direct cooling and storm water flows from the former Kaiser Aluminum plant to the Hylebos Waterway. Stormwater flow from Taylor Way still enters the ditch. The ditch has a bottom elevation of less than 5 feet MLLW and is tidally influenced for the full length of the ditch. Site drainage to the Kaiser Ditch only occurs along the slopes of the ditch, as the bulk of the site drainage is collected by a constructed storm water drainage system that discharges to a biofiltration swale and the Hylebos Waterway (discussed below).
- **East-West Ditch** - The East-West Ditch was located along the north side of the mound site. A storm water biofiltration swale (Figure 1-2) was constructed in the former ditch alignment to handle storm water that flows into catch basins installed in the engineered cover. Discharge from the swale is to the Hylebos Waterway through a pipe equipped with a tide gate. To construct the swale, approximately 1.5 to 4 feet of sediment was removed from the ditch, along with bank soils along the Arkema Mound side of the ditch. The excavated sediment/bank soil was disposed off-site at the LRI landfill. The finished swale consists of a vegetated top soil layer a minimum of 1.0 foot thick.

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3.3 Horizontal Groundwater Flow Directions – Pre-2013 IA

Water level measurements were made on six occasions between June 15, 2009 and February 1, 2011 at various tidal cycles and seasons as summarized below in Table 3-1. Most of the monitor wells installed on the site were screened in the Upper Aquifer (listed in attached Table 6-2). Five wells were screened in the Intermediate Aquifer (listed in attached Table 6-3). Measurement and elevation data are summarized in attached Tables 6-2 (Upper Aquifer wells) and 6-3 (Intermediate Aquifer wells).

Table 3-1 - Water Level Monitoring Rounds

Date	Tidal Level (ft-MLLW)	Tidal Direction	Figure No.
Upper Aquifer			
June 15, 2009	6.8	Rising	3-4a
September 24, 2009	7.9	Falling	3-4b
December 8, 2009	5.9	Falling	3-4c
March 22, 2010	0.0	Falling	3-4d
June 4, 2010	3.3	Falling	3-4e
February 1, 2011	10.7	Start Falling	3-4f
Intermediate Aquifer			
June 4, 2010	3.3	Falling	3-4g
February 1, 2011	10.7	Start Falling	3-4h

The water level elevations for each aquifer were contoured to estimate groundwater flow directions. Estimated flow directions in the Upper Aquifer are illustrated on Figures 3-4a to 3-4f while those for the Intermediate Aquifer are illustrated on Figures 3-4g and 3-4h.

In general, Upper Aquifer flow directions were towards the water bodies that are/were present on three sides of the site (East-West Ditch, Kaiser Ditch and Hylebos Waterway). During the wetter seasons of the year, flow appeared to be primarily towards the Hylebos Waterway and Kaiser Ditch (Figures 3-4c, 3-4d, 3-4e and 3-4f). During drier seasons of the year, it appeared that flow still continued towards the Hylebos Waterway and Kaiser Ditch with increased flow to the East-West Ditch (Figures 3-4a and 3-4b).

Past water level measurements on the Arkema manufacturing site indicate that tidal stage affects flow directions in the Intermediate Aquifer. On the former mound site, at lower tidal stages, flow is from the Arkema manufacturing site to the former Arkema mound site as illustrated on Figure 3-4g. However, at higher tidal stages, the flow is reversed as shown on Figure 3-4h. While flow reversals occur at higher tides, the net flow of groundwater is ultimately to the waterway.

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3.4 Vertical Gradients

Upper and Intermediate Aquifer water level elevations were compared to assess the presence of vertical gradients. The most complete set of measurements are available for the June 4, 2010 and February 1, 2011 monitoring rounds. The gradients were estimated for well pairs by subtracting the elevations for Intermediate Aquifer wells from those of the Upper Aquifer wells and dividing by the vertical distance between the mid-points of the well screens. The results are summarized below in Table 3-2.

Table 3-2 - Summary of Vertical Gradients

Well Pair	Date	Gradient	Direction	Tide (ft-MLLW)
MW-RR1-B-147S/MW-147(2)	6-4-10	0.33	Down	3.3
MW-RR1-B-147S/MW-147(2)	2-1-11	0.30	Down	10.7
MWG/MWG2	6-4-10	0.33	Down	3.3
MWG/MWG2	2-1-11	0.30	Down	10.7
MWA/MWA2	6-4-10	0.48	Down	3.3
MWA/MWA2	2-1-11	0.28	Down	10.7
MWF/MWF2	6-4-10	0.44	Down	3.3
MWF/MWF2	2-1-11	0.11	Down	10.7

Comparison of the water level elevations for the aquifer units indicates the presence of downward vertical gradients between the Upper and Intermediate Aquifers. Downward vertical gradients between these two units are typical for the Tacoma tide flats, and consistent with groundwater recharge driven by infiltration of precipitation.

4.0 HISTORICAL SOIL, WATER, AND SEDIMENT DATA

Site analytical data are discussed as historical data related to construction and monitoring of the containment cell (1992 to 2009). Historical data include the following:

- **Consent Decree:** Data summarized in the 1992 Consent Decree authorizing the construction of the containment cell.
- **Confirmation Soil Sampling:** Soil data collected following completion of the initial site cleanup and construction of the containment cell in 1992.
- **Groundwater Monitoring.** Monitoring results from on-site wells following completion of the containment cell in 1992 and sampling in 2008 prior to removal of the containment cell.
- **Surface Water Monitoring.** Monitoring of surface water discharging from the site following completion of the containment cell in 1992.
- **Confirmation Sediment Sampling.** Sediment data collected following the 2003-2005 sediment remediation of the Head of Hylebos Waterway along the site shoreline

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4.1 Consent Decree Data (pre-cell construction)

The Consent Decree summarizes data from a series of field investigations conducted at the site between 1987 and 1990. Field work consisted of surface and subsurface soil sampling, surface water and groundwater sampling, and sampling of woodwaste and slag. The findings presented in the Consent Decree are briefly summarized below.

Woodwaste. Extensive sampling and metals analysis was performed on the estimated (at the time of the Consent Decree) 40,000 cubic yards of woodwaste on the site (ENSR 1990). The average values of arsenic in five woodwaste piles were presented in the Consent Decree at concentrations ranging from 60 to 235 mg/kg, with four of the five piles having average arsenic concentrations above 100 mg/kg (Pile 1 at 235 mg/kg, Pile 2 at 185 mg/kg, Pile 3 at 210 mg/kg, Pile 4 at 60 mg/kg, and Pile 5 at 173 mg/kg)ⁱⁱⁱ. EP Toxicity testing for arsenic for each of the piles was well below the dangerous waste (DW) designation limit of 5 mg/l arsenic (Pile 1 at 0.44 mg/l, Pile 2 at 0.62 mg/l, Pile 3 at 0.65 mg/l, Pile 4 at 0.34 mg/l, and Pile 5 at 0.09 mg/l).

Groundwater Data: Site hydrogeology was characterized by a shallow unconfined aquifer lying above a clayey silt aquitard which limited vertical migration. The shallow unconfined aquifer was not considered a source of drinking water because of its natural salinity. Groundwater was found to migrate across the site to the Hylebos Waterway. At the time of the Consent Decree prior to the containment cell removal action, shallow groundwater collected from six wells indicated dissolved arsenic in one well at 190 ug/l. Dissolved zinc was found in the wells at concentrations ranging below the detection limit to 230 ug/l. Other dissolved metals of interest were not detected in the wells.

Soil Data. Soil in the immediate vicinity of the concentrated slag deposits (based on discrete soil samples) had elevated metals concentrations of 16 to 1,600 mg/kg arsenic, 26 to 1,500 mg/kg copper, 2.5 to 980 mg/kg lead, and 56 to 1,900 mg/kg zinc. Soil leaching tests indicated that the metals contained in on-site soil were not easily leached from the soil matrix.

4.2 Historical Confirmation Soil Sampling (Cell Construction)

Three soil sampling and analysis programs were completed at the time of the containment cell construction to document confirmation with soil CULs. Samples were collected: 1) from the subgrade of the containment cell prior to construction of the bottom liner; 2) on a 125-foot grid pattern (top six inches) through-out the site following excavation of the wood waste and slag; and 3) on a 25-foot grid pattern from the sidewalls and bottom of

ⁱⁱⁱ It appears that there is a typographical error in the Consent Decree for the average arsenic concentration in Pile 3. The Consent Decree reports a value of 210 mg/kg, while the testing results from Table 4-3 of ENSR 1990 reports 445 mg/kg. The 210 value is in the column adjacent to the 445 value in Table 4-3.

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slag excavation areas in the northeastern corner of the site. The results of the sampling are presented on Figure 4-1 and summarized below. Since the 1992 data were collected the site was used and the surface significantly disturbed. Therefore, the 1992 data were not considered representative of the conditions prior to the cell removal in 2008/2009.

Containment Cell Subgrade. Soil samples from the subgrade of the containment cell had arsenic and lead concentrations less than 20 mg/kg.

Surface Samples 125- foot Grid. Two of the 125-ft grid samples (5% of total samples) exceeded the 200 mg/kg Site Cleanup Objective for arsenic (C7 at 227 mg/kg and G1 at 208 mg/kg). The distribution of the results by arsenic concentration range is presented below in Table 4-1.

Table 4-1. Arsenic in Surface Soil (1992) - Area-Wide 125-foot Grid Sampling

Arsenic Concentration Range, mg/kg	Number of Samples	Percent of Samples
20 or less	18	41%
20-50	4	9%
50-100	18	41%
100-150	2	4.5%
150-200	0	0%
>200	2	4.5%
TOTAL	43	100%

Surface Samples 25-foot Grid. The 25-ft. grid samples were located in the northeast corner of the site and are shown on Figure 4-1. Five of those samples (3% of total samples) exceeded the site cleanup objective for arsenic (G.75/7.5 at 403 mg/kg; G.0/6.75 at 230 mg/kg; F0/6-1 at 288 mg/kg; F.25/6.0 at 210 mg/kg; and F.25/6.75 at 248 mg/kg). The distribution of the results by arsenic concentration range is presented below in Table 4-2.

Table 4-2. Arsenic in Surface Soil (1992) 25-foot Grid Sampling

Arsenic Concentration Range, mg/kg	Number of Samples	Percent of Samples
20 or less	133	68%
20-50	29	14%
50-100	17	8%
100-150	9	5%
150-200	4	2%
>200	5	3%
TOTAL	197	100%

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4.3 Historical Groundwater Monitoring

4.3.1 Groundwater Analytical Data – 1992-2003

The Confirmation and Performance Monitoring Plan (ENSR, 1992a) included installation of four monitoring wells around the perimeter of the containment cell, designated MW-1, MW-2, MW-3 and MW-4 as shown on Figures 3-1 and 4-2. The reported results of the groundwater monitoring for arsenic, including duplicate samples, are presented below in Table 4-3.

Table 4-3. Arsenic Groundwater Sampling Results, ug/l (1992-2003)

Date	Monitoring Wells				Duplicate Sample	
	MW-1	MW-2	MW-3	MW-4	Well	Arsenic
11/2/92	<100	<100	<100	<100	MW-4	<100
12/3/92	20	<2	3	<2	MW-1	24
1/13/93	<100	<100	<100	<100	MW-4	<100
4/12/93	<100	<100	<100	<100	MW-1	<100
6/30/93	<100	<100	<100	<100	MW-1	<100
10/4/93	<100	<100	<100	<100	MW-3	<100
1/28/94	34	10	16	12	none	n.a.
5/17/94	<100	<100	<100	<100	MW-2	<100
9/22/94	29	14	<10	<10	MW-1	29
1/20/95	25	<10	<10	<10	MW-1	22
4/14/95	<0.10	<10	<10	<10	MW-1	<10
7/6/95	28	<10	<10	<10	MW-1	28
11/14/95	39	7	<5	<5	MW-2	7
2/16/96	42	12	6	6	MW-2	11
5/16/96	32	15	14	37	MW-2	15
8/30/96	87	21	14	23	MW-2	<20
2/28/97	30	<20	<20	30	MW-1	<20
6/13/97	61	13	19	7.7	MW-1	52
9/16/97	61	20	6.3	17	MW-1	71
5/20/98	71	16	12	18	MW-1	79
10/13/98	34	8.1	<3	6.2	MW-1	40
5/16/00	34	9.3	<3	18	MW-1	41
9/15/00	54	7.4 ++	6.1 ++	43	MW-1	62
12/19/00	20	7.1	5.3	30	MW-1	27
3/8/01	27	18	5.1	4.2	MW-1	26
10/4/01	<3	3.5	<3	4.2	MW-1	<3
4/26/02	48	9.1	11	19	MW-1	43
9/24/02	83	25	10	23	MW-2	23
12/2/02	20	9	11	15	MW-2	7
3/6/03	68	24	7.7	6.6	MW-1	84

++ The results reported by Boateng do not agree with the analytical laboratory reports. The analytical lab reported results are summarized in this table.

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The upgradient well was designated MW-1, and the downgradient wells were designated MW-2, MW-3, and MW-4. Monitoring well MW-2 was abandoned in 2008 to make way for the removal of the containment cell. Except for one sampling of well MW-4 (9/15/2000, at 43 ug/l arsenic) all of the results from downgradient wells (MW-2, MW-3, and MW-4) were below the 1992 arsenic site cleanup objective of 40 ug/l.

Arsenic concentrations in upgradient well (MW-1) tended to vary between 20 ug/l and 90 ug/l between May 1996 and March 2003. During this period, the estimated UCL95%^{iv} concentration is estimated to be 50 ug/l based on a normal distribution. About half of the sampling results at MW-1 were above 40 ug/l and half below 40 ug/l.

The pre-construction baseline groundwater levels (ENSR, 1993b) indicated a depth to groundwater from the top of well casing (TOC) in the range of five to eight feet. The associated water level elevations ranged from 14.7 feet MLLW at upgradient well MW-1, located close to Taylor Way, to 10.8 feet MLLW at the far end of the containment cell closest to Hylebos Waterway (MW-3). The subgrade elevations at the Taylor Way end of the containment cell at the time of construction in 1992 were on the order of 14 to 15 feet MLLW, and then rising to 16 to 17 feet at the Hylebos Waterway end of the containment cell. This information indicates that shallow groundwater was near but below the base of the containment cell (both at elevation 14 to 15 feet MLLW), and several feet below the base of the containment cell near the Hylebos Waterway end of the containment cell (groundwater at elevation 10.7 feet and cell subgrade at 16 to 17 feet MLLW).

4.3.2 Groundwater Analytical Data - 2008

Groundwater samples were collected from the four ENSR wells (MW-1 through MW-4) in August 2008 prior to initiating removal of the containment cell. The results are summarized below in Table 4-4. Monitoring well MW-1 continued to show arsenic concentrations above 40 ug/l at 190 ug/l. The concentration in the downgradient wells continued to be below 40 ug/l, ranging from 4 to 9 ug/l.

Table 4-4. Arsenic Groundwater Sampling Results, ug/l (2008)

Date	ENSR Monitoring Wells				Landau Wells		
	MW-1	MW-2	MW-3	MW-4	RRI-117	RRI-146	RRI-147
8/28/2008	190	9	4	6	n.m.	n.m.	n.m.
12/15/2008	n.m.	n.m.	n.m.	n.m.	28	8	16

n.m. = not measured

^{iv} Upper 95% Confidence Limit on the Mean

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Three additional shallow monitoring wells were installed on site by Landau as part of engineering characterization of the Blair-Hylebos peninsula, as shown on Figure 4-2. Those wells were sampled on December 15, 2008, with the results presented in Table 4.4 (above). All three wells had arsenic concentrations in groundwater below 40 ug/l (8 to 28 ug/l).

Following removal of the containment cell in 2009, the subgrade elevations were measured and found to be as much as 1.5 to 2.8 feet below the 1992 as-built elevations, likely caused by subgrade settlement under the weight of the material in the containment cell. The lowest observed elevation of the bottom liner was on the order of 12 feet MLLW, located in the vicinity of the center of the containment cell. During removal of the liner, a few inches of ponded water was observed in the lowest portions of the containment cell subgrade, indicating that shallow groundwater likely extended above the deeper portions of the bottom liner during the wetter portions of the year.

4.4 Historical Surface Water Monitoring

Surface water monitoring was completed at a single discharge point located near the existing log ramp (Figure 1-2) along the Hylebos shoreline. The results of surface water sampling for arsenic are summarized below in Table 4-5. Surface water cleanup objectives were not set forth in the Final Cleanup Action Plan.

Table 4-5. Arsenic in Surface Water (1993-2000)

Sampling Date	Arsenic, ug/l Primary Sample	Arsenic, ug/l Duplicate Sample
December 9, 1993	16	16
November 10, 1995	17	17
March 19, 1997	22	22
November 3, 1998	<3	<3
December 27, 2000	54	54

4.5 Hylebos Waterway Sediment Data

The shoreline along 3009 Taylor Way was remediated in the period 2003 to 2005 as part of the Head of Hylebos Superfund sediment remedial action, as detailed in the Remedial Action Construction Report, Part 1, Head of Hylebos Problem Area (DOF 2006). Sediment cleanup was based on the site specific Commencement Bay Sediment Quality Objectives (SQOs) developed as part of the Superfund cleanup to be protective of possible aquatic life exposure pathways. In the CB/NT baseline risk assessment, a human health arsenic sediment cleanup level was not proposed because arsenic posed lower risks compared to PCBs and because arsenic concentrations in CB/NT fish were similar to concentrations in fish from the referenced area (EPA 1989). SQOs were developed to be protective of aquatic life living in sediment. The SQOs were developed using an Apparent Effects Threshold (AET) approach; that is extensive testing was

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conducted to develop site specific AETs on which to base the SQOs and sediment cleanup. If an SQO were exceeded an adverse biological effect is predicted. However, if chemical concentrations were below AETs, then no adverse effects are predicted. Three surface sediment samples (10 cm) were collected following remediation around the log haul-out ramp located along the site shoreline (samples IDH1, IDH2, and IDH3). All three samples had non-detected concentrations of arsenic (detection limit of 6 to 9 mg/kg arsenic).

Three additional surface sediment samples (10 cm) were collected following dredging along the shoreline of the site on roughly 200 ft. centers with the following results: SS-223 (10 mg/kg arsenic), SS-225 (10 mg/kg arsenic), SS-227 (19 mg/kg arsenic). Based on the post-remedial confirmation sediment sampling, sediments adjacent to the Arkema Mound site do not exceed the Commencement Bay SQOs for arsenic (57 mg/kg) and no adverse effects to aquatic life are predicted via exposure to sediment and sediment porewater.

5.0 SOIL ANALYTICAL DATA – 2009 TO 2011

Post-containment cell soil data were obtained from confirmation sampling after the containment cell was removed in 2009 and from additional soil sampling completed in the period 2009 to 2011 in accordance with sampling and analysis plans approved by Ecology (DOF 2009a; 2010a; 2010b; 2011b). These plans were prepared and implemented to meet the requirements of the current AOC between the Port and Ecology. Soil analytical data are presented in attached Table 5-1. Sample locations are shown on Figures 5-1, 5-2 and 5-3a to 5-3e. Table 5-1 includes the results of 283 soil sample analyses for arsenic and 107 analyses for lead. The samples include surface (including bank samples) and subsurface samples collected above the underlying aquitard from depths generally less than fifteen feet below ground surface.

5.1 Soil Screening Levels (SLs)

For screening purposes to identify areas of concern on the mound site, the 1992 soil screening levels (SLs) were updated to those listed below in Table 5.2. The SLs were based on the MTCA CULs for industrial sites (WAC 173-340-745) and Commencement Bay Sediment Quality Objectives (SQOs). The point of compliance for the direct contact pathway is 0 to 15 feet below ground surface consistent with WAC 173-340-745(7).

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Table 5-2 – Updated Soil Screening Levels

Soil Constituent	Screening Level (mg/kg)	Exposure Pathway	Basis
Arsenic	88	Direct Contact	Method C Industrial Site
Lead	1000		Method A Industrial Site
Arsenic	57	Soil Erosion Along Shoreline	SQO
Lead	450		SQO

Note: SQO – Commencement Bay Sediment Quality Objective

5.2 Post Cell Removal Confirmation Surface Soil Analytical Results

Soil samples were initially collected in 2009 from the top four inches of sand subgrade material that was located directly beneath the liner of the containment cell, after removal of the containment cell material and liner. The sample locations are shown on Figure 5-1 and the arsenic and lead results are presented in Table 5-1 (attached) and in Table 5.3 below. All of the results were well below SLs.

Table 5.3. Arsenic and Lead in Sand Subgrade Soil (2009) Following Removal of Containment Cell Liner

Sample ID	Arsenic mg/kg	Lead mg/kg	Notes
AT-SS-FD-B1	1.9	1.9	Southeast corner of cell
AT-SS-FD-B3_B1	19.5	13.5	Stained sand, southwest end of cell
AT-SS-FD-B3	3.6	3.7	Stained sand, southwest end of cell
AT-SS-FD-B5_B3	9.0	2.4	Stained sand, southwest end of cell
AT-SS-FD-D1	5	2	East border of cell
AT-SS-FD-D1(H)	0.9	1.6	At hole in liner, east border of cell
AT-SS-FD-D3 (ALT)	6	2	Center of cell
AT-SS-FD-F1	1.7	2.0	Northeast corner of cell
AT-SS-FD-F3	2.0	3.0	Northwest corner of cell
AT-SS-FD-F3_D3	48	18	Discolored sand, northwest corner

The sample with the highest arsenic concentration (sample AT-SS-FD-F3_D3) had a concentration of 48 mg/kg. The sample was located in an area of discolored subgrade sand. Upon inspection it was observed that the sand subgrade at the location was very thin and appeared to be mixed with underlying soil. The presence of the underlying soil in the sand subgrade was the source of the discoloration.

Staining of the sand subgrade was observed as the liner was pulled from the west end of the containment cell in early March 2009. The stained area was mapped and is shown on Figure 5-1. The discoloring did not appear to be caused by the presence of underlying soil, but appeared to be an inherent characteristic of the sand. Three soil samples were collected from the area of stained sand and tested for the presence of arsenic at locations

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shown on Figure 5-1. All three results were well below the arsenic SL (3.6, 9.0, and 19.5 mg/kg arsenic).

Sixteen additional confirmation surface soil samples were collected during early June 2009 that were analyzed for arsenic and lead to document the as-built condition of the ground surface following final grading after containment cell removal. The results of the testing program are presented in attached Table 5-1 and in Table 5.4 below. Sample locations are shown Figure 5-2. Twelve of the sixteen samples had arsenic concentrations in the range of 2 to 3 mg/kg, and were all collected from imported granular fill. The four samples closest to the Hylebos Waterway were collected in exposed soil that remained before the import of granular fill, and had arsenic concentrations in the range of 7 to 13 mg/kg.

Table 5-4 Finished Grade (June 2009) Analytical Testing Results

Sample ID	Lab Results (mg/kg)		Sample Taken
	Arsenic	Lead	Date
AT-SS-FD-B1	2.8	3	6/8/2009
AT-SS-FD-B3	2.6	3	6/8/2009
AT-SS-FD-B5	2.7	3	6/8/2009
AT-SS-FD-B6	2.7	3	6/8/2009
AT-SS-FD-D1	2.6	2	6/8/2009
AT-SS-FD-D3	2.6	2.1	6/8/2009
AT-SS-FD-D5	2.6	2	6/8/2009
AT-SS-FD-D6	2.5	3	6/8/2009
AT-SS-FD-F1	2.5	3.3	6/5/2009
AT-SS-FD-F3	2.5	2	6/8/2009
AT-SS-FD-F5	2.9	3	6/8/2009
AT-SS-FD-F6	2.9	3	6/8/2009
AT-SS-FD-G1	8.5	9	6/5/2009
AT-SS-FD-G3	12.0	8	6/5/2009
AT-SS-FD-G5	13.1	10	6/4/2009
AT-SS-FD-G6	7.4	6	6/4/2009

5.3 Other Soil Analytical Results

Other soil analytical data were collected to further characterize the site soil conditions and to design the 2013 IA. These data are also summarized in attached Table 5.1. The complete data set includes the results for 161 subsurface samples and 96 shoreline bank samples in addition to the sample results discussed above. The subsurface samples were collected from push-probes, monitoring well borings and test pits. Shoreline bank samples were collected using hand equipment (i.e. stainless steel spoons). Samples

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collected between June 2009 and January 2011 were used to characterize the site conditions and identify areas exceeding SLs.

Maximum detected concentrations prior to June 2011 used to identify areas exceeding SLs are summarized below in Table 5-5.

Table 5-5 – Highest Detected Concentrations – Before June 2011

Constituent	Interior Soil (mg/kg)	Interior Soil SL (mg/kg)	Bank Soil (mg/kg)	Bank Soil SL (mg/kg)
Arsenic	311	88	278	57
Lead	320	1000	na	450

Note: na – Not analyzed

Comparison of the maximum soil concentrations with SLs indicated that concentrations of arsenic were above SLs in both interior site soil and in shoreline bank soil. Maximum concentrations of lead were below SLs.

Three areas were identified where the arsenic soil SL was exceeded including the following: Northeast Area, P10 Area and SB7 Area. These areas are shown on Figure 5-3a, along with the highest soil arsenic concentration detected at each location as of May 2011.

Additional sampling was completed in each of these areas in June and July 2011 for design purposes and were refined in the Ecology approved Revised Interim Action Work Plan Addendum – 90% Design (DOF 2013a). Sample locations are shown on Figure 5-3b (Northeast Area) and Figures 5-3c to 5-3e (P10 and SB7 Areas). The updated highest detected soil concentrations are summarized below by area of concern in Table 5-6.

Table 5-6 – Highest Detected Concentrations – All Data (Pre-2013 IA)

Area	Interior Soil		Bank Soil	
	Arsenic (mg/kg)	SL (mg/kg)	Arsenic (mg/kg)	SL (mg/kg)
Northeast Area	383	88	1,260	57
P10 Area	311		not applicable	
SB7 Area	44.7 (a)		122	

Note: (a) – Top bank

5.4 Pre-2013 IA - Updated Soil-Contact SL and SQO Comparisons

Updated possible direct-contact exposure concentrations were estimated incorporating the additional data collected in June and July 2011 (Table 5-1). Procedures outlined in the MTCA [WAC 173-340-740(7)] were used including calculation of the upper 95%

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confidence limit on the mean concentration (UCL95%^v) and comparison of the results and data with the three MTCA criteria used to apply CULs. This calculation provides a means to assess the overall effect of the 2013 IA on soil arsenic concentrations. The updated results are summarized below in Table 5-7.

Table 5-7 – Pre-2013 IA Direct Contact SL Comparisons

Factor	Arsenic		Lead	
	MTCA Criteria	Result	MTCA Criteria	Result
UCL95% (mg/kg)	Less than 88	39.8	Less than 1,000	15
No concentrations can exceed 2X the SL	No samples can exceed 178 mg/kg	Max. = 1,260 mg/kg	No sample can exceed 2,000 mg/kg	Max. = 320 mg/kg
% of samples exceed SL	<10%	9.5	<10%	1

The updated data comparisons confirm that lead concentrations are below the direct-contact SL as the three MTCA criteria are met. In addition, the maximum lead concentration detected on the site is less than the SQO of 450 mg/kg indicating the soil erosion pathway is not of concern.

However, the comparisons confirmed that arsenic exceeded both its direct-contact SL as sample concentrations on the site exceeded two times the SL and SQO concentrations along portions of the shoreline were above 57 mg/kg (Figure 5-3b and 5-3d). The effects of the 2013 IA on arsenic soil concentrations and meeting potential CULs are described in the next report section.

5.5 Post-2013 IA - Soil-Contact SL and SQO Comparisons

Areas where soil was removed as part of the 2013 IA are shown on Figure 5-4a. Soil removed from the site is represented by the sample locations shown on Figures 5-4b to 5-4d. Table 5-8 (attached) shows which samples were removed and replaced with imported fill. The post-2013 IA comparisons with the direct contact SL were made using the same procedures described above. Arsenic concentration data was replaced with an assumed soil concentration of 7 mg/kg based on background concentration in Washington State (Ecology 1994). The post IA data set was estimated to be lognormally distributed. The resulting comparisons for arsenic are summarized below in Table 5-9.

Table 5-9 – Post-2013 IA Direct Contact SL Arsenic Comparisons

Factor	Pre-2013IA	Post-2013IA
UCL95% (mg/kg)	39.8	13.3
Sample number Above 2X the SL	7	0
% of samples above SL	9.5	2.1

^v The UCL95% concentration was estimated using MTCA-Stat assuming a lognormal data distribution.

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Analysis of the available soil analytical data indicate that soils beneath the Arkema Mound site are below the SL of 88 mg/kg based on the industrial Method C direct contact CUL and using the three MTCA cleanup application criteria. Implementation of the 2013 IA reduced the UCL95% arsenic concentration by approximately two thirds. In addition, the erosion potential of soil containing arsenic greater than the SQO was eliminated by removing shoreline soil with arsenic concentrations greater than the SQO, stabilizing the Hylebos shoreline and constructing the biofiltration swale.

6.0 GROUNDWATER ANALYTICAL DATA – 2008 TO 2011

Groundwater analytical data are available for the following monitoring locations and time periods. Sample locations are shown on Figure 3-1.

- Push-probes – Fourteen Upper Aquifer and two Intermediate Aquifer push-probes samples collected in May 2010 (Table 6-1).
- Upper Aquifer Monitoring Wells – Nineteen wells sampled between August 2008 and February 2011 (Table 6-2).
- Seep Sampler – One seep sample collected in February 2011 (Table 6-2).
- Intermediate Aquifer Monitoring Wells – Five wells sampled between June 2009 and February 2011 (Table 6-3).

Groundwater analyses focused on dissolved metals that may have leached from ASARCO slag and migrated to groundwater. Analyses were conducted for arsenic, chromium, copper, lead, nickel and zinc. Other analyses included typical field measurements (pH, electrical conductivity, temperature, turbidity and ferrous iron) and conventional constituents to generally characterize site geochemical conditions.

6.1 Groundwater Screening Levels (SLs)

To identify areas of the site of potential concern (i.e. potential source areas) with respect to leaching/migration of groundwater constituents and groundwater monitoring, SLs were developed to assist in identifying groundwater constituents of potential concern (GW-COPCs). SLs were developed by identifying potential receptors and basing the SLs on conservative possible CULs using procedures in the Washington State Model Toxics Control Act (MTCA – Chapter 173-340 WAC). An exposure pathway analysis and COPCs are discussed in a following report section.

Potential receptors and exposure pathways were identified as summarized in Table 6-4 below:

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Table 6-4 -Potential Groundwater Receptors and Exposure Pathways

Receptor	Pathway
Humans	Groundwater discharge to surface water and consumption of marine organisms
Aquatic Organisms	Groundwater discharge to surface water

6.1.1 Beneficial Uses of Groundwater

Ecology's 1991 responsiveness summary for amendments to MTCA noted that it is very unlikely that shallow groundwater in Commencement Bay or Harbor Island will be used for drinking water. A finding of fact in the 1992 Consent Decree for this site stated that shallow groundwater is not a current or potential future source of drinking water due to its natural salinity. This section elaborates on the groundwater potability exclusion criteria outlined in 173-340-720(2) subsections (a) through (c) to support previous Ecology determinations which are discussed below.

(a) The groundwater does not serve as a current source of drinking water.

There are no water supply wells located on the property. Deep aquifers are present beneath the Tacoma tideflats, however there are no nearby wells that obtain water from the groundwater zones of interest; Upper or Intermediate Aquifers

(b) The groundwater is not a potential future source of drinking water for any of the following reasons:

(i) The groundwater is present in insufficient quantity to yield greater than 0.5 gallon per minute on a sustainable basis to a well constructed in compliance with chapter 173-160 WAC and in accordance with normal domestic water construction practices for the area in which the site is located.

The Upper Aquifer likely would not yield sustainable amounts of groundwater especially during the drier portions of the year. This is especially the case as most of the groundwater recharge is local and precipitation is being collected by the drainage system installed as part of the engineered cover. It would also not be possible to construct a water supply well in accordance with Chapter 176-160 WAC as an 18-foot thick surface seal is typically required and the bottom of the Upper Aquifer lies at a depth of less than ten to fifteen feet. Wells could be installed in the Intermediate Aquifer in accordance with applicable drilling regulations that would yield more than 0.5 gpm. However, geologic materials include fine sands and silt which are of relatively low permeability. Because of this, groundwater yields to wells would likely be limited to quantities appropriate for single family domestic use and not for commercial or municipal use.

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(ii) The groundwater contains natural background concentrations of organic or inorganic constituents that make use of the water as drinking water source as not practical. Groundwater containing total dissolved solids at concentrations greater than 10,000 mg/l shall normally be considered to have fulfilled this requirement.

Total dissolved solids (TDS) concentrations for groundwater beneath the site are not available. However, chloride, sulfate, calcium, magnesium and silicon were analyzed in selected groundwater samples. The sum of these naturally occurring constituents along with electrical conductivity provides an indication of the TDS concentration of groundwater beneath the site, although the calculated concentrations will be low because sodium data is not available, and sodium is a major constituent in groundwater potentially affected by marine waters. Available data indicate that site groundwater ranges from relatively fresh (Upper Aquifer groundwater) to relatively saline (Intermediate Aquifer groundwater). Upper Aquifer groundwater TDS concentrations were generally less than 1,000 mg/l. The TDS concentrations of Intermediate Aquifer groundwater at MW-G2 likely approaches or is greater than 10,000 mg/l. The “TDS” concentration was calculated to be approximately 6,060 mg/l. In typical seawater, sodium is approximately 55% of the chloride concentration (David & DeWiest 1966) that would increase the calculated MW-G2 sample concentration to approximately 8,900 mg/l.

Groundwater pumpage from the site would cause the migration of marine water into fresh water. Mixing of groundwaters would increase the TDS of the fresher water, likely making the water practically unusable for domestic purposes.

(c) The department determines it is unlikely that hazardous substances will be transported from the contaminated ground water to groundwater that is a current or potential future source of drinking water, as defined in (a) and (b) of this subsection, at concentrations which exceed groundwater criteria published in chapter 173-200 WAC. In making this determination, the department shall consider site-specific factors including:

(i) The extent of affected groundwater

Affected groundwater is limited to localized portions of the site.

(ii) The distance to water supply wells

No water supply wells are located in the vicinity of the site. A review of Ecology’s well log data base indicates the nearest water supply wells are located on the former Kaiser

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Aluminum reduction plant located upgradient and approximately 1,000 feet to the southwest of the mound site. The logs of these wells indicate that they are very deep wells (greater than 800 feet deep) and are flowing artesian wells. There is no potential that migration from the Arkema Mound site could adversely affect these wells. The site is also located on the downgradient side of the Blair-Hylebos peninsula where groundwater discharges to the marine waterway.

(iii) The likelihood of interconnection between the contaminated groundwater that is a current or potential future source of drinking water due to well construction practices in the area of the state where the site is located:

Washington State water well standards require setbacks for drinking-water wells. Setbacks that may affect the theoretical drilling of a drinking water well in the site vicinity include the following: (1) Wells shall not be located in a floodway, or in a location not protected from a 100-year flood; and (2) Wells shall not be less than 50 feet from septic tanks and sewer lines, or 100 feet from contaminated sites. Also as noted above, the standards require an 18-foot surface seal of bentonite or similar material for all drilled drinking-water wells. As such, most wells in Washington are drilled to a minimum depth of 20 feet and do not use shallower waters for groundwater production. A theoretical drinking or industrial well drilled into the Intermediate Aquifer would encounter brackish groundwater with TDS concentrations approaching or exceeding 10,000 mg/l.

(iv) The physical and chemical characteristic of the hazardous substance

Site groundwater is potentially contaminated with metals. The greatest potential for contamination is to the Upper Aquifer. It is likely any pumpage of groundwater from wells installed in the less saline Upper Aquifer groundwater would not be sustainable.

(v) The hydrogeologic characteristic of the site

The groundwater zones beneath and in the vicinity of the site are hydraulically connected to the marine waterway where flow reversals and saltwater intrusion occur during higher tidal levels.

(vi) The presence of discontinuities in the affected geologic stratum

The groundwater zones are truncated by the navigation channel of the Hylebos Waterway where groundwater discharges to the marine waterway.

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(vii) The degree of confidence in any predictive modeling performed

Not applicable as no predictive modeling has been performed.

(d) Even if groundwater is classified as a potential future source of drinking water under (b) of this subsection, the department recognizes that there may be sites where there is an extremely low probability that the groundwater will be used for that purpose because of the site's proximity to surface water that is not suitable as a domestic water supply. An example of this situation would be shallow groundwater in proximity to marine waters such as on Harbor Island in Seattle. At such sites, the department may allow groundwater to be non-potable for purposes of this section if each of the following conditions can be demonstrated. These determinations must be for reasons other than that the groundwater or surface water has been contaminated by a release of a hazardous substance at the site.

(i) The conditions specified in (a) and (c) of this subsection have been met.

The conditions of (a) and (c) are met. Groundwater is not a current source of drinking water and it is unlikely that any contaminated groundwater would migrate to areas (or zones) where groundwater is a current or future source of drinking water at concentrations that would exceed groundwater-quality criteria published in Chapter 173-200 WAC.

(ii) There are known or projected points of entry of the groundwater into the surface water

Groundwater beneath the site is discharging to the Hylebos Waterway.

(iii) The surface water is not classified as a suitable water supply source under Chapter 173-201A

The Hylebos Waterway adjacent to the site is a saline marine waterway that is not classified as a suitable water supply.

(iv) The groundwater is sufficiently hydraulically connected to the surface water that the groundwater is not practicable to use as a drinking water source.

Groundwater beneath the site is sufficiently connected to the Hylebos Waterway so that sustained pumping of wells in the site vicinity will likely result in the intrusion of saline surface water into the aquifers and wells screened in the aquifers. This groundwater could be treated to reduce salinity, however because of the cost such treatment, a water purveyor or other entity would avoid installing wells into these aquifers.

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Summary. Groundwater beneath the site can be classified as nonpotable. Groundwater is not used as a drinking water source and is not suitable for future use as a potential source. Wells installed in the Upper Aquifer would not meet typical well construction standards and sustainable volumes are not likely possible from this aquifer. Pumpage of groundwater from the Intermediate Aquifer would cause saline water intrusion into the groundwater zones beneath the site. Furthermore, the groundwater does not discharge to a potential source of drinking water as the Hylebos Waterway is not a suitable source. The highest beneficial use of groundwater beneath the site is protection of the Hylebos Waterway (i.e. surface water).

6.1.2 Groundwater Screening Levels

Groundwater discharges to surface water. Surface water SLs were obtained from sources consistent with WAC 173-340-730 and are listed by source in attached Table 6-5. Most values were obtained from CLARC available on Ecology’s website. The sources are described below:

- a. Surface Water Quality (WAC 173-201A) - Protection of aquatic organisms and human consumption of aquatic organisms.
- b. Marine Chronic Criteria (EPA) – Protection of aquatic organisms and human consumption of aquatic organisms. – Criteria developed under the Clean Water Act 304^{vi}.
- c. MTCA Method B – Surface Water Cleanup Levels (WAC 173-340-730) – Protection of human consumption of aquatic organisms.

Dissolved (field filtered) metals concentrations were compared to the SLs because the metals criteria to protect surface water are predominately based on the dissolved metals fraction and samples sent to the laboratory are commonly bias-high, especially for push-probe samples, because of the entrainment of particulates.

Preliminary GW-COPCs were identified based on comparison of the collected data with the groundwater SLs listed in Table 6.6 below.

^{vi} National Toxics Rule (NTR) criteria for the protection of human health are not applicable because EPA has already conducted a site-specific risk assessment which provided more appropriate and relevant data for establishing site cleanup levels. The August 3, 2000 Explanation of Significant Difference (ESD), which was prepared and issued eight years after promulgation of the NTR, established applicable pathways which require site cleanup levels for groundwater discharges to surface water. In the case of the Hylebos Waterway, EPA found that human health exposure from consumption of aquatic organisms did not require source control, cleanup levels, or sediment remediation of arsenic because existing conditions prior to cleanup actions and the Record on Decision (ROD) did not pose unacceptable risks. Nevertheless, interim actions has occurred at this site which significantly reduced remnant arsenic at this site.

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Table 6.6 - Groundwater Screening Levels

Constituent	Screening Level (ug/l)
Arsenic	5
Chromium	50 (a)
Copper	3.1
Lead	8.1
Nickel	8.2
Zinc	81

Note: (a) – Based on Cr+6

6.2 Probe-Collected Groundwater Analytical Data

Groundwater samples were collected in May 2010 from push-probes to provide an indication of metals concentrations in the groundwater zones of interest. The purpose of the probe sampling was to determine whether additional monitoring wells should be installed and sampled. Data from monitoring wells should be used to assess compliance with CULs.

Table 6.1 (attached) presents the groundwater analytical data from analysis of the probe groundwater samples. Dissolved metals concentrations (arsenic, copper, lead, zinc) that exceeded SLs are highlighted in the table. Dissolved metals concentrations were exceeded in one or more samples indicating the need for additional monitoring wells.

6.3 Groundwater Analytical Data from Monitoring Wells

Tables 6.2 and 6.3 (attached) present the groundwater analytical data from nineteen Upper-Aquifer wells, one shoreline seep sampler^{vii}, and five intermediate-aquifer monitoring wells. The locations of the monitoring wells and the shoreline seep sampler are presented on Figure 3-1. Those dissolved metal concentrations above SLs are highlighted in orange on the tables and are summarized below.

6.3.1 Upper Aquifer Monitoring Wells.

Arsenic – Arsenic exceeded the SL (5 ug/l) in a number of groundwater samples. Most of the exceedances occurred in samples from MW-1, MW-A, and MW-E. Dissolved concentrations in most other locations were below the SL as summarized in Table 6-2 and the concentration plots presented in Appendix B. The plot for MW-RR1-B-147 indicates a consistent decline starting in late 2009 from approximately 30 ug/l to 3 ug/l (Feb. 2011).

^{vii} The shoreline seep sampler was installed to assess the quality of Upper Aquifer groundwater discharge to the Hylebos Waterway downgradient of monitoring wells where arsenic concentrations exceeded screening levels (i.e. wells MW-A and MW-H). The sampler was installed in a similar manner to those on the Arkema Manufacturing site. See Appendix A (seep sampler log) or Figure 8-2 for additional information.

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The pre-2013 IA pattern is generally illustrated by Figure 6-1 that shows dissolved arsenic concentrations in samples collected in February 2011. Most Upper Aquifer concentrations are below the SL. Dissolved concentrations exceeded the SL in three areas of the site including the Northeast Area, area to the south of remediation area P-10 and within the SB7 Area.

The highest dissolved arsenic concentrations were detected in samples from MW-A. Remediation of the Northeast Area should result in lower future groundwater concentrations. However, available data indicate that the dissolved arsenic concentration at the shoreline downgradient of MW-A was below the SL in February 2011, based on data from the seep sampler at SS-1, where arsenic was detected at 2 ug/l. Figure 6-2 shows a plot of arsenic along the groundwater flow path from MW-A to SS-1 and includes data from MW-H. Concentrations decline in an exponential fashion with distance from MW-A. While the data is limited, the decline is consistent with the geochemical model developed for the main Arkema site. Mixing of groundwater with oxygenated marine water causes arsenic to decrease in solubility and precipitate with iron and other oxides.

Chromium – Dissolved total chromium did not exceed the SL (50 ug/l) in any of the Upper Aquifer well samples. The SL is based on hexavalent chromium, resulting in a more conservative comparison.

Copper – Dissolved copper only exceeded the SL (3.1 ug/l) in three Upper Aquifer samples; MW-4 (August 2008), MW-RRI-B-117 (June 2009) and MW-E (June 2009). Samples from other locations and later samples from the indicated locations had concentrations below the SL.

Lead – Dissolved lead did not exceed the SL (8.1 ug/l) in any of the Upper Aquifer groundwater samples.

Nickel – Dissolved nickel did not exceed the SL (8.2 ug/l) in any of the Upper Aquifer samples.

Zinc - Zinc was detected above the SL (81 ug/l) in three wells. Most of the exceedances occurred in samples from MW-4. Zinc was detected in MW-4 samples above the SL in the last five quarterly samples (September 2009 through February 2011). The most recent measurement (February 2011) was 130 ug/l zinc. However, the first two sampling events on August 28, 2008 and on June 19, 2009 indicated zinc concentrations in MW-4 below the SL (18 and <4 ug/l). The prior MW-4 monitoring data collected by Boateng for Arkema was also generally below the SL for zinc. The twelve groundwater samples dating from 1996 through 2001 were all below 60 ug/l zinc, with most "U" qualified. The two highest historical zinc concentrations measured by Arkema were

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approximately 400 ug/l and both occurred within a year of building the mound in 1992, after which zinc concentrations declined in MW-4. It was not until September 2009 that the zinc concentrations in MW-4 started to climb, rising to 187, to 810, to 510, and to 3,470 ug/l zinc in consecutive quarterly monitoring events from September 2009 to June 2010, followed by a drop to 130 ug/l in February 2011.

The cause for the increase in zinc concentrations documented in MW-4 is likely related to well maintenance. Monitoring well MW-4 was reconfigured during the summer of 2009 with the above ground steel casing and PVC well pipe cut off and re-configured to a flush-mount monument.

A new monitoring well (MW-L) was installed in December 2010 within approximately 20 feet and downgradient of monitoring well MW-4, between MW-4 and Kaiser Ditch, to establish if elevated zinc is present in the groundwater beyond MW-4. The February 2011 sampling indicated non-detectable concentrations of zinc (< 4 ug/l) in MW-L.

During the February 2011 sampling event zinc was detected above the SL for the first time in two other wells, MW-RRI-B-146 and MW-C, where it had not been present above screening levels for at least five prior sampling events. The elevated levels of zinc in MW-RRI-B-146 and MW-C appear to be related to standing water in the zinc coated (galvanized) well monuments and faulty well caps.

Intermediate Aquifer Monitoring Wells. Attached Table 6-3 presents the groundwater analytical data collected between 2009 and 2011 from five Intermediate Aquifer wells located at the site as shown on Figure 3-1. Well MW-AK-1 was installed by Arkema and has been sampled five times for this project since 2009. Wells MW-A2, MW-F2, MW-G2, and MW-147(2) were installed and sampled for the first time in June 2010 and sampled a second time in February 2011.

SL exceedances are highlighted on Table 6-3. Dissolved lead and zinc concentrations did not exceed their respective SLs in any of the samples. Dissolved copper (5 ug/l) marginally exceeded its SL (3 ug/l) in the February 2011 sample from MW-A2. The SL for dissolved total chromium and dissolved nickel also exceeded their respective SLs in samples from MW-A2. Dissolved nickel exceeded the SL in the sample from MW-G2.

Dissolved arsenic exceeded the SL in samples from well MW-A2. An evaluation of the groundwater analytical data in the northeast corner of the site indicates that arsenic, chromium, and/or nickel concentrations in samples from Intermediate Aquifer wells MW-A2 and MW-G2 are associated with sources and migration from the adjacent Arkema Manufacturing site and not past log-yard operations on the Arkema Mound site. This is based on the following lines of evidence.

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- Upper Aquifer groundwater from MW-A exhibited dissolved arsenic concentrations ranging from 540 to 1700 ug/l since June 2009. The geochemistry at MW-A indicates the Upper Aquifer water to be principally freshwater with relatively low levels of chloride, sulfate, hardness, nondetectable sulfides, a slightly acidic pH (6.2), and a redox potential that is generally oxidative (Eh=308 mV).
- Intermediate Aquifer groundwater at MW-A2 exhibited a dissolved arsenic concentration of 136 to 154 ug/l (measured during 6/10 and 2/11) and a geochemistry indicating the Intermediate Aquifer groundwater to be alkaline (pH 9.2), brackish, of moderate hardness, and with relatively low redox potential (Eh= -71 mV). This water is considered highly reducing and exhibits a total sulfides concentration of 65 mg/L. The Intermediate Aquifer pH ranged between 6.5 and 9.2 standard pH units. The pH at MW-A2 (pH=9.2) is substantially higher than those measured in the Upper Aquifer (pH=6.0 to 7.0) or other Intermediate Aquifer (pH=6.5 to 6.9) well samples.
- Groundwater geochemistry indicates the Upper and Intermediate Aquifer waters to be unrelated with little to no mixing between the two water masses beneath the northeastern portion of the site. Based on the available evidence, their sources of arsenic contamination are unrelated.
- The Arkema Manufacturing site groundwater for both Upper and Intermediate aquifers in the vicinity is characterized as highly alkaline (pH=8.5-12), brackish, low to moderate hardness, highly reducing (Eh= -243 to -173 mV), with total sulfides of 17 to 206 mg/L. These characteristics compare well with the groundwater data for MW-A2 (Intermediate Aquifer groundwater on the Mound site). The groundwater characteristics at MW-A2 are similar with the characteristics of well 8G3-2 on the Arkema Manufacturing site (Intermediate Aquifer groundwater). This observation is consistent with known groundwater flow directions for the area.

Based on these comparisons, the Intermediate Aquifer beneath the Northeast Area has been included as part of the main Arkema Manufacturing Site (DOF 2013).

7.0 CONTAMINANTS OF POTENTIAL CONCERN (COPCS)

7.1 Exposure Pathway Analysis

As part of the process of identifying COPCs, an exposure pathway analysis was completed based on review of site data and likely current and future land uses (i.e. industrial). The purpose of the analysis was to identify the media and relevant remaining exposure pathways for the site. The results are illustrated on Figure 7-1. Most exposure pathways are not complete based on the following:

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- The two interim actions removed remaining log-sort yard ASARCO slag and woodwaste from the site.
- With removal of the woodwaste/slag containment cell, lead concentrations declined below the industrial direct contact SL of 1,000 mg/kg.
- The 2013 IA was focused on arsenic and achieved the interim action objectives; arsenic concentrations were reduced to below the industrial direct contact SL and shoreline arsenic concentrations were below the Commencement Bay SQO.
- Installation of an engineered cover, drainage system, and subsurface utilities as part of the 2013 IA further reduced possible exposures to site workers via wind erosion and direct contact. Placement of the engineered cover also eliminated possible exposures to terrestrial wildlife consistent with WAC 173-340-7491 (discussed further below).

As illustrated on Figure 7-1, the one remaining potential exposure pathway is the groundwater to surface water pathway.

7.2 Terrestrial Ecological Evaluation

WAC 173-340-7491 presents criteria for sites where a terrestrial ecological evaluation need not be performed. WAC 173-340-7491(1) states the following:

“Criteria for determining that no further evaluation is required. No further evaluation is required if the department determines that a site meets any of the criteria in (a) through (d) of this subsection.” Subsection (b) reads as follows:

“(b) All soil contaminated with hazardous substances is, or will be covered by buildings, paved roads, pavement or other physical barriers that will prevent plants or wildlife from being exposed to the soil contamination. To qualify for this exclusion, an institutional control shall be required by the department under WAC 173-340-440. An exclusion based on planned future use shall include a completion date for such future development that is acceptable to the department.”

The site is covered with an engineer cover installed as part of the 2013 IA. The cover consists of compacted (dense) crushed rock with two Geogrid layers and one geotextile layer. This cover will “prevent wildlife from feeding on plants, earthworms, insects or other food in or on the soil” [see WAC 173-340-7491(1)(c)(iii)].

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7.3 Contaminants of Potential Concern (COPCs)

Pre-2013 IA concentrations of arsenic were above the SL beneath localized portions of the site adjacent to the shoreline. The remaining potential exposure pathway is associated with possible migration of arsenic in Upper Aquifer groundwater to surface water. Arsenic is identified as the remaining groundwater COPC at the site. Other metal concentrations in groundwater are below SLs.

Post interim action groundwater data has yet to be collected. As discussed above, the 2013 IA reduced soil arsenic concentrations by two thirds on a site wide basis. Concentration reductions in the remediated areas were substantially higher. For this reason, it would be expected that post 2013 IA arsenic concentrations would be lower than those previously detected. Furthermore, evaluation of the well and seep sampler data in the Northeast Area, while limited, suggests that even before the 2013 IA was completed, arsenic in groundwater discharging to the Hylebos Waterway was below the SL. A post interim action monitoring program is recommended to characterize groundwater concentrations of arsenic in the interim action areas.

8.0 RECOMMENDED GROUNDWATER MONITORING PROGRAM

AO DE6129 anticipated that a FS and Cleanup Action Plan (CAP) will be prepared after the 2013 IA and RI are completed and approved by Ecology. Conversations with Ecology indicate that, based on available data, a FS will not be required and the Port should move forward with preparing a draft CAP (DCAP) that will include groundwater monitoring requirements. The need for additional remedial actions will be based on the results of groundwater monitoring. Monitoring would proceed following approval of the CAP. The outlines of the proposed monitoring program are presented below.

8.1 Monitoring Objective

The objective of the proposed post 2013IA monitoring is to assess whether Upper Aquifer dissolved arsenic concentrations exceed surface water SLs at the point where groundwater discharges to surface water. Monitoring would be conducted at two general locations on the site as follows:

- Along the Hylebos shoreline within the northeast corner of the site, and
- Along the western/southern site boundary in the vicinity of the former locations of wells MW-1 and MW-E (downgradient of the P10 Area and adjacent to the SB7 Area).

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8.2 Proposed Monitoring Locations

Monitoring is proposed to be completed at three locations as follows and shown on Figure 8-1:

- Northeast Area
 - One monitoring well at the approximate former location of MW-H.
- Southwestern Site Boundary
 - Two monitoring wells located along the site boundary in the vicinity of former wells MW-1 and MW-E.

The wells would be installed in a similar manner as the previously installed wells. Five feet long wells screens would be placed above the underlying silt layer.

8.3 Sampling Frequency and Interpretation

The wells would be sampled on a quarterly basis for two years. Analyses would be made for field parameters (pH, conductivity, temperature, ferrous iron) and total and dissolved arsenic. In addition, total and dissolved zinc and copper would be analyzed in samples from the well in the Northeast area to confirm these metals are not COPCs. If the analytical results for dissolved zinc and copper are below SLs (Table 6-5) for two quarters, these constituents would be eliminated from the monitoring program.

After completion of two years of monitoring, the arsenic concentration trend will be evaluated to assess the efficacy of the interim action. If concentrations are not shown to be declining, Ecology may require the installation of two seep samplers along the Arkema shoreline and monitoring would continue. This approach is based on past data that indicated the dissolved arsenic concentration of groundwater discharging to the waterway was below the SL (in seep sampler SS-1) prior to completion of the 2013IA with upgradient concentrations between 548 and 1,680 ug/l (Well A). Future groundwater arsenic concentrations beneath the Northeast Area should be lower with removal of the high concentration source soils. The seep samplers would be installed as follows:

- Seep samplers would be installed at the locations shown on Figure 8-1 in a similar manner as SS-1 (Figure 8-2). The samplers would be installed at the top of the underlying silt layer (approximate elevation 9 to 10 feet MLLW - within the intertidal zone) and be incorporated into the stabilized shoreline fill section. Sampling would occur on outgoing tides when waterway levels fall below the elevation of the sampler and Upper Aquifer groundwater is seeping into the waterway.

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8.4 Work Plan

Once the general outline of a monitoring program is approved by Ecology, a work plan/sampling and analysis plan would be prepared as an attachment to the DCAP and be submitted for comment and approval. The plans would include well/seep sampler installation and sampling procedures, analytes (e.g. dissolved arsenic, and field and conventional parameters), analytical methods, sampling frequency, QA/QC procedures, reporting schedule and data interpretation.

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TABLE 5-1 - Soil Analytical Data Collected After Mound Removal

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Sample No.	Date	Depth	Arsenic	Lead	Comment (sample locations shown on Figure 4-3a unless indicated otherwise)
		(feet)	(mg/kg)	(mg/kg)	
Screening Levels	-----	-----	88/57	1000/450	
AT-SS-FD-B1	2009	At Grade	1.9	1.9	Surface samples - cell liner subgrade after mound removal - see Figure 4-1
AT-SS-FD-B3_B1	2009	At Grade	19.5	13.5	
AT-SS-FD-B3	2009	At Grade	3.6	3.7	
AT-SS-FD-B5_B3	2009	At Grade	9	2.4	
AT-SS-FD-D1	2009	At Grade	5	2	
AT-SS-FD-D1(H)	2009	At Grade	0.9	1.6	
AT-SS-FD-D3(ALT)	2009	At Grade	6	2	
AT-SS-FD-F1	2009	At Grade	1.7	2	
AT-SS-FD-F3	2009	At Grade	2	3	
AT-SS-FD-F3_D3	2009	At Grade	48	18	
AT-SS-FD-B1	Jun-09	At Grade	2.8	3	Surface samples - finished grade after mound removal - see Figure 4-2
AT-SS-FD-B3	Jun-09	At Grade	2.6	3	
AT-SS-FD-B5	Jun-09	At Grade	2.7	3	
AT-SS-FD-B6	Jun-09	At Grade	2.7	3	
AT-SS-FD-D1	Jun-09	At Grade	2.6	2	
AT-SS-FD-D3	Jun-09	At Grade	2.6	2.1	
AT-SS-FD-D5	Jun-09	At Grade	2.6	2	
AT-SS-FD-D6	Jun-09	At Grade	2.5	3	
AT-SS-FD-F1	Jun-09	At Grade	2.5	3.3	
AT-SS-FD-F3	Jun-09	At Grade	2.5	2	
AT-SS-FD-F5	Jun-09	At Grade	2.9	3	
AT-SS-FD-F6	Jun-09	At Grade	2.9	3	
AT-SS-FD-G1	Jun-09	At Grade	8.5	9	
AT-SS-FD-G3	Jun-09	At Grade	12	8	
AT-SS-FD-G5	Jun-09	At Grade	13.1	10	
AT-SS-FD-G6	Jun-09	At Grade	7.4	6	
P1-A	6/11/09	0-2	21.6	16	Probe soil samples along Hylebos shoreline
P1-B	6/11/09	2-5	25.4	15	
P1-C	6/11/09	6-8	1.6	<1	
P1-D	6/11/09	8-10	15.8	8	
P2-A	6/11/09	0-2.5	20.4	15	Probe soil samples along Hylebos shoreline
P2-B	6/11/09	2.5-5	19.5	14	
P2-C	6/11/09	5-7	26.6	22	
P2-D	6/11/09	7-10	25.2	12	
P3-A	6/11/09	0.5-2.5	91.9	75	Probe soil samples - Northwest Area
P3-B	6/11/09	2.5-5	58.3	11	
P3-C	6/11/09	5-8.5	6.5	1	
P3-D	6/11/09	9.5-10	4.1	4	
P4-A	6/11/09	1-3	103	121	Probe soil samples southwest corner of site
P4-B	6/11/09	3-5	8.4	4	
P4-C	6/11/09	5-7.5	1.8	2	
P4-D	6/11/09	7.5-10	2.7	2	
P5-A	6/11/09	0-2	6.1	7	Probe soil samples along Kaiser Ditch
P5-B	6/11/09	2-5	0.9	1	
P5-C	6/11/09	5-8	2.2	2	
P5-D	6/11/09	8-10	2.6	2	
P6-A	6/11/09	0.5-2.5	2.3	5	Probe soil samples central interior of site
P6-B	6/11/09	2.5-3.5	23.8	20	
P6-C	6/11/09	6.5-9	1.4	1	
P6-D	6/11/09	9-10	1	<1	
P7-A	6/11/09	0.5-3	2.8	7	Probe soil samples beneath former mound footprint
P7-B	6/11/09	3-5	2.7	3	
P7-C	6/11/09	5-6.5	3.3	3	
P7-D	6/11/09	6.5-10	1.4	1	
P8-A	6/11/09	1-3.5	73.4	74	Probe soil samples along East-West Ditch
P8-B	6/11/09	3.5-5	1.1	1	
P8-C	6/11/09	5-7	1.3	1	
P8-D	6/11/09	7-10	1.3	1	

TABLE 5-1 - Soil Analytical Data Collected After Mound Removal

Former Arkema Mound Site
3009 Taylor Way, Tacoma, WA

Sample No.	Date	Depth (feet)	Arsenic (mg/kg)	Lead (mg/kg)	Comment (sample locations shown on Figure 4-3a unless indicated otherwise)
Screening Levels	-----	-----	88/57	1000/450	
P9-A	6/11/09	0-1.5	4.2	5	Probe soil samples along Kaiser Ditch
P9-B	6/11/09	1.5-5	2.7	1	
P9-C	6/11/09	5-7.5	1.3	<1	
P9-D	6/11/09	7.5-10	0.9	1	
P10-A	6/11/09	1-2.5	54.1	43	Probe soil samples P-10 Area
P10-B	6/11/09	2.5-5	311	320	
P10-C	6/11/09	5-7.5	4.7	2	
P10-D	6/11/09	7.5-10	2.1	2	
P11-A	6/11/09	1-2.5	2.8	6	Probe soil samples beneath former mound footprint
P11-B	6/11/09	2.5-5	2.9	7	
P11-C	6/11/09	5-7.5	4.8	1	
P11-D	6/11/09	7.5-9.5	1.5	2	
P-12	5/12/10	0-1.5	30.4	35	Probe soil samples in northwest area along Hylebos and E-W ditch shoreline
P12 *	5/12/10	3	57.0	-	
P12 *	5/12/10	6	99.1	-	
P-13	5/12/10	0-2	40.5	28	Probe soil samples along Hylebos shoreline north side of log ramp
P-13	5/12/10	2-5	2.3	1	
P-14	5/12/10	0.5	5.2	7	Probe soil samples along Hylebos shoreline by P-2
P-14	5/12/10	2.5	16.6	3	
P-14	5/12/10	5	11.7	1	
P-14	5/12/10	7.5	10.3	9	
P-14	5/12/10	10	8.5	5	
P-14	5/12/10	12.5	6.8	7	
P-14	5/12/10	15	6.5	4	
P-14	5/12/10	17.5	2.2	3	
P-14	5/12/10	20	1.2	2	
P-15	5/12/10	1-3	15.8	11	Probe soil samples along Hylebos shoreline
P-16	5/11/10	0.5-2.5	62.6	20	Probe soil samples in Northwest Area along E-W ditch
P-16	5/11/10	2.5-5	8.2	21	
P-16*	5/11/10	7.5	2.3	-	
P-16*	5/11/10	10	6.0	-	
P-17	5/11/10	1-3.5	1.7	1	Probe soil samples along E-W Ditch near
P-18	5/12/10	2.5-4	14.5	13	Probe soil sample near head of E-W Ditch
P-19	5/12/10	0-1.5	45.7	108	Probe soil samples east side and near head of Kaiser Ditch (off-property)
P-19*	5/12/10	6	6.4	-	
P-19*	5/12/10	9	5.3	-	
P-24*	5/12/10	3	2.1	-	Probe soil samples along eastern property line (central portion)
P-24*	5/12/10	6	5.9	-	
P-27*	5/12/10	3	3.8	-	Probe soil samples along eastern property line near head of Kaiser Ditch
P-27*	5/12/10	6	5.9	-	
P-32*	5/12/10	3	4.8	-	Probe soil samples adjacent to Northwest Area
P-32*	5/12/10	6	13.2	-	
P33A	7/19/11	0-2.5	4.9	-	Probe samples in P10 Area - Figures 4-3b and 4-3e
P33B	7/19/11	2.5-5	144	-	
P33C	7/19/11	5-7.5	2.3	-	
P34A	7/19/11	0-0.25	28.8	-	
P34B	7/19/11	2.5-5	6	-	
P34C	7/19/11	5-7.5	2.7	-	
P36A	7/19/11	0-0.25	39.8	-	
P36B	7/19/11	2.5-5	6.9	-	
P36C	7/19/11	5-7.5	2.7	-	
P39A	7/19/11	0-0.25	37.4	-	
P39B	7/19/11	2.5-5	30.5	-	
P39C	7/19/11	5-7.5	6.1	-	
P42A	7/19/11	0-2.5	14.9	-	
P42B	7/19/11	2.5-5	164	-	
P42C	7/19/11	5-7.5	6.7	-	

TABLE 5-1 - Soil Analytical Data Collected After Mound Removal

Former Arkema Mound Site
3009 Taylor Way, Tacoma, WA

Sample No.	Date	Depth	Arsenic	Lead	Comment (sample locations shown on Figure 4-3a unless indicated otherwise)
		(feet)	(mg/kg)	(mg/kg)	
Screening Levels	-----	-----	88/57	1000/450	
P43A	7/19/11	0-2.5	16	-	Probe samples in/adjacent to P10 Area - Figures 4-3b and 4-3c
P43B	7/19/11	2.5-5	134	-	
P43C	7/19/11	5-7.5	49	-	
P44A	7/19/11	0-2.5	17.1	-	
P44B	7/19/11	2.5-5	9	-	
P44C	7/19/11	5-7.5	2.9	-	
MW A-0/1.5	6/10/09	0-1.5	22.6	11	Well soil samples in Northwest Area
MW A-2.5/4	6/10/09	2.5-4	18.1	13	
MW A-5/6.5	6/10/09	5-6.5	4.6	4	
MW A-7.5/9	6/10/09	7.5-9	5.6	6	
MW A-10-11.5	6/10/09	10-11.5	10.1	8	
MW A-12.5/14	6/10/09	12.5-14	4.7	5	
MW A-15/16.5	6/10/09	15-16.5	8.1	4	
MW B-1/2.5	6/10/09	1-2.5	8.4	7	
MW B-2.5-4	6/10/09	2.5-4	1.9	2	
MW B-5/6.5	6/10/09	5-6.5	3.9	3	
MW B-7.5-9	6/10/09	7.6-9	1.2	2	Well soil samples with western central portion of site
MW B-10/11.5	6/10/09	10-11.5	1.2	1	
MW B-12.5-14	6/10/09	12.5-14	2.7	3	
MW C-0/1.5	6/10/09	0-1.5	19.5	13	
MW C-2.5/4	6/10/09	2.5-4	79	60	
MW C-5/6.5	6/10/09	5-6.5	5.3	10	
MW C-7.5/9	6/10/09	7.5-9	1.2	2	Well soil samples along Hylebos shoreline
MW C-10/11.5	6/10/09	10-11.5	0.3	1	
MW C-12.5/14	6/10/09	12.5-14	13.3	12	
MW D-0/1.5	6/10/09	0-1.5	4.4	9	
MW D-2.5/4	6/10/09	2.5-4	107	117	Well soil samples near head of E-W Ditch
MW D-5/6.5	6/10/09	5-6.5	6.9	1	
MW D-7.5/9	6/10/09	7.5-9	2.0	1	
MW D-10/11.5	6/10/09	10-11.5	3.5	2	
MW E-0/1.5	6/10/09	0-1.5	20.9	21	Well soil samples adjacent to head of Kaiser Ditch
MW E-2.5/4	6/10/09	2.5-4	7.4	10	
MW E-5/6.5	6/10/09	5-6.5	2.6	2	
MW E-7.5/9	6/10/09	7.5-9	16.5	4	
MW E-10/11.5	6/10/09	10-11.5	4.5	3	
SB1-A	11/16/10	0-2	32.6	-	Bank soil samples - Northwest Area - along E-W Ditch slope
SB1-B	11/16/10	2-3	7.6	-	
SB2-A	11/15/10	0.5-2	278	-	Bank soil samples - Northwest Area - along E-W Ditch slope - near ditch mouth
SB2-B	11/15/10	2-4	142	-	
SB3-A	11/15/10	0-1	18.4	-	Bank soil samples - Northwest Area - along Hylebos shoreline at mouth of E-W Ditch
SB3-B	11/15/10	1-2.5	124	-	
SB3-C	11/15/10	2.5-3	5.5	-	
SB3-D	11/15/10	3-4	1.9	-	
SB3-IT	11/15/10	10.0' MLLW	11.4	-	
SB4-A	11/15/10	0-1	29.9	-	
SB4-B	11/15/10	1-1.6	6.5	-	Bank soil samples - Northwest Area - along Hylebos shoreline - Figure 4-3c
SB4-C	11/15/10	1.6-3	3.2	-	
SB4-D	11/15/10	3-4	7.9	-	
SB4-IT	11/15/10	10.0' MLLW	8.8	-	
SB5-A	11/15/10	0-1.2	2.7	-	
SB5-B	11/15/10	1.2-3	3.2	-	
SB5-IT	11/15/10	10.0' MLLW	7.5	-	Bank soil samples - head of Kaiser Ditch slope (SB7 Area) - Figures 4-3b and 4-3d.
SB6-A	11/16/10	2	6.8	-	
SB6-B	11/16/10	6	34.2	-	
SB6-C	11/16/10	12	40.5	-	
SB7-A	11/16/10	1	86.8	-	
SB7-B	11/16/10	5	19.6	-	
SB7-C	11/16/10	10	6.2	-	

TABLE 5-1 - Soil Analytical Data Collected After Mound Removal

Former Arkema Mound Site
3009 Taylor Way, Tacoma, WA

Sample No.	Date	Depth	Arsenic	Lead	Comment (sample locations shown on Figure 4-3a unless indicated otherwise)
		(feet)	(mg/kg)	(mg/kg)	
Screening Levels		-----	88/57	1000/450	
SB-8A	6/21/11	0-1	42.4	-	Bank soil samples - Northwest Area - along E-W Ditch slope - Figure 4-3c
SB-8B	6/21/11	1-2.5	1260	-	
SB-8C	6/21/11	2.5-3.5	378	-	
SB-9A	6/21/11	0-1	18.1	-	
SB-9B	6/21/11	1-2.5	16.1	-	
SB-9C	6/21/11	2.5-3.5	42	-	
SB-10A	6/21/11	0-1	23.6	-	
SB-10B	6/21/11	1-2.5	17	-	
SB-10C	6/21/11	2.5-4	6.6	-	
SB-11A	6/21/11	0-1	19.3	-	
SB-11B	6/21/11	1-2.5	4.8	-	
SB-11C	6/21/11	2.5-4	4.2	-	
SB-12A	6/21/11	0-1	3.7	-	
SB-12B	6/21/11	1-2.5	44.4	-	
SB-12C	6/21/11	2.5-4	38.2	-	
SB-12D	6/21/11	4-5	50.9	-	
SB-13A	6/21/11	0-1	18.4	-	
SB-13B	6/21/11	1-2.5	124	-	
SB-13C	6/21/11	2.5-3	5.5	-	
SB-13D	6/21/11	10.0' MLLW	1.9	-	
SB-14A	6/21/11	0-1	28.6	-	
SB-14B	6/21/11	1-2.5	58.4	-	
SB-14C	6/21/11	2.5-4	1.3	-	
SB-14D	6/21/11	4-5	12.5	-	
SB-15A	6/21/11	0-1	70.4	-	
SB-15B	6/21/11	1-2.5	73.5	-	
SB-15C	6/21/11	2.5-4	10.9	-	
SB-15D	6/21/11	4-5	9.9	-	
SB-16A	6/21/11	0-1	23.8	-	
SB-16B	6/21/11	1-2.5	51.2	-	
SB-16C	6/21/11	2.5-4	18.1	-	
SB-16D	6/21/11	4-5	65.7	-	
SB-17A	6/21/11	0-1	75.8	-	
SB-17B	6/21/11	1-2.5	64	-	
SB-17C	6/21/11	2.5-4	3.7	-	
SB-17D	6/21/11	4-5	29.1	-	
SB-18A	6/21/11	0-1	66.2	-	
SB-18B	6/21/11	1-2.5	34.4	-	
SB-18C	6/21/11	2.5-4	4.3	-	
SB-18D	6/21/11	4-5	11.2	-	
SB-19	6/22/11	0-1	8.4	-	SB7 Bank Area (along head of Kaiser Ditch shoreline) - Figures 4-3b and 4-3d
SB-19	6/22/11	2-4	9.9	-	
SB-20	6/22/11	0-1	7.3	-	
SB-20	6/22/11	2-4	38.4	-	
SB-21	6/22/11	0-1	122	-	
SB-21	6/22/11	2-4	108	-	
SB-21	6/22/11	5-7	42.7	-	
SB-21	6/22/11	9-10	89.7	-	
SB-22	6/22/11	0-1	35	-	
SB-22	6/22/11	2-4	43.4	-	
SB-23	6/22/11	0-1	10.1	-	
SB-23	6/22/11	2-4	16.5	-	
SB-24	6/22/11	0-1	15	-	
SB-24	6/22/11	2-4	12	-	
SB-25	6/22/11	0-1	3.4	-	
SB-25	6/22/11	2-4	16.7	-	
SB-26	6/22/11	0-1	5.3	-	
SB-26	6/22/11	2-4	12.1	-	

TABLE 5-1 - Soil Analytical Data Collected After Mound Removal

Former Arkema Mound Site
3009 Taylor Way, Tacoma, WA

Sample No.	Date	Depth (feet)	Arsenic (mg/kg)	Lead (mg/kg)	Comment (sample locations shown on Figure 4-3a unless indicated otherwise)
Screening Levels	-----	-----	88/57	1000/450	
PSB2	7/20/11	0-1	383	-	Probe soil samples adjacent to slope sample location SB2 - Northwest Area - Figure 4-3c
PSB2	7/20/11	1-2	285	-	
PSB2	7/20/11	2-3	46.3	-	
PSB2	7/20/11	3-4	7.8	-	
PSB3	7/20/11	0-1	44.1	-	Probe soil samples adjacent to slope sample location SB3 - Northwest Area - Figure 4-3c
PSB3	7/20/11	0-2	65.8	-	
PSB3	7/20/11	2-3	3.8	-	
PSB3	7/20/11	3-4	8.1	-	
PSB3	7/20/11	4-5	29.9	-	
PSB3	7/20/11	5-6	1.5	-	
PSB3	7/20/11	6-7	2	-	
PSB8	7/20/11	0-1	97.9	-	Probe soil samples adjacent to slope sample location SB8 - Northwest Area - Figure 4-3c
PSB8	7/20/11	1-2	93.5	-	
PSB8	7/20/11	2-3	81.9	-	
PSB8	7/20/11	3-4	22.8	-	
PSB16	7/20/11	0-1	21.5	-	Probe soil samples adjacent to slope sample location SB16 - Northwest Area - Figure 4-3c
PSB16	7/20/11	1-2	21.7	-	
PSB16	7/20/11	2-3	32.2	-	
PSB16	7/20/11	3-4	5.6	-	
PSB16	7/20/11	4-5	335	-	
G-1	6/22/11	0-1	21	-	SB7 Bank Area (top of bank along head of Kaiser Ditch shoreline) - Figure 4-3d.
G-1N	6/22/11	0-1	31.1	-	
G-2	6/22/11	0-1	122	-	
G-2	6/22/11	1-3	6.5	-	
G-2	6/22/11	3-5	10	-	
G-2	6/22/11	5-7	5.1	-	
G-2	6/22/11	7-9	15.4	-	
G-2N	6/22/11	0-1	31.8	-	
G-3	6/22/11	0-1	29.6	-	
G-3N	6/22/11	0-1	44.7	-	
G-4	6/22/11	0-1	19	-	
G-5	6/22/11	0-1	7.6	-	
G-6	6/22/11	0-1	15	-	
G-7	6/22/11	0-1	7.5	-	
G-8	6/22/11	0-1	5.8	-	
TP1-0.5	1/27/11	0.5-1	88.1	-	In or adjacent to Northwest Area along E-W Ditch shoreline - Figure 4-3c
TP1-2	1/27/11	1.5-2.5	67.1	-	
TP1-4	1/27/11	3.5-4	3.3	-	
TP2-0.5	1/27/11	0.2-1	77.6	-	
TP2-2	1/27/11	1.5-2	13.7	-	
TP2-3	1/27/11	3-3.5	93.2	-	
TP3-1	1/27/11	0.5-1.5	44.6	-	
TP3-3	1/27/11	2.5-3.5	101	-	
TP3-5	1/27/11	4-5	2.5	-	
TP4-1	1/27/11	0.5-1.5	5.1	-	
TP4-3	1/27/11	2.5-3.5	66.9	-	
TP4-5	1/27/11	4-5	4.9	-	
TP5-1	1/27/11	0.5-1.5	15.3	-	
TP5-3	1/27/11	2.5-3.5	95.7	-	
TP5-5	1/27/11	4-5	36.8	-	
TP6-1	1/27/11	0.5-1.5	74.8	-	
TP6-3	1/27/11	2.5-3.5	2.3	-	

Notes P designates samples from geoprobe explorations
A-E designate samples from hollow stem auger borings for monitoring well installations.
* 3/3/11 Archive analysis
TP designates samples from Test Pit explorations
SB designates samples from slope sidewall explorations
IT - Intertidal sediment sample
(a) - Direct contact SL/SQO

TABLE 5-8 - Soil Samples Removed by 2013 IA

Former Arkema Mound Site
3009 Taylor Way, Tacoma, WA

Sample No.	Date	Depth (feet)	Arsenic	Lead	Comment (sample locations shown on Figure 4-3a unless indicated otherwise)
			(mg/kg)	(mg/kg)	
CUL	-----	-----	88/57(a)	1000/450(a)	
AT-SS-FD-B1	2009	At Grade	1.9	1.9	Surface samples - cell liner subgrade after mound removal - see Figure 4-1
AT-SS-FD-B3_B1	2009	At Grade	19.5	13.5	
AT-SS-FD-B3	2009	At Grade	3.6	3.7	
AT-SS-FD-B5_B3	2009	At Grade	9	2.4	
AT-SS-FD-D1	2009	At Grade	5	2	
AT-SS-FD-D1(H)	2009	At Grade	0.9	1.6	
AT-SS-FD-D3(ALT)	2009	At Grade	6	2	
AT-SS-FD-F1	2009	At Grade	1.7	2	
AT-SS-FD-F3	2009	At Grade	2	3	
AT-SS-FD-F3_D3	2009	At Grade	48	18	
AT-SS-FD-B1	Jun-09	At Grade	2.8	3	Surface samples - finished grade after mound removal - see Figure 4-2
AT-SS-FD-B3	Jun-09	At Grade	2.6	3	
AT-SS-FD-B5	Jun-09	At Grade	2.7	3	
AT-SS-FD-B6	Jun-09	At Grade	2.7	3	
AT-SS-FD-D1	Jun-09	At Grade	2.6	2	
AT-SS-FD-D3	Jun-09	At Grade	2.6	2.1	
AT-SS-FD-D5	Jun-09	At Grade	2.6	2	
AT-SS-FD-D6	Jun-09	At Grade	2.5	3	
AT-SS-FD-F1	Jun-09	At Grade	2.5	3.3	
AT-SS-FD-F3	Jun-09	At Grade	2.5	2	
AT-SS-FD-F5	Jun-09	At Grade	2.9	3	
AT-SS-FD-F6	Jun-09	At Grade	2.9	3	
AT-SS-FD-G1	Jun-09	At Grade	8.5	9	
AT-SS-FD-G3	Jun-09	At Grade	12	8	
AT-SS-FD-G5	Jun-09	At Grade	13.1	10	
AT-SS-FD-G6	Jun-09	At Grade	7.4	6	
P1-A	6/11/09	0-2	21.6	16	Probe soil samples along Hylebos shoreline
P1-B	6/11/09	2-5	25.4	15	
P1-C	6/11/09	6-8	1.6	<1	
P1-D	6/11/09	8-10	15.8	8	
P2-A	6/11/09	0-2.5	20.4	15	Probe soil samples along Hylebos shoreline
P2-B	6/11/09	2.5-5	19.5	14	
P2-C	6/11/09	5-7	26.6	22	
P2-D	6/11/09	7-10	25.2	12	
P3-A	6/11/09	0.5-2.5	91.9	75	Probe soil samples - Northwest Area
P3-B	6/11/09	2.5-5	58.3	11	
P3-C	6/11/09	5-8.5	6.5	1	
P3-D	6/11/09	9.5-10	4.1	4	
P4-A	6/11/09	1-3	103	121	Probe soil samples southwest corner of site
P4-B	6/11/09	3-5	8.4	4	
P4-C	6/11/09	5-7.5	1.8	2	
P4-D	6/11/09	7.5-10	2.7	2	
P5-A	6/11/09	0-2	6.1	7	Probe soil samples along Kaiser Ditch
P5-B	6/11/09	2-5	0.9	1	
P5-C	6/11/09	5-8	2.2	2	
P5-D	6/11/09	8-10	2.6	2	
P6-A	6/11/09	0.5-2.5	2.3	5	Probe soil samples central interior of site
P6-B	6/11/09	2.5-3.5	23.8	20	
P6-C	6/11/09	6.5-9	1.4	1	
P6-D	6/11/09	9-10	1	<1	
P7-A	6/11/09	0.5-3	2.8	7	Probe soil samples beneath former mound footprint
P7-B	6/11/09	3-5	2.7	3	
P7-C	6/11/09	5-6.5	3.3	3	
P7-D	6/11/09	6.5-10	1.4	1	
P8-A	6/11/09	1-3.5	73.4	74	Probe soil samples along East-West Ditch
P8-B	6/11/09	3.5-5	1.1	1	
P8-C	6/11/09	5-7	1.3	1	
P8-D	6/11/09	7-10	1.3	1	

TABLE 5-8 - Soil Samples Removed by 2013 IA

Former Arkema Mound Site
3009 Taylor Way, Tacoma, WA

Sample No.	Date	Depth (feet)	Arsenic	Lead	Comment (sample locations shown on Figure 4-3a unless indicated otherwise)
			(mg/kg)	(mg/kg)	
CUL	-----	-----	88/57(a)	1000/450(a)	
P9-A	6/11/09	0-1.5	4.2	5	Probe soil samples along Kaiser Ditch
P9-B	6/11/09	1.5-5	2.7	1	
P9-C	6/11/09	5-7.5	1.3	<1	
P9-D	6/11/09	7.5-10	0.9	1	
P10-A	6/11/09	1-2.5	54.1	43	Probe soil samples P-10 Area
P10-B	6/11/09	2.5-5	311	320	
P10-C	6/11/09	5-7.5	4.7	2	
P10-D	6/11/09	7.5-10	2.1	2	
P11-A	6/11/09	1-2.5	2.8	6	Probe soil samples beneath former mound footprint
P11-B	6/11/09	2.5-5	2.9	7	
P11-C	6/11/09	5-7.5	4.8	1	
P11-D	6/11/09	7.5-9.5	1.5	2	
P-12	5/12/10	0-1.5	30.4	35	Probe soil samples in northwest area along Hylebos and E-W ditch shoreline
P12 *	5/12/10	3	57.0	-	
P12 *	5/12/10	6	99.1	-	
P-13	5/12/10	0-2	40.5	28	Probe soil samples along Hylebos shoreline north side of log ramp
P-13	5/12/10	2-5	2.3	1	
P-14	5/12/10	0.5	5.2	7	Probe soil samples along Hylebos shoreline by P-2
P-14	5/12/10	2.5	16.6	3	
P-14	5/12/10	5	11.7	1	
P-14	5/12/10	7.5	10.3	9	
P-14	5/12/10	10	8.5	5	
P-14	5/12/10	12.5	6.8	7	
P-14	5/12/10	15	6.5	4	
P-14	5/12/10	17.5	2.2	3	
P-14	5/12/10	20	1.2	2	
P-15	5/12/10	1-3	15.8	11	Probe soil samples along Hylebos shoreline
P-16	5/11/10	0.5-2.5	62.6	20	Probe soil samples in Northwest Area along E-W ditch
P-16	5/11/10	2.5-5	8.2	21	
P-16*	5/11/10	7.5	2.3	-	
P-16*	5/11/10	10	6.0	-	
P-17	5/11/10	1-3.5	1.7	1	Probe soil samples along E-W Ditch near
P-18	5/12/10	2.5-4	14.5	13	Probe soil sample near head of E-W Ditch
P-19	5/12/10	0-1.5	45.7	108	Probe soil samples east side and near head of Kaiser Ditch (off-property)
P-19*	5/12/10	6	6.4	-	
P-19*	5/12/10	9	5.3	-	
P-24*	5/12/10	3	2.1	-	Probe soil samples along eastern property line (central portion)
P-24*	5/12/10	6	5.9	-	
P-27*	5/12/10	3	3.8	-	Probe soil samples along eastern property line near head of Kaiser Ditch
P-27*	5/12/10	6	5.9	-	
P-32*	5/12/10	3	4.8	-	Probe soil samples adjacent to Northwest Area
P-32*	5/12/10	6	13.2	-	
P33A	7/19/11	0-2.5	4.9	-	Probe samples in P10 Area - Figures 4-3b and 4-3e
P33B	7/19/11	2.5-5	144	-	
P33C	7/19/11	5-7.5	2.3	-	
P34A	7/19/11	0-0.25	28.8	-	
P34B	7/19/11	2.5-5	6	-	
P34C	7/19/11	5-7.5	2.7	-	
P36A	7/19/11	0-0.25	39.8	-	
P36B	7/19/11	2.5-5	6.9	-	
P36C	7/19/11	5-7.5	2.7	-	
P39A	7/19/11	0-0.25	37.4	-	
P39B	7/19/11	2.5-5	30.5	-	
P39C	7/19/11	5-7.5	6.1	-	
P42A	7/19/11	0-2.5	14.9	-	
P42B	7/19/11	2.5-5	164	-	
P42C	7/19/11	5-7.5	6.7	-	

TABLE 5-8 - Soil Samples Removed by 2013 IA

Former Arkema Mound Site
3009 Taylor Way, Tacoma, WA

Sample No.	Date	Depth	Arsenic	Lead	Comment (sample locations shown on Figure 4-3a unless indicated otherwise)
		(feet)	(mg/kg)	(mg/kg)	
CUL	-----	-----	88/57(a)	1000/450(a)	
P43A	7/19/11	0-2.5	16	-	Probe samples in/adjacent to P10 Area - Figures 4-3b and 4-3c
P43B	7/19/11	2.5-5	134	-	
P43C	7/19/11	5-7.5	49	-	
P44A	7/19/11	0-2.5	17.1	-	
P44B	7/19/11	2.5-5	9	-	
P44C	7/19/11	5-7.5	2.9	-	
MW A-0/1.5	6/10/09	0-1.5	22.6	11	Well soil samples in Northwest Area
MW A-2.5/4	6/10/09	2.5-4	18.1	13	
MW A-5/6.5	6/10/09	5-6.5	4.6	4	
MW A-7.5/9	6/10/09	7.5-9	5.6	6	
MW A-10-11.5	6/10/09	10-11.5	10.1	8	
MW A-12.5/14	6/10/09	12.5-14	4.7	5	
MW A-15/16.5	6/10/09	15-16.5	8.1	4	
MW B-1/2.5	6/10/09	1-2.5	8.4	7	Well soil samples with western central portion of site
MW B-2.5-4	6/10/09	2.5-4	1.9	2	
MW B-5/6.5	6/10/09	5-6.5	3.9	3	
MW B-7.5-9	6/10/09	7.6-9	1.2	2	
MW B-10/11.5	6/10/09	10-11.5	1.2	1	
MW B-12.5-14	6/10/09	12.5-14	2.7	3	
MW C-0/1.5	6/10/09	0-1.5	19.5	13	
MW C-2.5/4	6/10/09	2.5-4	79	60	
MW C-5/6.5	6/10/09	5-6.5	5.3	10	
MW C-7.5/9	6/10/09	7.5-9	1.2	2	
MW C-10/11.5	6/10/09	10-11.5	0.3	1	
MW D-0/1.5	6/10/09	0-1.5	4.4	9	Well soil samples near head of E-W Ditch
MW D-2.5/4	6/10/09	2.5-4	107	117	
MW D-5/6.5	6/10/09	5-6.5	6.9	1	
MW D-7.5/9	6/10/09	7.5-9	2.0	1	
MW D-10/11.5	6/10/09	10-11.5	3.5	2	Well soil samples adjacent to head of Kaiser Ditch
MW E-0/1.5	6/10/09	0-1.5	20.9	21	
MW E-2.5/4	6/10/09	2.5-4	7.4	10	
MW E-5/6.5	6/10/09	5-6.5	2.6	2	
MW E-7.5/9	6/10/09	7.5-9	16.5	4	
MW E-10/11.5	6/10/09	10-11.5	4.5	3	Bank soil samples - Northwest Area - along E-W Ditch slope
SB1-A	11/16/10	0-2	32.6	-	
SB1-B	11/16/10	2-3	7.6	-	Bank soil samples - Northwest Area - along E-W Ditch slope - near ditch mouth
SB2-A	11/15/10	0.5-2	278	-	
SB2-B	11/15/10	2-4	142	-	Bank soil samples - Northwest Area - along Hylebos shoreline at mouth of E-W Ditch
SB3-A	11/15/10	0-1	18.4	-	
SB3-B	11/15/10	1-2.5	124	-	
SB3-C	11/15/10	2.5-3	5.5	-	
SB3-D	11/15/10	3-4	1.9	-	
SB3-IT	11/15/10	10.0' MLLW	11.4	-	Bank soil samples - Northwest Area - along Hylebos shoreline - Figure 4-3c
SB4-A	11/15/10	0-1	29.9	-	
SB4-B	11/15/10	1-1.6	6.5	-	
SB4-C	11/15/10	1.6-3	3.2	-	
SB4-D	11/15/10	3-4	7.9	-	
SB4-IT	11/15/10	10.0' MLLW	8.8	-	
SB5-A	11/15/10	0-1.2	2.7	-	Bank soil samples - head of Kaiser Ditch slope (SB7 Area) - Figures 4-3b and 4-3d.
SB5-B	11/15/10	1.2-3	3.2	-	
SB5-IT	11/15/10	10.0' MLLW	7.5	-	
SB6-A	11/16/10	2	6.8	-	
SB6-B	11/16/10	6	34.2	-	
SB6-C	11/16/10	12	40.5	-	
SB7-A	11/16/10	1	86.8	-	
SB7-B	11/16/10	5	19.6	-	
SB7-C	11/16/10	10	6.2	-	

TABLE 5-8 - Soil Samples Removed by 2013 IA

Former Arkema Mound Site
3009 Taylor Way, Tacoma, WA

Sample No.	Date	Depth	Arsenic	Lead	Comment (sample locations shown on Figure 4-3a unless indicated otherwise)
		(feet)	(mg/kg)	(mg/kg)	
CUL	-----	-----	88/57(a)	1000/450(a)	
SB-8A	6/21/11	0-1	42.4	-	Bank soil samples - Northwest Area - along E-W Ditch slope - Figure 4-3c
SB-8B	6/21/11	1-2.5	1260	-	
SB-8C	6/21/11	2.5-3.5	378	-	
SB-9A	6/21/11	0-1	18.1	-	
SB-9B	6/21/11	1-2.5	16.1	-	
SB-9C	6/21/11	2.5-3.5	42	-	
SB-10A	6/21/11	0-1	23.6	-	
SB-10B	6/21/11	1-2.5	17	-	
SB-10C	6/21/11	2.5-4	6.6	-	
SB-11A	6/21/11	0-1	19.3	-	
SB-11B	6/21/11	1-2.5	4.8	-	
SB-11C	6/21/11	2.5-4	4.2	-	
SB-12A	6/21/11	0-1	3.7	-	
SB-12B	6/21/11	1-2.5	44.4	-	
SB-12C	6/21/11	2.5-4	38.2	-	
SB-12D	6/21/11	4-5	50.9	-	
SB-13A	6/21/11	0-1	18.4	-	
SB-13B	6/21/11	1-2.5	124	-	
SB-13C	6/21/11	2.5-3	5.5	-	
SB-13D	6/21/11	10.0' MLLW	1.9	-	
SB-14A	6/21/11	0-1	28.6	-	
SB-14B	6/21/11	1-2.5	58.4	-	
SB-14C	6/21/11	2.5-4	1.3	-	
SB-14D	6/21/11	4-5	12.5	-	
SB-15A	6/21/11	0-1	70.4	-	
SB-15B	6/21/11	1-2.5	73.5	-	
SB-15C	6/21/11	2.5-4	10.9	-	
SB-15D	6/21/11	4-5	9.9	-	
SB-16A	6/21/11	0-1	23.8	-	
SB-16B	6/21/11	1-2.5	51.2	-	
SB-16C	6/21/11	2.5-4	18.1	-	
SB-16D	6/21/11	4-5	65.7	-	
SB-17A	6/21/11	0-1	75.8	-	
SB-17B	6/21/11	1-2.5	64	-	
SB-17C	6/21/11	2.5-4	3.7	-	
SB-17D	6/21/11	4-5	29.1	-	
SB-18A	6/21/11	0-1	66.2	-	
SB-18B	6/21/11	1-2.5	34.4	-	
SB-18C	6/21/11	2.5-4	4.3	-	
SB-18D	6/21/11	4-5	11.2	-	
SB-19	6/22/11	0-1	8.4	-	SB7 Bank Area (along head of Kaiser Ditch shoreline) - Figures 4-3b and 4-3d
SB-19	6/22/11	2-4	9.9	-	
SB-20	6/22/11	0-1	7.3	-	
SB-20	6/22/11	2-4	38.4	-	
SB-21	6/22/11	0-1	122	-	
SB-21	6/22/11	2-4	108	-	
SB-21	6/22/11	5-7	42.7	-	
SB-21	6/22/11	9-10	89.7	-	
SB-22	6/22/11	0-1	35	-	
SB-22	6/22/11	2-4	43.4	-	
SB-23	6/22/11	0-1	10.1	-	
SB-23	6/22/11	2-4	16.5	-	
SB-24	6/22/11	0-1	15	-	
SB-24	6/22/11	2-4	12	-	
SB-25	6/22/11	0-1	3.4	-	
SB-25	6/22/11	2-4	16.7	-	
SB-26	6/22/11	0-1	5.3	-	
SB-26	6/22/11	2-4	12.1	-	

TABLE 5-8 - Soil Samples Removed by 2013 IA

Former Arkema Mound Site
3009 Taylor Way, Tacoma, WA

Sample No.	Date	Depth (feet)	Arsenic	Lead	Comment (sample locations shown on Figure 4-3a unless indicated otherwise)
			(mg/kg)	(mg/kg)	
CUL	-----	-----	88/57(a)	1000/450(a)	
PSB2	7/20/11	0-1	383	-	Probe soil samples adjacent to slope sample location SB2 - Northwest Area - Figure 4-3c
PSB2	7/20/11	1-2	285	-	
PSB2	7/20/11	2-3	46.3	-	
PSB2	7/20/11	3-4	7.8	-	
PSB3	7/20/11	0-1	44.1	-	Probe soil samples adjacent to slope sample location SB3 - Northwest Area - Figure 4-3c
PSB3	7/20/11	0-2	65.8	-	
PSB3	7/20/11	2-3	3.8	-	
PSB3	7/20/11	3-4	8.1	-	
PSB3	7/20/11	4-5	29.9	-	
PSB3	7/20/11	5-6	1.5	-	
PSB3	7/20/11	6-7	2	-	
PSB8	7/20/11	0-1	97.9	-	Probe soil samples adjacent to slope sample location SB8 - Northwest Area - Figure 4-3c
PSB8	7/20/11	1-2	93.5	-	
PSB8	7/20/11	2-3	81.9	-	
PSB8	7/20/11	3-4	22.8	-	
PSB16	7/20/11	0-1	21.5	-	Probe soil samples adjacent to slope sample location SB16 - Northwest Area - Figure 4-3c
PSB16	7/20/11	1-2	21.7	-	
PSB16	7/20/11	2-3	32.2	-	
PSB16	7/20/11	3-4	5.6	-	
PSB16	7/20/11	4-5	335	-	
G-1	6/22/11	0-1	21	-	SB7 Bank Area (top of bank along head of Kaiser Ditch shoreline) - Figure 4-3d.
G-1N	6/22/11	0-1	31.1	-	
G-2	6/22/11	0-1	122	-	
G-2	6/22/11	1-3	6.5	-	
G-2	6/22/11	3-5	10	-	
G-2	6/22/11	5-7	5.1	-	
G-2	6/22/11	7-9	15.4	-	
G-2N	6/22/11	0-1	31.8	-	
G-3	6/22/11	0-1	29.6	-	
G-3N	6/22/11	0-1	44.7	-	
G-4	6/22/11	0-1	19	-	
G-5	6/22/11	0-1	7.6	-	
G-6	6/22/11	0-1	15	-	
G-7	6/22/11	0-1	7.5	-	
G-8	6/22/11	0-1	5.8	-	
TP1-0.5	1/27/11	0.5-1	88.1	-	In or adjacent to Northwest Area along E-W Ditch shoreline - Figure 4-3c
TP1-2	1/27/11	1.5-2.5	67.1	-	
TP1-4	1/27/11	3.5-4	3.3	-	
TP2-0.5	1/27/11	0.2-1	77.6	-	
TP2-2	1/27/11	1.5-2	13.7	-	
TP2-3	1/27/11	3-3.5	93.2	-	
TP3-1	1/27/11	0.5-1.5	44.6	-	
TP3-3	1/27/11	2.5-3.5	101	-	
TP3-5	1/27/11	4-5	2.5	-	
TP4-1	1/27/11	0.5-1.5	5.1	-	
TP4-3	1/27/11	2.5-3.5	66.9	-	
TP4-5	1/27/11	4-5	4.9	-	
TP5-1	1/27/11	0.5-1.5	15.3	-	
TP5-3	1/27/11	2.5-3.5	95.7	-	
TP5-5	1/27/11	4-5	36.8	-	
TP6-1	1/27/11	0.5-1.5	74.8	-	
TP6-3	1/27/11	2.5-3.5	2.3	-	


Notes P designates samples from geoprobe explorations
A-E designate samples from hollow stem auger borings for monitoring well installations.
* 3/3/11 Archive analysis
TP designates samples from Test Pit explorations
SB designates samples from slope sidewall explorations
IT - Intertidal sediment sample; (a) - Direct contact SL/SQO
 Soil represented by sample removed as part of the 2013 Interim Action

TABLE 6-1 - Groundwater Analytical Data from Push-Probes, May 2010,

Arkema Mound Site
Tacoma, Washington

Probe Number	P12	P16	P17	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28	P32	P30	P31
Screen Depth (ft.)	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	7-11	6-10	6-10	4-8	6-10	6-10	21-25	21-25
Aquifer	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Intermed.	Intermed.
Date Sampled	5/12/10	5/11/10	5/11/10	5/12/10	5/11/10	5/13/10	5/13/10	5/12/10	5/12/10	5/13/10	5/13/10	5/12/10	5/13/10	5/12/10	5/13/10	5/13/10
Metals (mg/l)																
Arsenic (Screen 5 ug/l)	26 D	73 D	4.0 D	8.0 D	14 D	0.20 D	5.5 D	10 D	17 D	1.1 D	2.1 D	36 D	0.8 D	411 D	2.9 D	1.0 D
Copper (Screen 3 ug/l)	20 D	<2.0 U	<2.0 U	6.0 D	3 D	<0.5 U	2.5 D	<2.0 U	14 D	1.0 D	0.5 D	127 D	<0.5 U	<2.0 U	1.8 D	1.5 D
Lead (Screen 8 ug/l)	3.0 D	<2.0 U	<1.0 U	<2.0 U	<2.0 U	<1.0 U	2.0 D	<1.0 U	3.0 D	<1.0 U	<1.0 U	48 D	<1.0 U	<1.0 U	<1.0 U	<1.0 U
Zinc (Screen 81 ug/l)	190 D	<2.0 U	20 D	40 D	<20 U	14 D	63 D	260 D	140 D	41 D	34 D	490 D	26 D	80 D	38 D	75 D

Notes

D = Dissolved concentration, field filtered 0.45um
 - - - = Not measured-well and/or analyte not on monitoring schedule
 U = Not detected at indicated detection limit
 J = Estimated concentration
 N.R. = Not Reported


 Push-probe concentration above screening level

TABLE 6-2 - Groundwater Analytical Data, Upper Aquifer Monitoring Wells - 2008 to 2011

Arkema Mound Site
Tacoma, WA

Well Number - Aquifer	MW-1							MW2	MW-3						
	08/28/08	6/16/09	9/26/09	12/09/09	03/24/10	6/15/10	2/3/11		08/28/08	08/28/08	6/16/09	9/26/09	12/10/09	03/23/10	6/15/10
Field Parameters															
pH	6.2	6.1	6.0	6.0	6.0	6.2	6.6	6.5	6.4	5.8	6.0	6.1	5.9	6.0	6.0
Conductivity (uS/cm)	926	455	693	202	228	330	203	804	1213	620	731	591	943	929	927
Temperature (C)	15.2	15.0	18.2	12.2	11.1	14.0	9.6	15.4	16.1	13.6	17.6	14.0	11.6	12.9	11.7
Turbidity (NTU)	49.1	39.3	25.7	4.3	7.2	21.0	5.2	65.9	16.5	4.5	8.7	4.7	4.7	5.4	19.8
Ferrous Iron (mg/l)	---	4.1	4.5	1.8	0.8	2.0	0.2		---	4.2	4.8	5.6	4.8	3.8	4.8
Metals (ug/l)															
Arsenic (Screen 5 ug/l)	190	7.0 D	60 D	71 D	22 D	6.6 D	43 D	8.6 D	3.6	9.6 D	1.5 D	1.5 D	1.7 D	1.0 D	1.0 D
Copper (Screen 3 ug/l)	<5.0	1.0 D	1.1 D	<0.5 U	0.6 D	<0.5 U	<0.5 U	<5.0 U	<5.0	<0.5 U	<0.5 U	0.6 D	0.6 D	<0.5 U	<0.5 U
Lead (Screen 8 ug/l)	<2.0	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<2.0 U	<2.0	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
Zinc (Screen 81 ug/l)	<7.0	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<7.0 U	<7.0	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	10 D
Chromium (Screen 50 ug/l*)	---	---	---	---	---	---	<0.5 U	---	---	---	---	---	---	---	---
Nickel (Screen 8 ug/l)	---	---	---	---	---	---	<0.5 U	---	---	---	---	---	---	---	---
Other Parameters (mg/l)															
Iron	17	---	---	---	---	---	0.24 D	59	78.0	---	---	---	---	---	---
Cadmium	---	---	---	---	---	---	<.002 U	---	---	---	---	---	---	---	---
Calcium	---	---	---	---	---	---	35.4 D	---	---	---	---	---	---	---	---
Magnesium	---	---	---	---	---	---	2.85 D	---	---	---	---	---	---	---	---
Manganese	0.99	---	---	---	---	---	0.077 D	1.2	3.2	---	---	---	---	---	---
Silicon	---	---	---	---	---	---	8.57 D	---	---	---	---	---	---	---	---
Sodium	57	---	---	---	---	---	---	65	110.0	---	---	---	---	---	---
Alkalinity (mg/l CaCO3)	---	---	---	---	---	---	110	---	---	---	---	---	---	---	---
Carbonate (mg/l CaCO3)	---	---	---	---	---	---	<1 U	---	---	---	---	---	---	---	---
Bicarbonate (mg/l CaCO3)	---	---	---	---	---	---	110	---	---	---	---	---	---	---	---
Hydroxide (mg/l CaCO3)	---	---	---	---	---	---	<1 U	---	---	---	---	---	---	---	---
Chloride	13	---	---	---	---	---	1.6	26	45	---	---	---	---	---	---
Sulfates	3.6	---	---	---	---	---	2	2.2	4.4	---	---	---	---	---	---
Sulfide	---	---	---	---	---	---	<0.050 U	---	---	---	---	---	---	---	---
Dissolved Organic Carbon	---	---	---	---	---	---	4.31 D	---	---	---	---	---	---	---	---
TOC	26	---	---	---	---	---	---	48	54	---	---	---	---	---	---
Water Table															
Date Measured	8/28/08	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11	8/28/08	8/28/08	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11
Time	1000	1727	1435	1501	1347	1512	1600	1100	1200	1715	1428	1454	1341	1521	1532
Depth to water (ft.)	N.R.	3.70	4.82	3.86	3.58	3.15	3.35	N.R.	N.R.	5.85	6.81	6.10	5.84	5.89	5.75
Elevation (ft. MLLW)	12.50	13.39	12.3	13.23	13.51	13.94	13.74	12.10	10.90	11.62	10.66	11.37	11.63	11.58	11.72

Notes

- D = Dissolved concentration, field filtered 0.45um
- = Not measured-well and/or analyte not on monitoring schedule
- U = Not detected at indicated detection limit
- J = Estimated concentration
- N.R. = Not Reported
- * - Based on CR+6

- Concentration exceeds screening level

TABLE 6-2 - Groundwater Analytical Data, Upper Aquifer Monitoring Wells - 2008 to 2011

Arkema Mound Site
Tacoma, WA

Well Number - Aquifer	MW-4							MW-RRI-B-117						
	08/28/08	6/16/09	9/25/09	12/10/09	03/24/10	6/15/10	2/3/11	12/15/08	6/16/09	9/25/09	12/09/09	03/23/10	6/14/10	2/2/11
Field Parameters														
pH	6.3	6.1	6.1	6.2	5.9	6.2	6.1	6.6	6.0	6.1	6.1	6.0	6.2	6.1
Conductivity (uS/cm)	1678	800	775	265	622	738	467	627	433	355	461	603	728	1018
Temperature (C)	14.3	13.9	16.2	13.5	11.8	13.0	12.0	10.5	15.5	18.9	13.1	10.8	13.6	10.9
Turbidity (NTU)	76.6	12.9	23.0	6.2	9.3	12.7	13.6	5.4	5.8	3.1	13.5	7.2	7.0	22.2
Ferrous Iron (mg/l)	---	4.8	4.6	5.6	4.0	2.8	4.4	---	5.2	6.4	4.8	4.4	5.0	4.0
Metals (ug/l)														
Arsenic (Screen 5 ug/l)	6.5	2.4 D	3.8 D	3.8 D	1.7 D	1.2 D	1.3 D	280	5.0 D	5.2 D	3.3 D	2.6 D	2.5 D	3.6 D
Copper (Screen 3 ug/l)	8.3	<0.5 U	1.1 D	<0.5 U	0.5 D	0.5 D	0.7 D	<5.0	9.0 D	<0.5 U	0.7 D	0.6 D	<0.5 U	0.5 D
Lead (Screen 8 ug/l)	<2.0	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<2.0	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
Zinc (Screen 81 ug/l)	18	<4.0 U	187 D	810 D	510 D	3470 D	129 D	24	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	1.0 D
Chromium (Screen 50 ug/l*)	---	---	---	---	---	---	2.0 D	---	---	---	---	---	---	---
Nickel (Screen 8 ug/l)	---	---	---	---	---	---	1.0 D	---	---	---	---	---	---	---
Other Parameters (mg/l)														
Iron	76.0	---	---	---	---	---	26 D	25	---	---	---	---	---	---
Cadmium	---	---	---	---	---	---	<.002 U	---	---	---	---	---	---	---
Calcium	---	---	---	---	---	---	25.5 D	---	---	---	---	---	---	---
Magnesium	---	---	---	---	---	---	12.1 D	---	---	---	---	---	---	---
Manganese	2.1	---	---	---	---	---	0.61 D	1.1	---	---	---	---	---	---
Silicon	---	---	---	---	---	---	22.1 D	---	---	---	---	---	---	---
Sodium	180.0	---	---	---	---	---	---	280	---	---	---	---	---	---
Alkalinity (mg/l CaCO3)	---	---	---	---	---	---	197	---	---	---	---	---	---	---
Carbonate (mg/l CaCO3)	---	---	---	---	---	---	<1 U	---	---	---	---	---	---	---
Bicarbonate (mg/l CaCO3)	---	---	---	---	---	---	197	---	---	---	---	---	---	---
Hydroxide (mg/l CaCO3)	---	---	---	---	---	---	<1 U	---	---	---	---	---	---	---
Chloride	100	---	---	---	---	---	17.7	160	---	---	---	---	---	---
Sulfates	1.3	---	---	---	---	---	3.6	5.3	---	---	---	---	---	---
Sulfide	---	---	---	---	---	---	<0.050 U	---	---	---	---	---	---	---
Dissolved Organic Carbon	---	---	---	---	---	---	19.8 D	---	---	---	---	---	---	---
TOC	83	---	---	---	---	---	---	24	---	---	---	---	---	---
Water Table														
Date Measured	8/28/08	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11	12/15/08	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11
Time	1300	1713	1430	1456	1342	1523	1548	1030	1709	1424	1450	1338	1517	1528
Depth to water (ft.)	N.R.	5.80	7.06	5.85	5.52	5.19	5.25	N.R.	3.94	4.32	3.58	4.10	3.75	3.84
Elevation (ft. MLLW)	10.30	11.00	9.74	10.95	11.28	11.61	11.55	12.10	11.31	10.91	11.67	11.15	11.5	11.41

Notes

- D = Dissolved concentration, field filtered 0.45um
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- U = Not detected at indicated detection limit
- J = Estimated concentration
- N.R. = Not Reported
- * - Based on CR+6

- Concentration exceeds screening level

TABLE 6-2 - Groundwater Analytical Data, Upper Aquifer Monitoring Wells - 2008 to 2011

Arkema Mound Site
Tacoma, WA

Well Number - Aquifer	MW-RRI-B-146							MW-RRI-B-147						
	12/15/08	6/16/09	9/26/09	12/09/09	03/24/10	6/14/10	2/4/11	12/15/08	6/16/09	9/25/09	12/09/09	03/23/10	6/14/10	2/3/11
Field Parameters														
pH	6.4	6.1	6.1	6.3	6.1	6.3	6.2	6.7	6.2	6.2	6.5	6.3	6.7	6.4
Conductivity (uS/cm)	1419	656	690	1033	992	1059	1105	2106	496	821	562	637	449	397
Temperature (C)	12.1	14.0	17.9	13.9	11.6	13.1	10.9	12.7	13.7	17.9	12.5	10.7	13.1	10.1
Turbidity (NTU)	19.9	5.2	29.0	9.7	11.5	5.2	210.0	10.5	5.4	7.2	4.3	6.1	19.3	10.9
Ferrous Iron (mg/l)	---	4.0	4.2	6.0	4.2	5.2	3.8	---	5.2	5.2	5.8	3.4	3.4	1.4
Metals (ug/l)														
Arsenic (Screen 5 ug/l)	8.0	8.1 D	3.5 D	4.4 D	6.0 D	4.8 D	4.2 D	16	29 D	27 D	19 D	12 D	6.7 D	3.2 D
Copper (Screen 3 ug/l)	<5.0	1.0 D	0.8 D	<0.5 U	0.7 D	<0.5 U	0.6 D	<5.0 U	1.1 D	0.6 D	<0.5 U	0.7 D	<0.5 U	<0.5 U
Lead (Screen 8 ug/l)	<2.0	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<2.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
Zinc (Screen 81 ug/l)	<7.0	<4.0 U	<4.0 U	<4.0 U	<4.0 U	25 D	1670 D	<7.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U
Chromium (Screen 50 ug/l*)	---	---	---	---	---	---	---	---	---	---	---	---	---	2.0 D
Nickel (Screen 8 ug/l)	---	---	---	---	---	---	---	---	---	---	---	---	---	0.7 D
Other Parameters (mg/l)														
Iron	90	---	---	---	---	---	---	24	---	---	---	---	---	10.4 D
Cadmium	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.0002 U
Calcium	---	---	---	---	---	---	---	---	---	---	---	---	---	23.5 D
Magnesium	---	---	---	---	---	---	---	---	---	---	---	---	---	4.4 D
Manganese	1.9	---	---	---	---	---	---	0.77	---	---	---	---	---	0.388 D
Silicon	---	---	---	---	---	---	---	---	---	---	---	---	---	28.3 D
Sodium	99	---	---	---	---	---	---	24	---	---	---	---	---	---
Alkalinity (mg/l CaCO3)	---	---	---	---	---	---	---	---	---	---	---	---	---	194
Carbonate (mg/l CaCO3)	---	---	---	---	---	---	---	---	---	---	---	---	---	<1 U
Bicarbonate (mg/l CaCO3)	---	---	---	---	---	---	---	---	---	---	---	---	---	194
Hydroxide (mg/l CaCO3)	---	---	---	---	---	---	---	---	---	---	---	---	---	<1 U
Chloride	53	---	---	---	---	---	---	4.4	---	---	---	---	---	9.8
Sulfates	0.51	---	---	---	---	---	---	19	---	---	---	---	---	2.8
Sulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.050 U
Dissolved Organic Carbon	---	---	---	---	---	---	---	---	---	---	---	---	---	11
TOC	52	---	---	---	---	---	---	38	---	---	---	---	---	---
Water Table														
Date Measured	12/15/08	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11	12/15/08	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11
Time	1330	1717	1438	1503	1349	1537	1545	1130	1719	1439	1504	1352	1538	1540
Depth to water (ft.)	N.R.	4.76	6.34	5.83	4.85	4.87	4.99	N.R.	4.78	6.09	4.05	3.95	3.70	3.80
Elevation (ft. MLLW)	14.7	13.2	11.6	12.14	13.12	13.1	12.98	14.20	12.39	11.08	13.12	13.22	13.47	13.37

Notes

- D = Dissolved concentration, field filtered 0.45um
- = Not measured-well and/or analyte not on monitoring schedule
- U = Not detected at indicated detection limit
- J = Estimated concentration
- N.R. = Not Reported
- * - Based on CR+6

- Concentration exceeds screening level

TABLE 6-2 - Groundwater Analytical Data, Upper Aquifer Monitoring Wells - 2008 to 2011

Arkema Mound Site
Tacoma, WA

Well Number - Aquifer	MW-A						MW-B					
	6/16/09	9/25/09	12/09/09	03/23/10	6/16/10	2/3/11	6/16/09	9/25/09	12/09/09	03/23/10	6/14/10	2/4/11
Field Parameters												
pH	6.0	6.0	6.1	6.0	6.2	6.1	5.9	6.1	6.2	6.1	6.3	6.1
Conductivity (uS/cm)	459	656	453	615	665	577	477	572	426	853	1082	1265
Temperature (C)	13.4	15.8	13.0	10.6	13.1	10.4	13.6	17.6	13.4	11.5	13.1	11.4
Turbidity (NTU)	5.0	12.8	9.6	3.5	2.1	5.9	16.8	13.6	7.8	4.4	45.1	127.0
Ferrous Iron (mg/l)	2.4	3.6	3.4	5.4	4.2	4.8	5.0	5.6	6.0	5.6	5.4	3.4
Metals (ug/l)												
Arsenic (Screen 5 ug/l)	1170 D	548 D	1600 D	1680 D	1590 D	790 D	3.5 D	4.0 D	2.9 D	2.7 D	2.3 D	2.7 D
Copper (Screen 3 ug/l)	1.2 D	1.1 D	1.0 D	0.8 D	1.0 D	1.0 D	<0.5 D	<0.5 U	1.0 D	0.9 D	<0.5 U	0.8 D
Lead (Screen 8 ug/l)	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
Zinc (Screen 81 ug/l)	<4.0 U	<4.0 U	5.0 D	5.0 D	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	60 D
Chromium (Screen 50 ug/l*)	---	---	---	---	2.0 D	3.0 D	---	---	---	---	---	---
Nickel (Screen 8 ug/l)	---	---	---	---	2.0 D	1.9 D	---	---	---	---	---	---
Other Parameters (mg/l)												
Iron	---	---	---	---	34.8 D	34.2 D	---	---	---	---	---	---
Cadmium	---	---	---	---	<0.0002 U	<0.0002 U	---	---	---	---	---	---
Calcium	---	---	---	---	44.8 D	52.1 D	---	---	---	---	---	---
Magnesium	---	---	---	---	14.2 D	16.0 D	---	---	---	---	---	---
Manganese	---	---	---	---	1.32 D	1.41 D	---	---	---	---	---	---
Silicon	---	---	---	---	27.0 D	25.9 D	---	---	---	---	---	---
Sodium	---	---	---	---	---	---	---	---	---	---	---	---
Alkalinity (mg/l CaCO3)	---	---	---	---	254	248	---	---	---	---	---	---
Carbonate (mg/l CaCO3)	---	---	---	---	<1 U	<1 U	---	---	---	---	---	---
Bicarbonate (mg/l CaCO3)	---	---	---	---	254	248	---	---	---	---	---	---
Hydroxide (mg/l CaCO3)	---	---	---	---	<1 U	<1 U	---	---	---	---	---	---
Chloride	---	---	---	---	20.0	10.2	---	---	---	---	---	---
Sulfates	---	---	---	---	25.7	17.8	---	---	---	---	---	---
Sulfide	---	---	---	---	<0.05 U	<0.05 U	---	---	---	---	---	---
Dissolved Organic Carbon	---	---	---	---	26.0	24.6	---	---	---	---	---	---
TOC	---	---	---	---	---	---	---	---	---	---	---	---
Water Table												
Date Measured	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11
Time	1705	1422	1447	1335	1512	1531	1707	1426	1451	1339	1518	1534
Depth to water (ft.)	3.94	7.98	5.92	6.63	5.70	5.61	4.18	5.27	3.90	3.79	3.80	3.70
Elevation (ft. MLLW)	13.39	9.35	11.41	10.7	11.63	11.72	12.06	10.97	12.34	12.45	12.44	12.54

Notes

D = Dissolved concentration, field filtered 0.45um
 --- = Not measured-well and/or analyte not on monitoring schedule
 U = Not detected at indicated detection limit
 J = Estimated concentration
 N.R. = Not Reported
 * - Based on CR+6


 - Concentration exceeds screening level

TABLE 6-2 - Groundwater Analytical Data, Upper Aquifer Monitoring Wells - 2008 to 2011

Arkema Mound Site
Tacoma, WA

Well Number - Aquifer	MW-C						MW-D					
	6/16/09	9/25/09	12/10/09	03/23/10	6/14/10	2/4/11	6/16/09	9/25/09	12/09/09	03/23/10	6/14/10	2/2/11
Field Parameters												
pH	6.1	6.2	6.2	6.1	6.3	6.1	6.5	6.3	6.6	6.2	6.3	6.5
Conductivity (uS/cm)	716	750	723	1283	1233	1222	836	960	329	275	362	212
Temperature (C)	12.9	16.4	14.8	12.2	12.7	12.8	13.0	17.1	11.4	9.9	11.8	8.9
Turbidity (NTU)	7.4	8.6	10.1	4.6	18.4	7.1	7.3	10.0	6.5	6.8	5.4	18.4
Ferrous Iron (mg/l)	8.2	4.4	5.8	5.0	4.6	2.8	3.5	4.8	4.6	4.4	4.6	4.0
Metals (ug/l)												
Arsenic (Screen 5 ug/l)	3.5 D	1.2 D	1.4 D	1.5 D	1.0 D	1.0 D	12.3 D	11.2 D	3.7 D	3.2 D	3.9 D	3.0 D
Copper (Screen 3 ug/l)	0.8 D	0.5 D	<0.5 U	0.7 D	<0.5 U	0.6 D	0.7 D	<0.5 U	0.9 D	0.6 D	1.8 D	0.8 D
Lead (Screen 8 ug/l)	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
Zinc (Screen 81 ug/l)	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	153 D	<4.0 U	<4.0 U	11 D	<4.0 U	<4.0 U	<4.0 U
Chromium (Screen 50 ug/l*)	---	---	---	---	---	---	---	---	---	---	---	---
Nickel (Screen 8 ug/l)	---	---	---	---	---	---	---	---	---	---	---	---
Other Parameters (mg/l)												
Iron	---	---	---	---	---	---	---	---	---	---	---	---
Cadmium	---	---	---	---	---	---	---	---	---	---	---	---
Calcium	---	---	---	---	---	---	---	---	---	---	---	---
Magnesium	---	---	---	---	---	---	---	---	---	---	---	---
Manganese	---	---	---	---	---	---	---	---	---	---	---	---
Silicon	---	---	---	---	---	---	---	---	---	---	---	---
Sodium	---	---	---	---	---	---	---	---	---	---	---	---
Alkalinity (mg/l CaCO3)	---	---	---	---	---	---	---	---	---	---	---	---
Carbonate (mg/l CaCO3)	---	---	---	---	---	---	---	---	---	---	---	---
Bicarbonate (mg/l CaCO3)	---	---	---	---	---	---	---	---	---	---	---	---
Hydroxide (mg/l CaCO3)	---	---	---	---	---	---	---	---	---	---	---	---
Chloride	---	---	---	---	---	---	---	---	---	---	---	---
Sulfates	---	---	---	---	---	---	---	---	---	---	---	---
Sulfide	---	---	---	---	---	---	---	---	---	---	---	---
Dissolved Organic Carbon	---	---	---	---	---	---	---	---	---	---	---	---
TOC	---	---	---	---	---	---	---	---	---	---	---	---
Water Table												
Date Measured	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11
Time	1711	1427	1453	1340	1520	1530	1729	1437	1505	1350	1536	1602
Depth to water (ft.)	8.21	8.77	7.96	8.20	7.91	7.99	3.16	4.22	1.93	1.88	1.15	1.60
Elevation (ft. MLLW)	11.01	10.45	11.26	11.02	11.31	11.23	12.2	11.1	13.38	13.43	14.16	13.71

Notes

D = Dissolved concentration, field filtered 0.45um
 --- = Not measured-well and/or analyte not on monitoring schedule
 U = Not detected at indicated detection limit
 J = Estimated concentration
 N.R. = Not Reported
 * - Based on CR+6


 - Concentration exceeds screening level

TABLE 6-2 - Groundwater Analytical Data, Upper Aquifer Monitoring Wells - 2008 to 2011

Arkema Mound Site
Tacoma, WA

Well Number - Aquifer	MW-E						MW-F		MW-G		MW-H	MW-J	MW-K	MW-L
	6/16/09	9/25/09	12/10/09	03/24/10	6/15/10	2/3/11	6/16/10	2/2/11	6/16/10	2/2/11	2/3/11	2/2/11	2/2/11	2/3/11
Field Parameters														
pH	6.2	6.3	6.5	6.2	6.4	6.0	6.6	6.7	7.1	7.0	6.5	6.3	6.6	7.0
Conductivity (uS/cm)	2606	2550	574	1549	1330	562	1110	1244	3935	3018	1101	470	295	21
Temperature (C)	13.2	17.2	13.3	9.6	11.9	9.4	12.2	6.7	13.2	9.6	11.3	10.6	10.4	10.6
Turbidity (NTU)	28.6	7.8	2.2	7.0	7.0	3.2	2.1	4.1	35.2	8.3	22.5	6.6	3.1	34.7
Ferrous Iron (mg/l)	4.2	4.6	5.2	3.0	4.4	5.6	5.6	4.0	2.8	3.4	4.6	4.6	4.8	5.0
Metals (ug/l)														
Arsenic (Screen 5 ug/l)	12.4 D	13.4 D	30.8 D	40.3 D	19.0 D	23.4 D	0.7 D	0.7 D	1.6 D	1.4 D	45.5 D	10.4 D	1.2 D	0.9 D
Copper (Screen 3 ug/l)	5.4 D	3.1 D	1.2 D	0.7 D	2.0 D	<0.5 U	<0.5 U	<0.5 U	0.7 D	0.8 D	0.8 D	<5.0 U	<5.0 U	<5.0 U
Lead (Screen 8 ug/l)	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
Zinc (Screen 81 ug/l)	12.0 D	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U
Chromium (Screen 50 ug/l*)	---	---	---	---	---	2 D	3.0 D	---	13 D	---	2.0 D	---	---	3.0
Nickel (Screen 8 ug/l)	---	---	---	---	---	5.2 D	1.0 D	---	1.0 D	---	2.8 D	---	---	1.2
Other Parameters (mg/l)														
Iron	---	---	---	---	---	39.1 D	26.3 D	---	21.8 D	---	39.2 D	---	---	20.2
Cadmium	---	---	---	---	---	<0.0002 U	<0.0002 U	---	<0.0002 U	---	<0.0002 U	---	---	<0.0002 U
Calcium	---	---	---	---	---	32.7 D	34.3 D	---	17.8 D	---	62.5 D	---	---	9.5
Magnesium	---	---	---	---	---	23.5 D	13.7 D	---	11.0 D	---	25.5 D	---	---	4.3
Manganese	---	---	---	---	---	1.61 D	0.52 D	---	0.63 D	---	2.40 D	---	---	0.396
Silicon	---	---	---	---	---	29.1 D	30.7 D	---	34.0 D	---	24.9 D	---	---	20.1
Sodium	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Alkalinity (mg/l CaCO3)	---	---	---	---	---	259	430.0	---	577	---	390	---	---	64
Carbonate (mg/l CaCO3)	---	---	---	---	---	<1.0 U	<1 U	---	<1 U	---	<1 U	---	---	<1 U
Bicarbonate (mg/l CaCO3)	---	---	---	---	---	259	430.0	---	577	---	390	---	---	64
Hydroxide (mg/l CaCO3)	---	---	---	---	---	<1.0 U	<1 U	---	<1 U	---	<1 U	---	---	<1 U
Chloride	---	---	---	---	---	41.1	84.6	---	842	---	16.0	---	---	16
Sulfates	---	---	---	---	---	0.4	<0.5 U	---	0.6	---	36.9	---	---	36.5
Sulfide	---	---	---	---	---	<0.05 U	<0.05 U	---	<0.05 U	---	<0.05 U	---	---	<0.05 U
Dissolved Organic Carbon	---	---	---	---	---	24.1	17.0	---	66	---	100	---	---	13
TOC	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Water Table														
Date Measured	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11	6/4/10	2/1/11	6/4/10	2/1/11	2/1/11	2/1/11	2/1/11	2/1/11
Time	1723	1432	1458	1345	1527	1556	1515	1525	1542	1536	1530	1603	1605	1551
Depth to water (ft.)	7.02	7.00	5.89	6.30	5.79	5.10	9.93	10.02	0.96	1.47	5.68	3.92	4.35	4.44
Elevation (ft. MLLW)	8.97	8.99	10.10	9.69	10.2	10.89	11.18	11.09	13.92	13.41	11.18	12.01	11.08	11.36

Notes

- D = Dissolved concentration, field filtered 0.45um
- = Not measured-well and/or analyte not on monitoring schedule
- U = Not detected at indicated detection limit
- J = Estimated concentration
- N.R. = Not Reported
- * - Based on CR+6


 - Concentration exceeds screening level

TABLE 6-2 - Groundwater Analytical Data, Upper Aquifer Monitoring Wells - 2008 to 2011

Arkema Mound Site
Tacoma, WA

Well Number - Aquifer	SS-1	MW-AK2					
	2/3/11	6/16/09	9/25/09	12/10/09	03/24/10	6/15/10	2/4/11
Field Parameters							
pH	6.3	6.3	6.3	6.3	6.3	6.4	6.3
Conductivity (uS/cm)	4475	863	909	707	1262	1411	1115
Temperature (C)	5.4	13.4	17.0	13.5	11.4	12.6	10.9
Turbidity (NTU)	4.9	3.7	2.8	8.7	9.2	7.3	23.8
Ferrous Iron (mg/l)	1.0	0.0	0.0	6.0	5.2	4.6	5.2
Metals (ug/l)							
Arsenic (Screen 5 ug/l)	2.0 D	1.0 D	<0.5 U	1.2 D	0.6 D	<0.5 U	0.5 D
Copper (Screen 3 ug/l)	9.0 D	0.5 D	<0.0 U	0.6 D	0.8 D	<0.5 U	<0.5 U
Lead (Screen 8 ug/l)	<2.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
Zinc (Screen 81 ug/l)	10 D	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U
Chromium (Screen 50 ug/l*)	<1.0 U	---	---	---	---	---	---
Nickel (Screen 8 ug/l)	5.0	---	---	---	---	---	---
Other Parameters (mg/l)							
Iron	0.9	---	---	---	---	---	---
Cadmium	<0.0005 U	---	---	---	---	---	---
Calcium	64.9	---	---	---	---	---	---
Magnesium	129.0	---	---	---	---	---	---
Manganese	0.15	---	---	---	---	---	---
Silicon	13.0	---	---	---	---	---	---
Sodium	---	---	---	---	---	---	---
Alkalinity (mg/l CaCO3)	277	---	---	---	---	---	---
Carbonate (mg/l CaCO3)	<1 U	---	---	---	---	---	---
Bicarbonate (mg/l CaCO3)	277	---	---	---	---	---	---
Hydroxide (mg/l CaCO3)	<1 U	---	---	---	---	---	---
Chloride	2090	---	---	---	---	---	---
Sulfates	328.0	---	---	---	---	---	---
Sulfide	<0.05 U	---	---	---	---	---	---
Dissolved Organic Carbon	13	---	---	---	---	---	---
TOC	---	---	---	---	---	---	---
Water Table							
Date Measured	---	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11
Time	---		1434	1457	1344	1525	1554
Depth to water (ft.)	---	5.91	6.99	5.40	5.24	4.88	4.91
Elevation (ft. MLLW)	---	10.37	9.29	10.88	11.04	11.4	11.37

Notes

- D = Dissolved concentration, field filtered 0.45um
- = Not measured-well and/or analyte not on monitoring schedule
- U = Not detected at indicated detection limit
- J = Estimated concentration
- N.R. = Not Reported
- * - Based on CR+6 - Concentration exceeds screening level

TABLE 6-3 - Groundwater Analytical Data, Intermediate Aquifer Monitoring Wells

Arkema Mound Site
Tacoma, WA

Well Number - Aquifer	MW-AK1						MW-A2		MW-F2		MW-G2		MW-147(2)	
	6/16/09	9/26/09	12/10/09	03/23/10	6/15/10	2/1/11	6/16/10	2/3/11	6/16/10	2/2/11	6/16/10	2/2/11	6/14/10	2/2/11
Field Parameters														
pH	6.5	6.4	6.4	6.4	6.5	---	9.2	9.2	6.6	6.6	6.8	6.9	6.8	6.5
Conductivity (uS/cm)	2737	2404	2180	4399	4395	---	37071	35350	14761	15640	17332	17981	9462	8914
Temperature (C)	14.2	14.5	13.6	13.6	13.3	---	12.7	12.6	13.2	13.3	12.7	12.2	13.0	13.4
Turbidity (NTU)	115.0	315.0	175.0	61.0	227.0	---	4.7	3.5	4.4	2.5	20.9	18.2	4.6	2.8
Ferrous Iron (mg/l)	3.0	3.4	3.4	3.6	3.4	---	1.0	0.2	4.6	3.8	4.6	4.0	5.0	4.2
Metals (mg/l)														
Arsenic (Screen 0.036 mg/l)	3.4 D	3.6 D	2.0 D	2.8 D	4.8 D	---	154 D	136 D	5.0 D	3.0 D	6.0 D	2.0 D	5.6 D	6.0 D
Copper (Screen 0.003 mg/l)	1.2 D	1.9 D	1.9 D	1.2 D	2.1 D	---	<5.0 U	5.0 D	<2.0 U	<2.0 U	<2.0 U	<2.0 U	0.9 D	<2.0 U
Lead (Screen 0.008 mg/l)	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	---	<1.0 U	<1.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<2.0 U	<5.0 U
Zinc (Screen 0.081 mg/l)	<4.0 U	<4.0 U	<4.0 U	<4.0 U	<4.0 U	---	<4.0 U	<4.0 U	<20 U	<20 U	<20 U	<20 U	<4.0 U	<20 U
Chromium (Screen 0.050 mg/l*)	---	---	---	---	---	---	108	116 D	18	---	4.0	---	---	---
Nickel (Screen 0.008 mg/l)	---	---	---	---	---	---	12	14 D	4.0	---	10	---	---	---
Other Parameters (mg/l)														
Iron	---	---	---	---	---	---	2.38	0.2 D	7.46	---	5.31	---	---	---
Cadmium	---	---	---	---	---	---	<0.002 U	<0.002 U	<0.001 U	---	<0.001 U	---	---	---
Calcium	---	---	---	---	---	---	15.6	13.8 D	84.1	---	143	---	---	---
Magnesium	---	---	---	---	---	---	21.2	12.9 D	218	---	431	---	---	---
Manganese	---	---	---	---	---	---	0.092	0.1 D	0.339	---	0.311	---	---	---
Silicon	---	---	---	---	---	---	19.5	21.7 D	22.4	---	18.3	---	---	---
Sodium	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Alkalinity (mg/l CaCO3)	---	---	---	---	---	---	2360	2490	1370	---	1630	---	---	---
Carbonate (mg/l CaCO3)	---	---	---	---	---	---	653	954	<1 U	---	<1 U	---	---	---
Bicarbonate (mg/l CaCO3)	---	---	---	---	---	---	1710	1530	1370	---	1630	---	---	---
Hydroxide (mg/l CaCO3)	---	---	---	---	---	---	<1 U	<1 U	<1 U	---	<1 U	---	---	---
Chloride	---	---	---	---	---	---	11600	11200	4540	---	5200	---	---	---
Sulfates	---	---	---	---	---	---	730	724	52.6	---	266	---	---	---
Sulfide	---	---	---	---	---	---	65.1	68.4	<0.05 U	---	<0.05 U	---	---	---
Dissolved Organic Carbon	---	---	---	---	---	---	94.8	19.7	43.2	---	19.8	---	---	---
TOC	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Water Levels														
Date Measured	6/15/09	9/24/09	12/8/09	3/22/10	6/4/10	2/1/11	6/4/10	2/1/11	6/4/10	2/1/11	6/4/10	2/1/11	6/4/10	2/1/11
Time	1731	1434	1500	1346	1528	1558	1513	1554	1516	1526	1543	1537	1539	1541
Depth to water (ft.)	8.53	8.47	8.22	8.80	8.13	7.45	9.40	7.60	14.89	11.35	5.95	5.91	8.35	7.98
Elevation (ft. MLLW)	8.65	8.71	8.96	8.38	9.05	9.73	7.54	9.34	6.32	9.86	8.94	8.98	8.83	9.20

Notes

- D = Dissolved concentration, field filtered 0.45um
- = Not measured-well and/or analyte not on monitoring schedule
- U = Not detected at indicated detection limit
- J = Estimated concentration
- N.R. = Not Reported
- * - As Cr+6

Concentration exceeds screening level

TABLE 6-5 - GROUNDWATER SCREENING LEVEL SOURCES

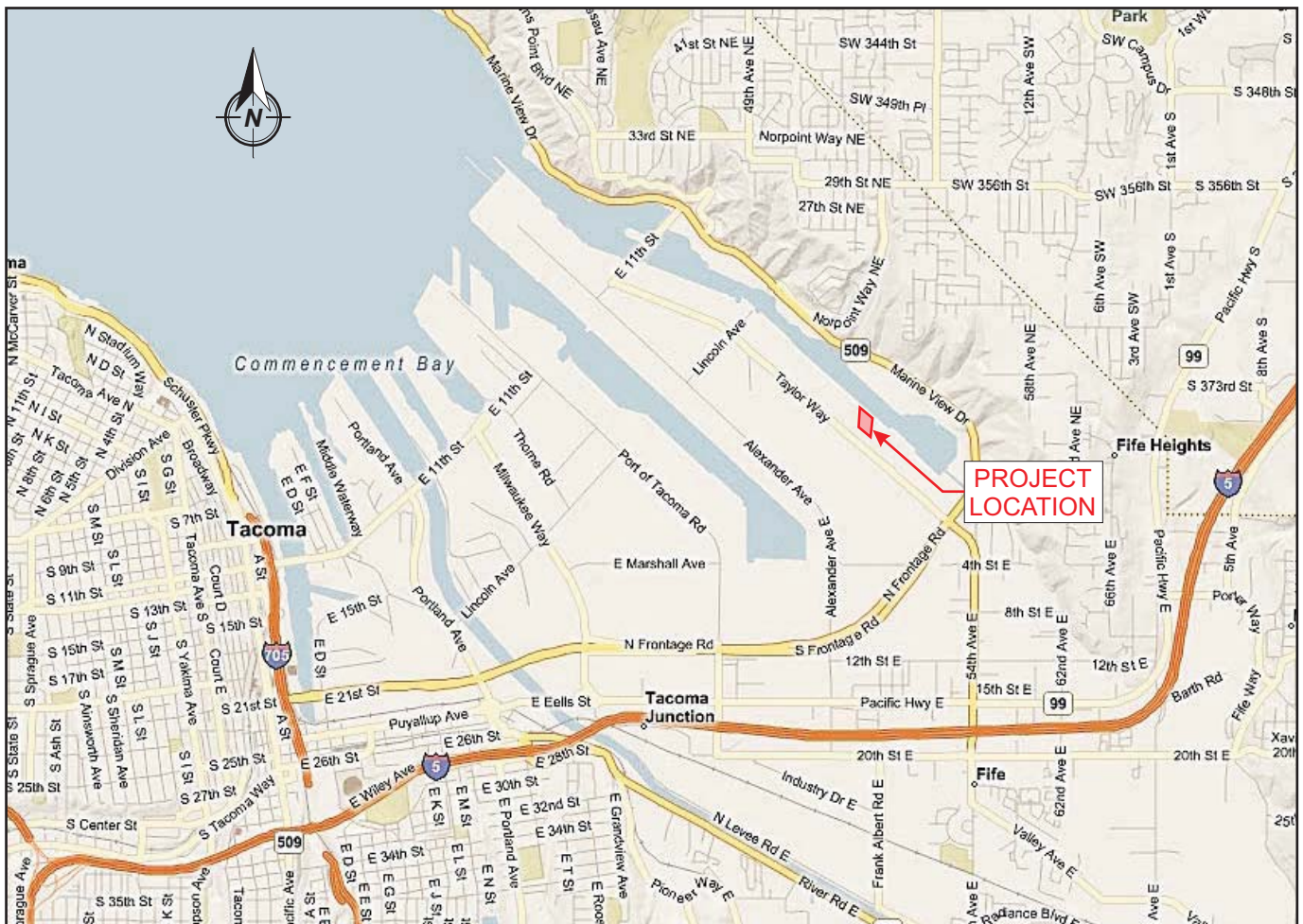
Former Arkema Mound Site
Tacoma, Washington

Detected Constituents	Units	Screening Level (SL)	Protect Marine Surface Water/Sediment					
			Aquatic Life - Chronic			Human Health		
			173-201A	CWA (a)	NTR (b)	CWA (a)	NTR (b)	Method B(c)
Dissolved Arsenic	ug/l	5 (d)	36	36	36	0.14	0.14	0.10
Dissolved Chromium (as Cr+6)	ug/l	50	50	50	50	-----	-----	486
Dissolved Copper	ug/l	3.1	3.1	3.1	2.4(f)	-----	-----	2880
Dissolved Lead	ug/l	8.1	8.1	8.1	8.1	-----	-----	-----
Dissolved Nickel	ug/l	8.2	8.2	8.2	8.2	4600	4600	1000
Dissolved Zinc	ug/l	81	81	81	81	26000	-----	16500

- Notes: (a) - Clean Water Act 304.
 (b) - National Toxic Rule (NTR 40CFR131)
 (c) - WAC 173-340-730. Values obtained from CLARC updated Feb. 2015.
 (d) - SL adjusted for Washignton State background.
 (e) - Site specific data (water effects ratio) required to apply this value.



Not to Scale



Not To Scale

General Note:
Vicinity map images come from
Microsoft Virtual Earth web site.

Port of Tacoma
Tacoma, Washington
Remedial Investigation and Feasibility Study
Removal of Woodwaste/Slag Containment Cell
3009 Taylor Way, Tacoma WA

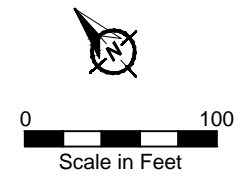
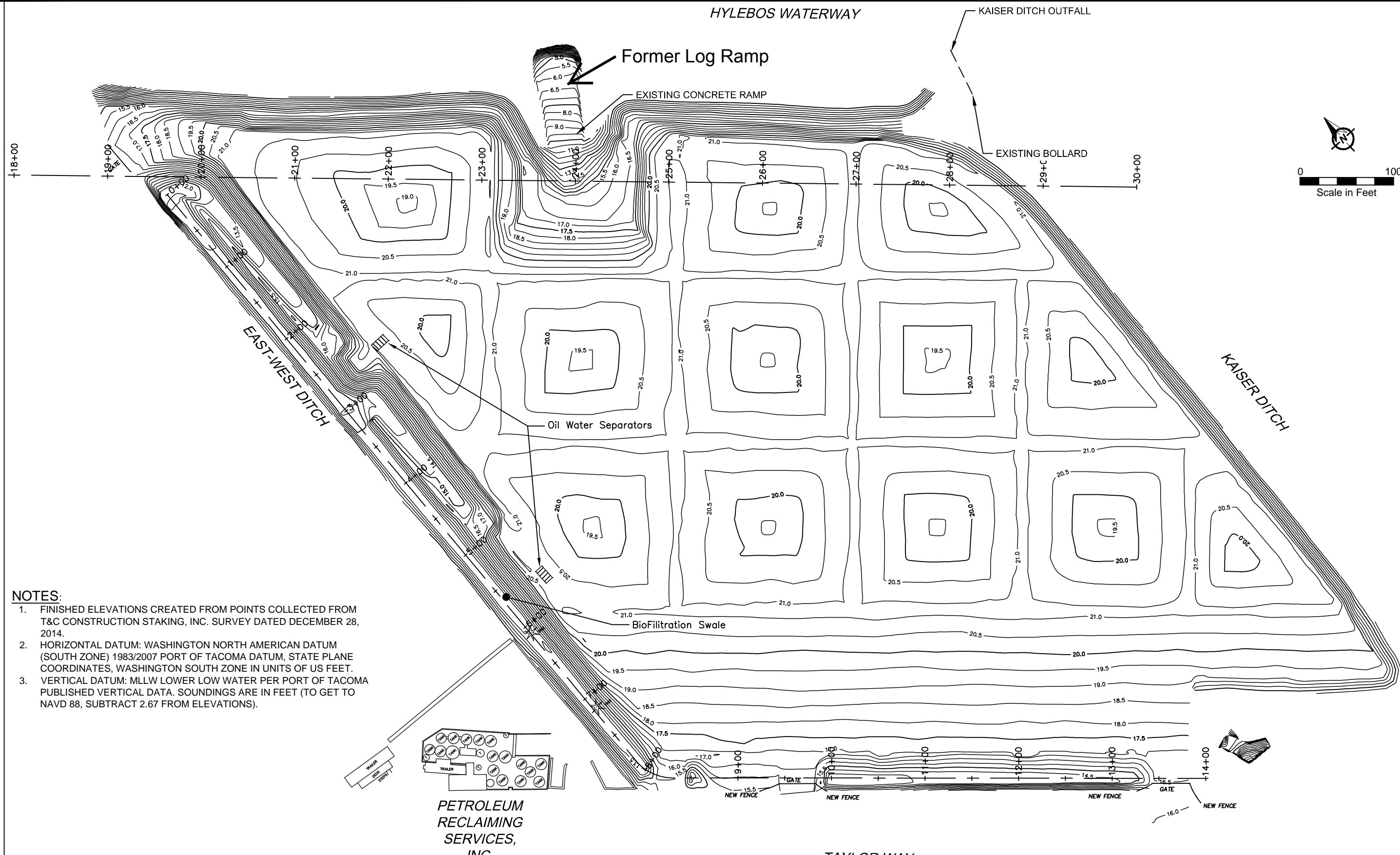
VICINITY MAP

Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
1-1**

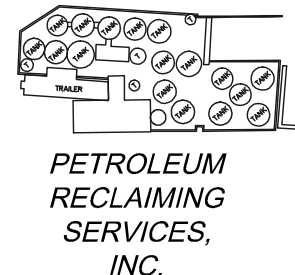
March 27, 2010

PLOT TIME: 5/27/2015 4:50 PM MOD TIME: 5/27/2015 1:56 PM USER: Lee Barras DWG: D:\Projects\Port of Tacoma Arkema Site\CAD\Figures\2015-05\MGD Report\2015-05-27 POT ArkemaAs-Built Site Plan Fig 1-2.dwg



NOTES:

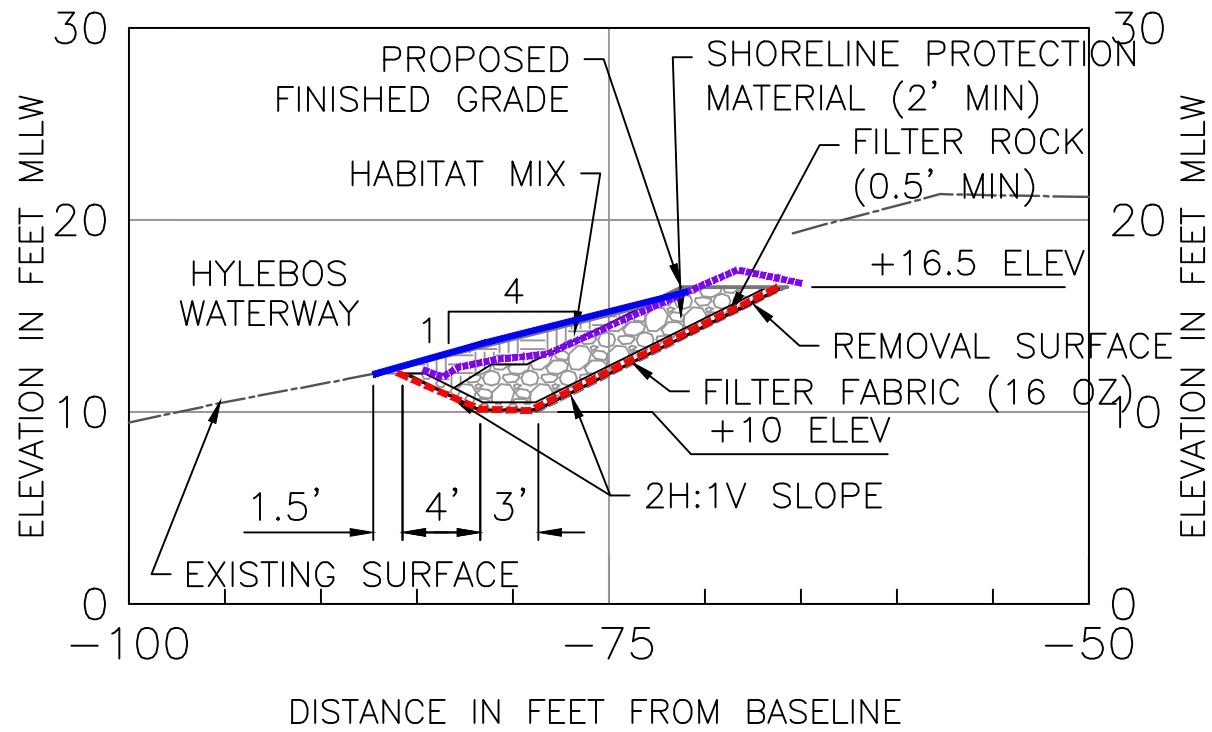
1. FINISHED ELEVATIONS CREATED FROM POINTS COLLECTED FROM T&C CONSTRUCTION STAKING, INC. SURVEY DATED DECEMBER 28, 2014.
2. HORIZONTAL DATUM: WASHINGTON NORTH AMERICAN DATUM (SOUTH ZONE) 1983/2007 PORT OF TACOMA DATUM, STATE PLANE COORDINATES, WASHINGTON SOUTH ZONE IN UNITS OF US FEET.
3. VERTICAL DATUM: MLLW LOWER LOW WATER PER PORT OF TACOMA PUBLISHED VERTICAL DATA. SOUNDINGS ARE IN FEET (TO GET TO NAVD 88, SUBTRACT 2.67 FROM ELEVATIONS).



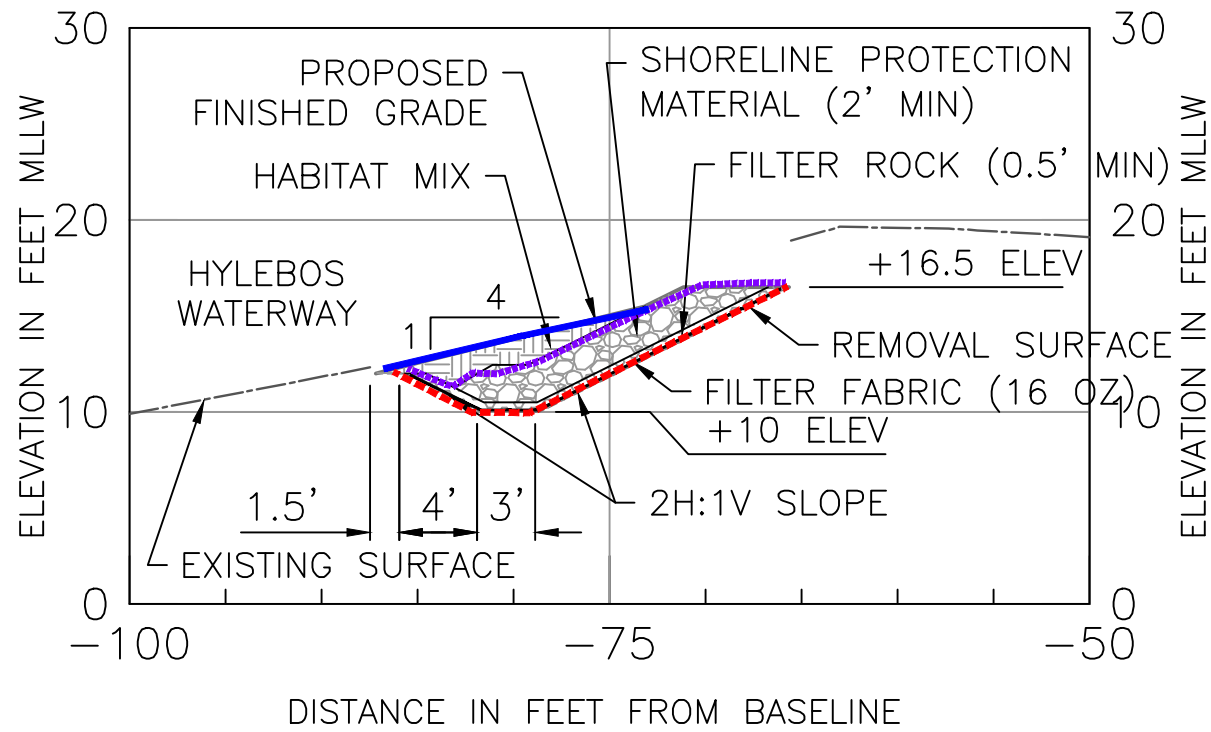
PORT OF TACOMA
 ONE SITCUM PLAZA TACOMA, WA 98401-1837
 3009 TAYLOR WAY MTCA INTERIM ACTION -
 ECOLOGY AGREED ORDER DE 6129
AS-BUILT SITE PLAN
CONSTRUCTED PROJECT

DOF DALTON
 OLMSTED
 FUGLEVAND
FIGURE
1-2
 May 27, 2015

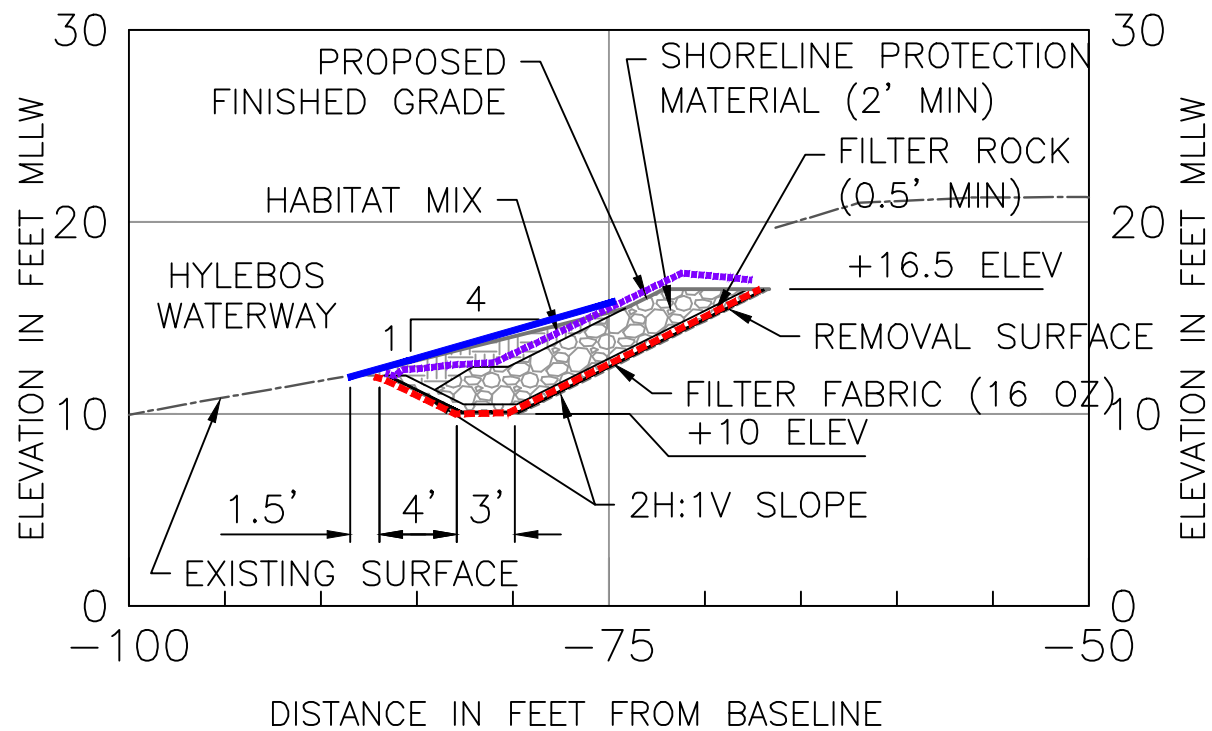
PLOT TIME: 5/27/2015 4:50 PM MOD TIME: 5/27/2015 2:12 PM USER: Lee Barras DWG: D:\Projects\Port of Tacoma\Arkema Site\CAD\Figures\2015-05\MGD Report\2015-05-18 POT Hylebos Shoreline Typical Fig 1-4.dwg



HYLEBOS WATERWAY STA 21+50



HYLEBOS WATERWAY STA 25+50

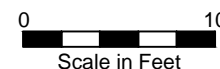


HYLEBOS WATERWAY STA 22+00

LEGEND

- Existing Surface
- Excavation Surface
- Proposed Finished Grade
- As-Built Finished Grade
- As-Built Shoreline Protection Material
- As-Built Shoreline Excavation Surface
- Habitat Mix
- Shoreline Protection Material
- Filter Rock with Filter Fabric (16 oz)

1. Existing elevations created from a composite of surveys. Shoreline and bathymetry survey provided by the Port of Tacoma and prepared by Apex Engineering, PLLC and Bush, Roed & Hitchings, Inc. dated January 5, 2012. Upland survey provided by Sitts and Hill dated 6-11-2012.
2. As-built survey provided by AEC dated October 2013.
3. Horizontal datum: Washington North American Datum (South Zone) 1983/2007 Port of Tacoma Datum, State Plane Coordinates, Washington South Zone.
4. Vertical datum: (MLLW) Mean Lower Low Water per Port of Tacoma published vertical data. Soundings are in feet (to get to NAVD 88, subtract 2.67 from elevations).



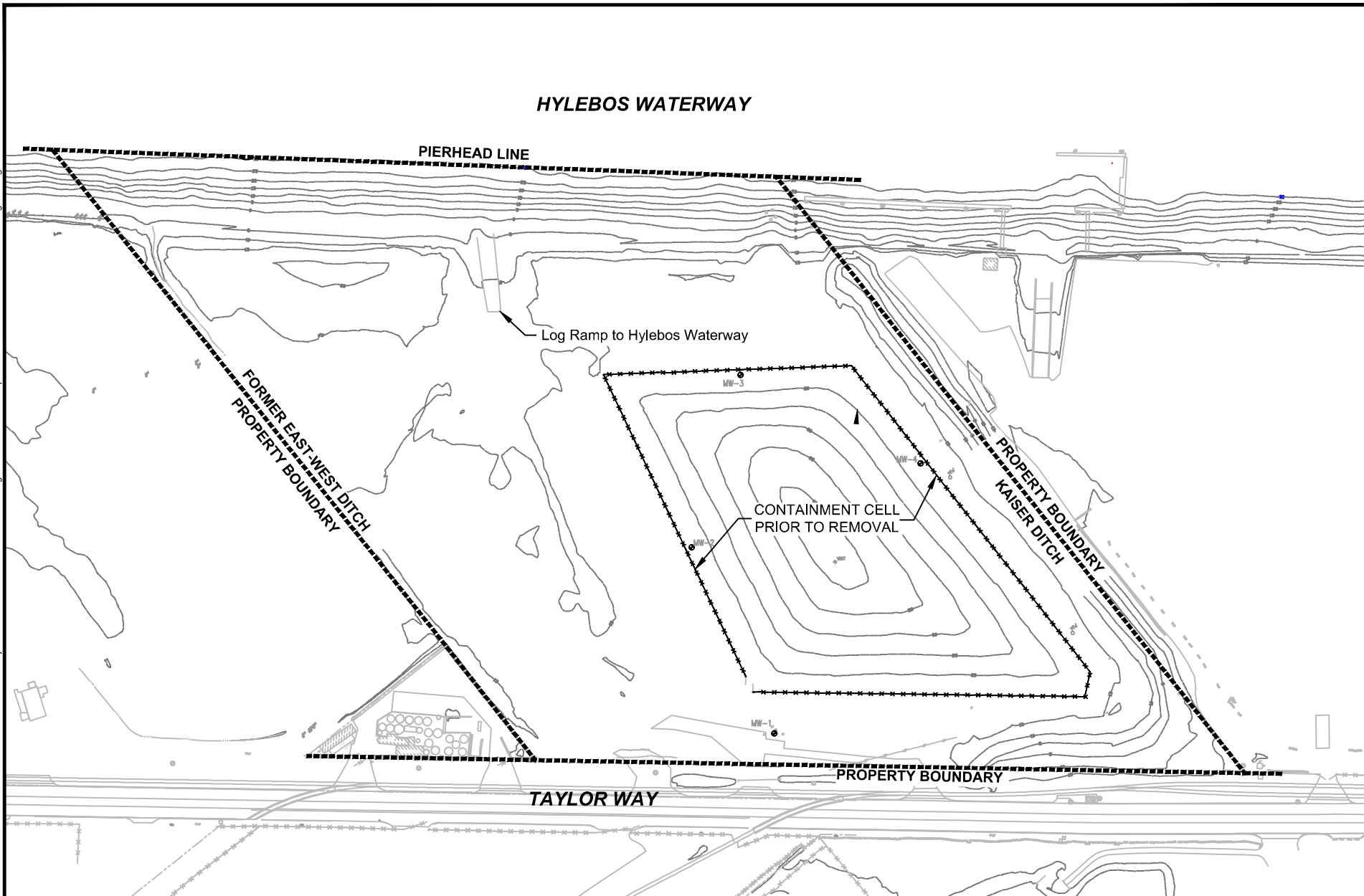
PORT OF TACOMA
 ONE SITCUM PLAZA TACOMA, WA 98401-1837
 3009 TAYLOR WAY MTCA INTERIM ACTION -
 ECOLOGY AGREED ORDER DE 6129
**HYLEBOS SHORELINE TYPICAL
 STABILIZATION AS-BUILT
 CROSS SECTIONS**



FIGURE 1-3

May 2015

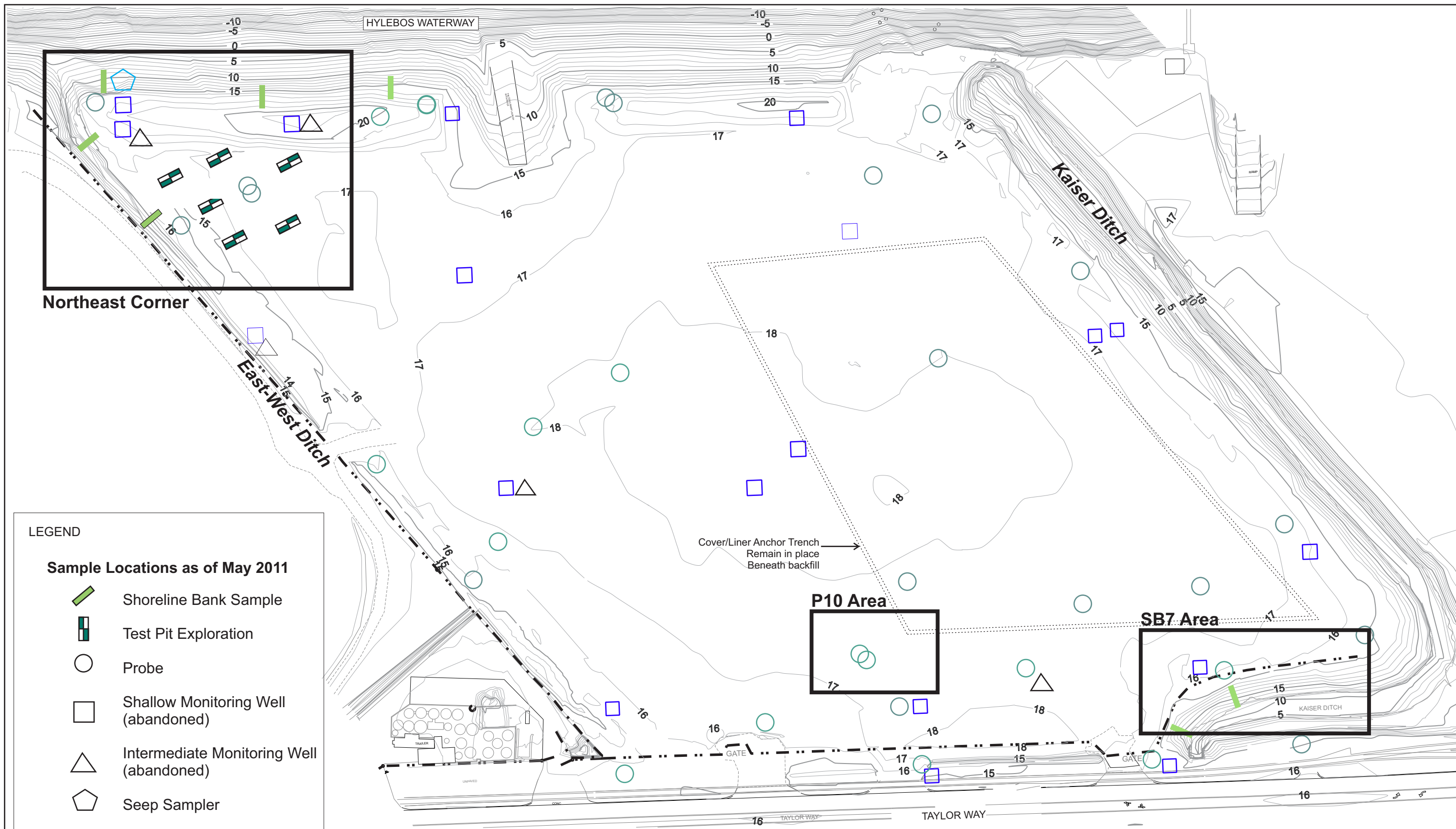
PLOT TIME: 5/27/2015 4:50 PM MOD TIME: 5/27/2015 2:11 PM USER: Lee Barras DWG: D:\Projects\Port of Tacoma Arkema Site\CAD\Figures\2015-05\WCD Report\2015-05-18 2007 Containment Cell Fig 1-3.dwg



SOURCE:
TOPOGRAPHIC SURVEY (INCLUDING PROPERTY
BOUNDARIES) BY PARAMETRIX FOR PORT OF TACOMA -
FOURTH QUARTER 2007.
PROPERTY BOUNDARIES ACQUIRED FROM CAD FILE
(E7001-XEBD.DWG) PROVIDED BY PORT OF TACOMA.









Port of Tacoma Tacoma, Washington		FIGURE 1-4
Arkema Mound Remedial Investigation 3009 Taylor Way, Tacoma, WA		
2007 CONTAINMENT CELL SITE MAP		
Dalton, Olmsted & Fuglevand, Inc.		May 2015

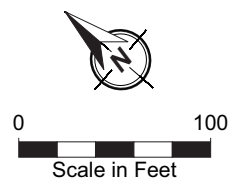


LEGEND

Sample Locations as of May 2011

-  Shoreline Bank Sample
-  Test Pit Exploration
-  Probe
-  Shallow Monitoring Well (abandoned)
-  Intermediate Monitoring Well (abandoned)
-  Seep Sampler

General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



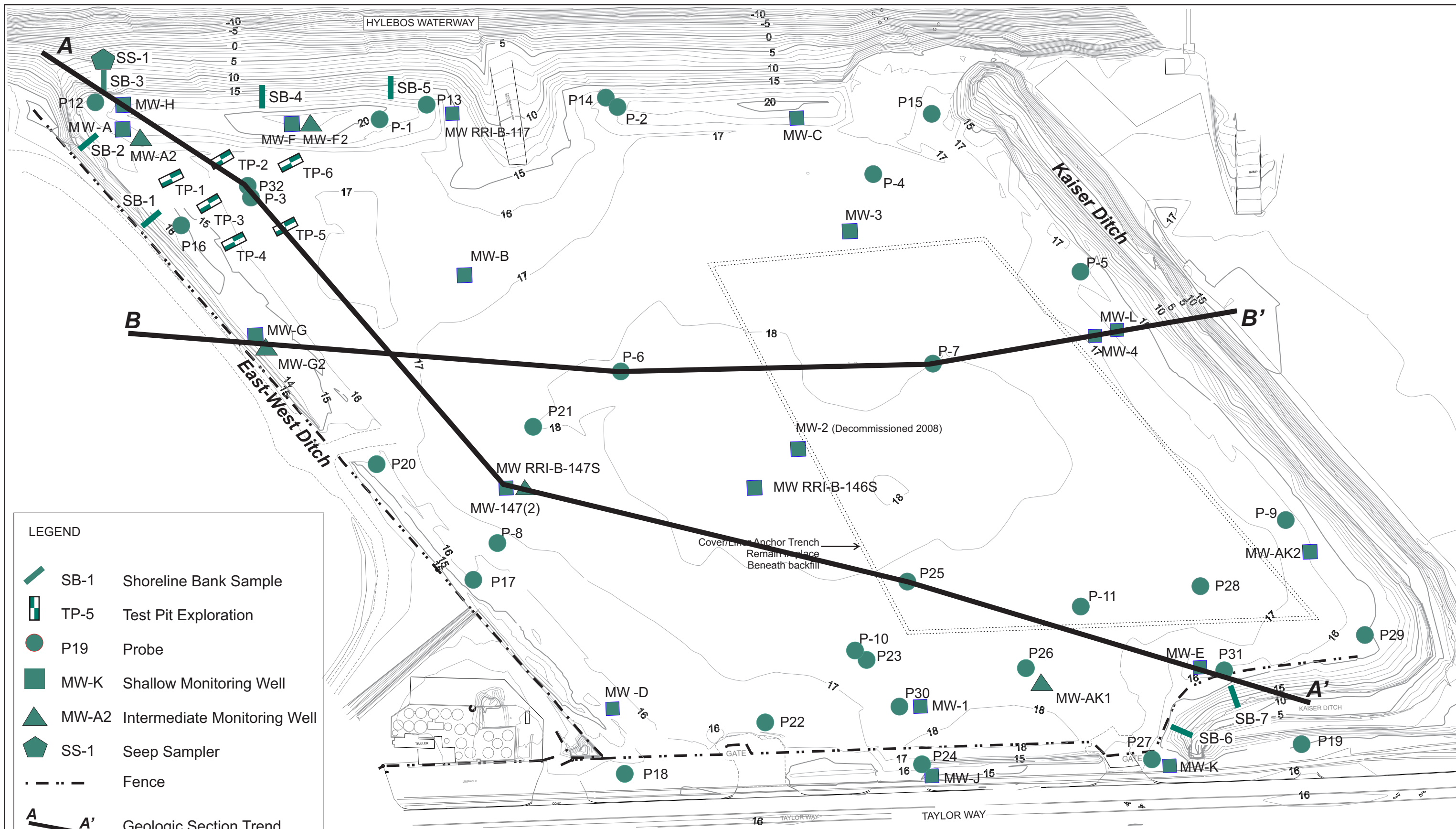
Port of Tacoma
 Tacoma, Washington
 Arkema Mound RI

**Interim Action Areas
 2013 IA**

Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
 1-5**

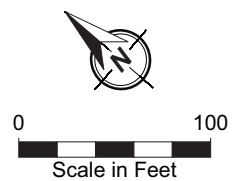
May 2015



LEGEND

- SB-1 Shoreline Bank Sample
- TP-5 Test Pit Exploration
- P19 Probe
- MW-K Shallow Monitoring Well
- MW-A2 Intermediate Monitoring Well
- SS-1 Seep Sampler
- Fence
- A A' Geologic Section Trend

General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



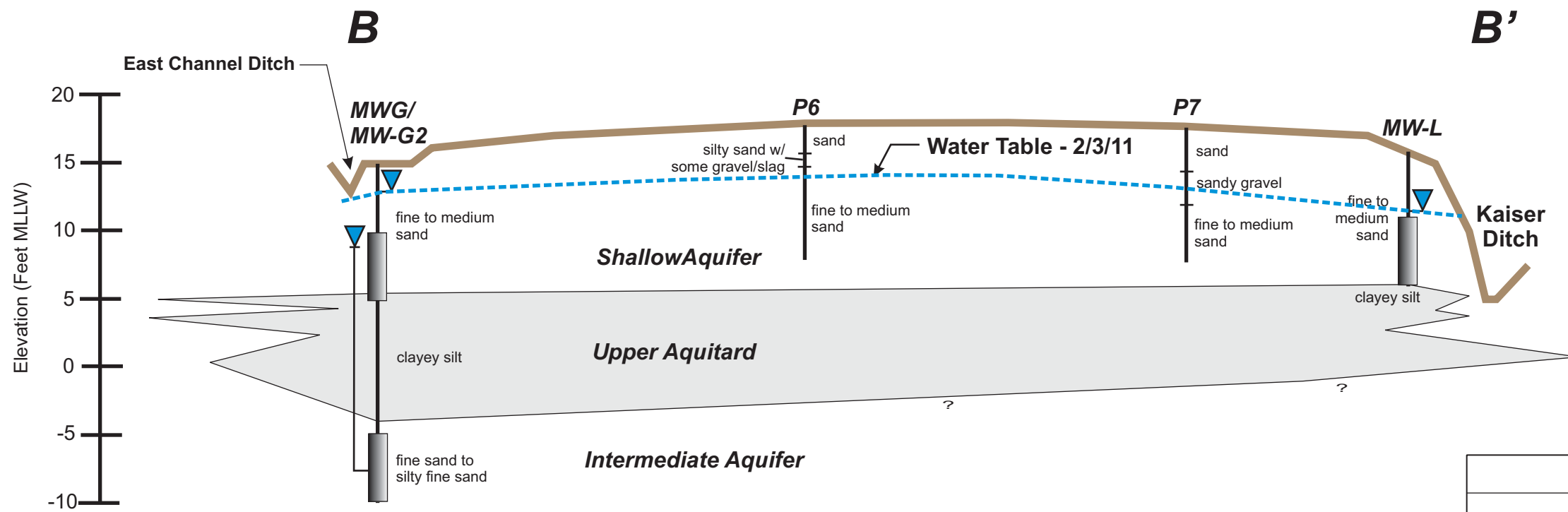
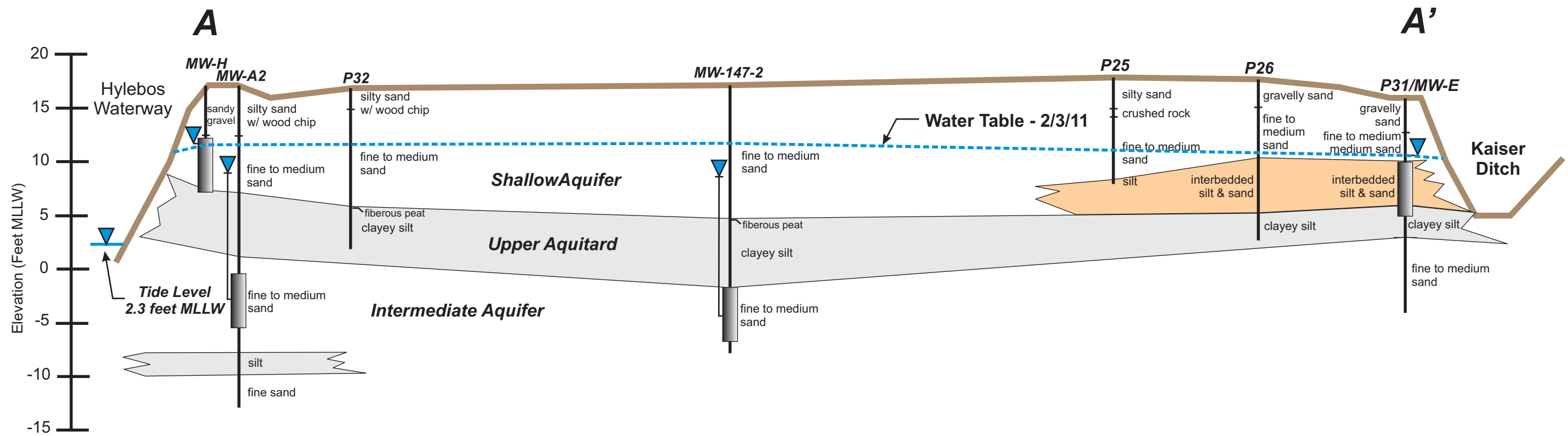
Port of Tacoma
 Tacoma, Washington
 Remedial Investigation & Feasibility Study
 3009 Taylor Way, Tacoma, WA

**Exploration/Sample Locations
 and Geologic Section Trends**

Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
 3-1**

May 2015



LEGEND

Probe
P25

Monitoring Well
MW-H

Geologic Contacts

Well Water Level on 2/3/2011

Well Screen

Note: Water levels obtained during a tidal stage of approximately 2.3 ft-MLLW

0 100
Scale in Feet

Port of Tacoma
Tacoma, Washington

Remedial Investigation
3009 Taylor Way, Tacoma, WA

**Geologic Sections A and B
(prior to 2013 IA)**

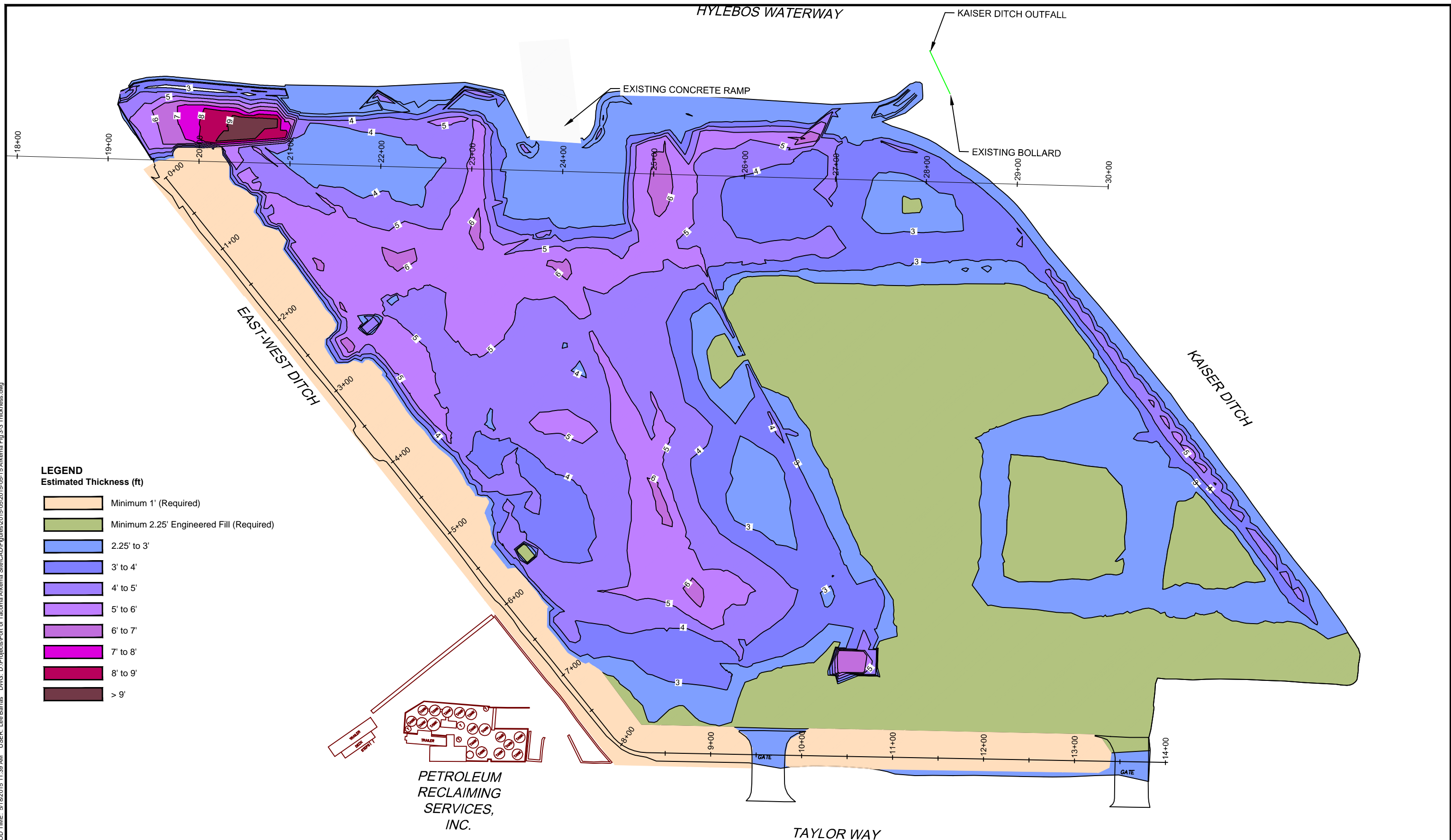
Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
3-2**

May 2015

Ref: Geologic Sections A B a.cdr

PLOT TIME: 5/18/2015 11:39 AM MOD TIME: 5/18/2015 11:39 AM USER: Lee Barras DWG: D:\Projects\Port of Tacoma\Akema Site\CAD\Figures\2015-05-15\Akema Fig 3-3 Thickness.dwg

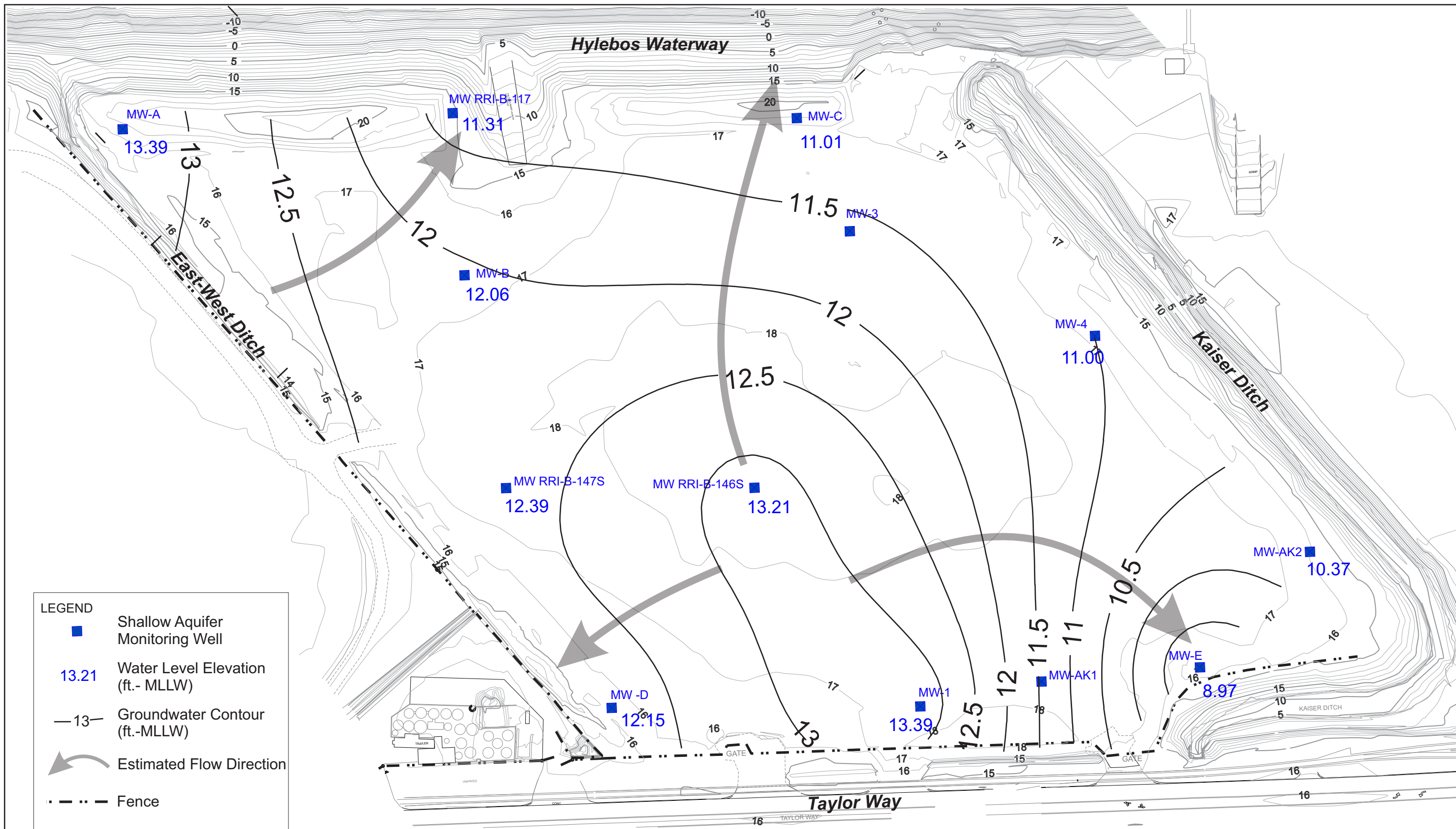


PORT OF TACOMA
ONE SITCUM PLAZA TACOMA, WA 98401-1837
3009 TAYLOR WAY SITE

FILL THICKNESS MAP

DOF DALTON
OLMSTED
FUGLEVAND

Figure 3-3
May 18, 2015

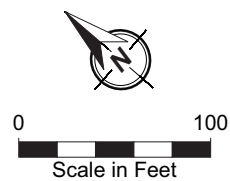


LEGEND

- Shallow Aquifer Monitoring Well
- 13.21 Water Level Elevation (ft.- MLLW)
- 13— Groundwater Contour (ft.-MLLW)
- Estimated Flow Direction
- - - - Fence

Measurements made on in-coming tide @ 6.8 ft. MLLW

General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



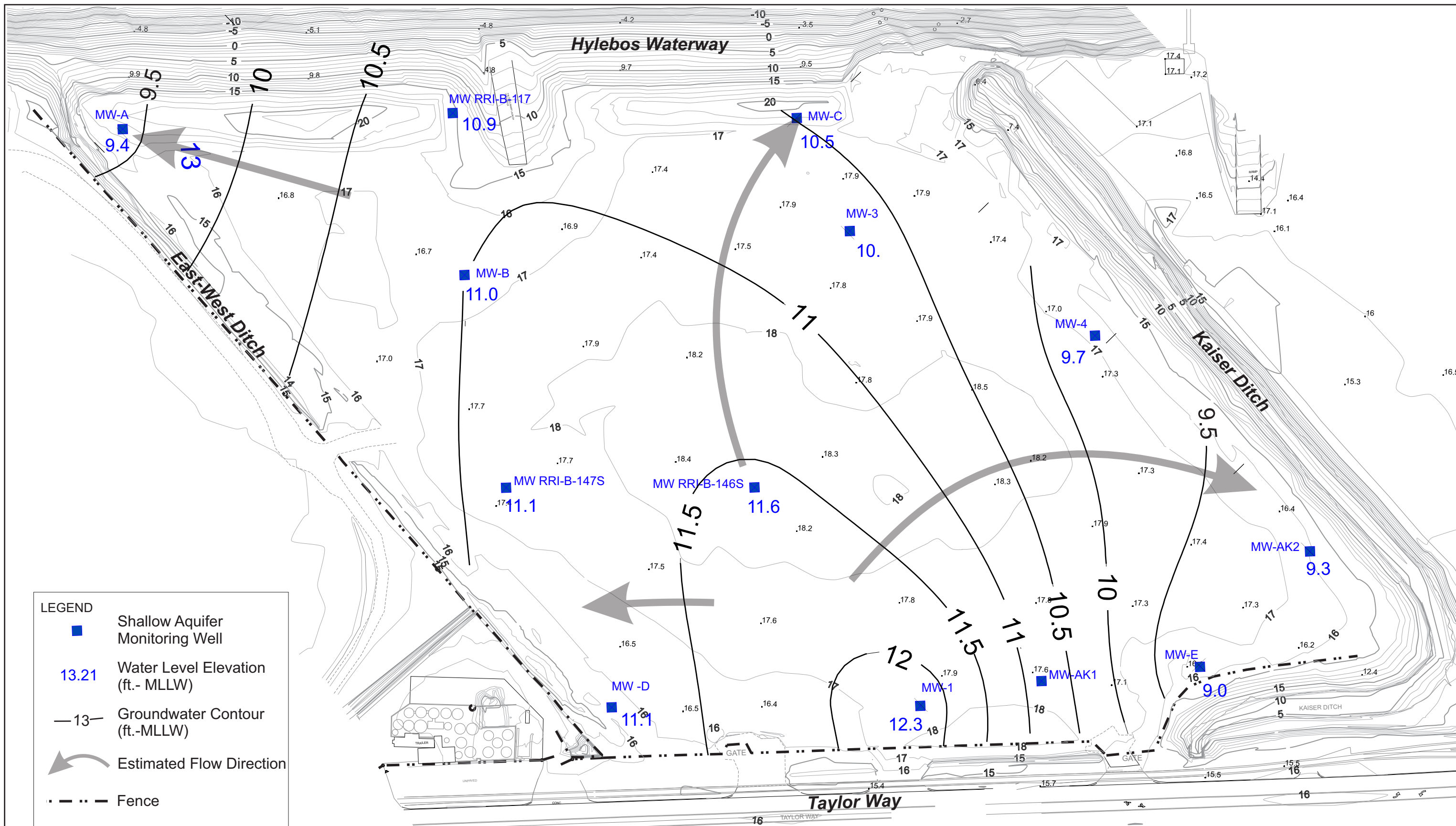
Port of Tacoma
 Tacoma, Washington
 Arkema Mound RI/FS
**Groundwater Contours
 Upper Aquifer
 June 15, 2009**

Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
 3-4a**

May 2015

Ref: Fig 2-3a Akw GW contours 7-09.cdr

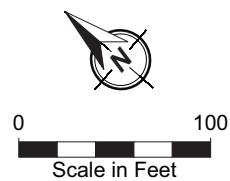


LEGEND

- Shallow Aquifer Monitoring Well
- 13.21 Water Level Elevation (ft.- MLLW)
- 13— Groundwater Contour (ft.-MLLW)
- ➔ Estimated Flow Direction
- - - Fence

Measurements made on out-going tide @ 7.9 ft. MLLW

General Note:
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 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



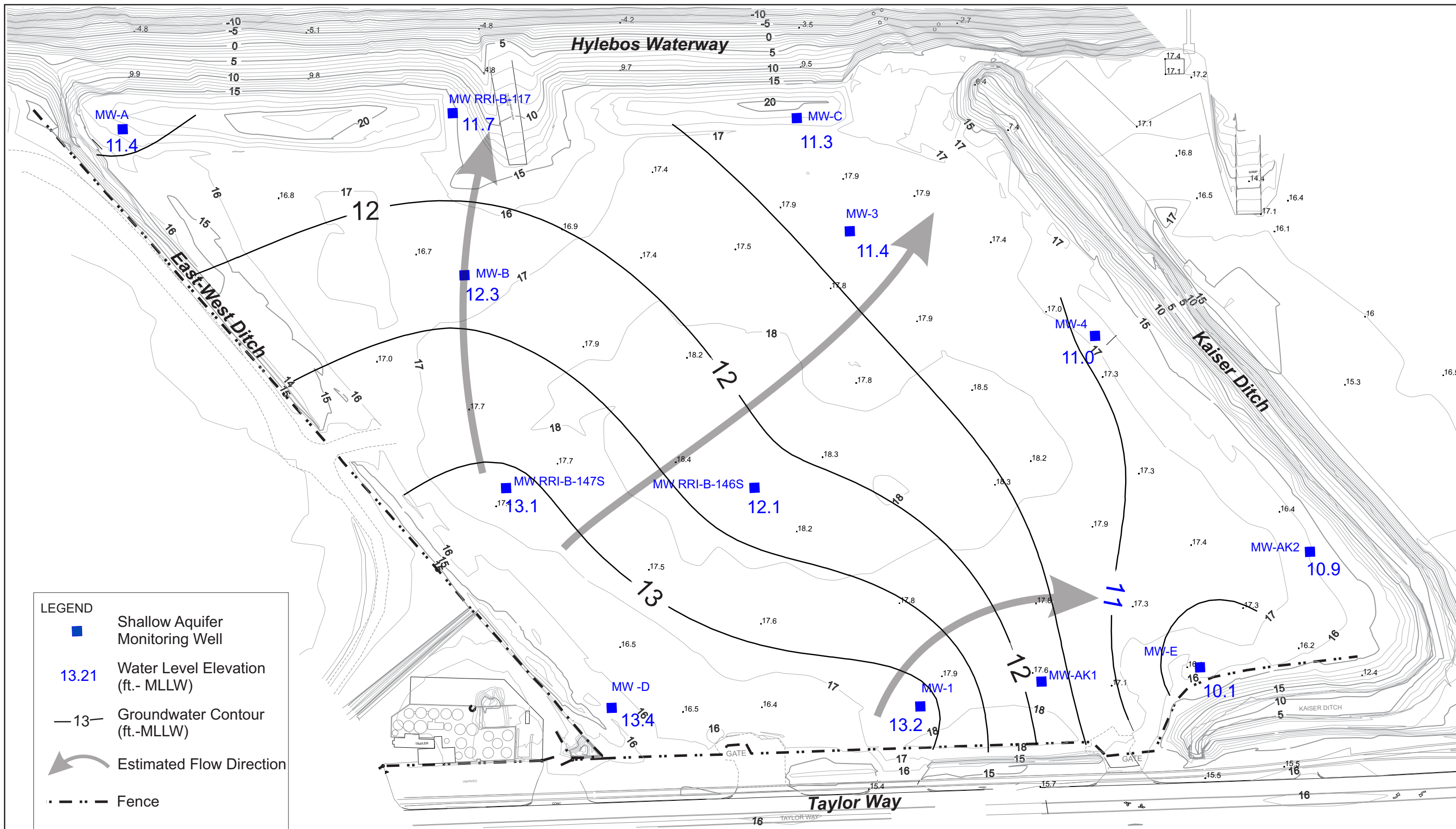
Port of Tacoma
Tacoma, Washington
Arkema Mound RI/FS
Groundwater Contours
Upper Aquifer
September 24, 2009

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 3-4b

May 2015

Ref: Fig 2-3b Akw GW contours 9-09.cdr

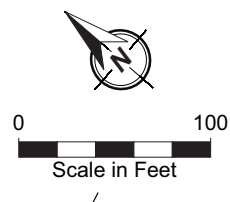


LEGEND

- Shallow Aquifer Monitoring Well
- 13.21 Water Level Elevation (ft.- MLLW)
- 13— Groundwater Contour (ft.-MLLW)
- ➔ Estimated Flow Direction
- - - - Fence

Measurements made on out-going tide @ 5.9 ft. MLLW

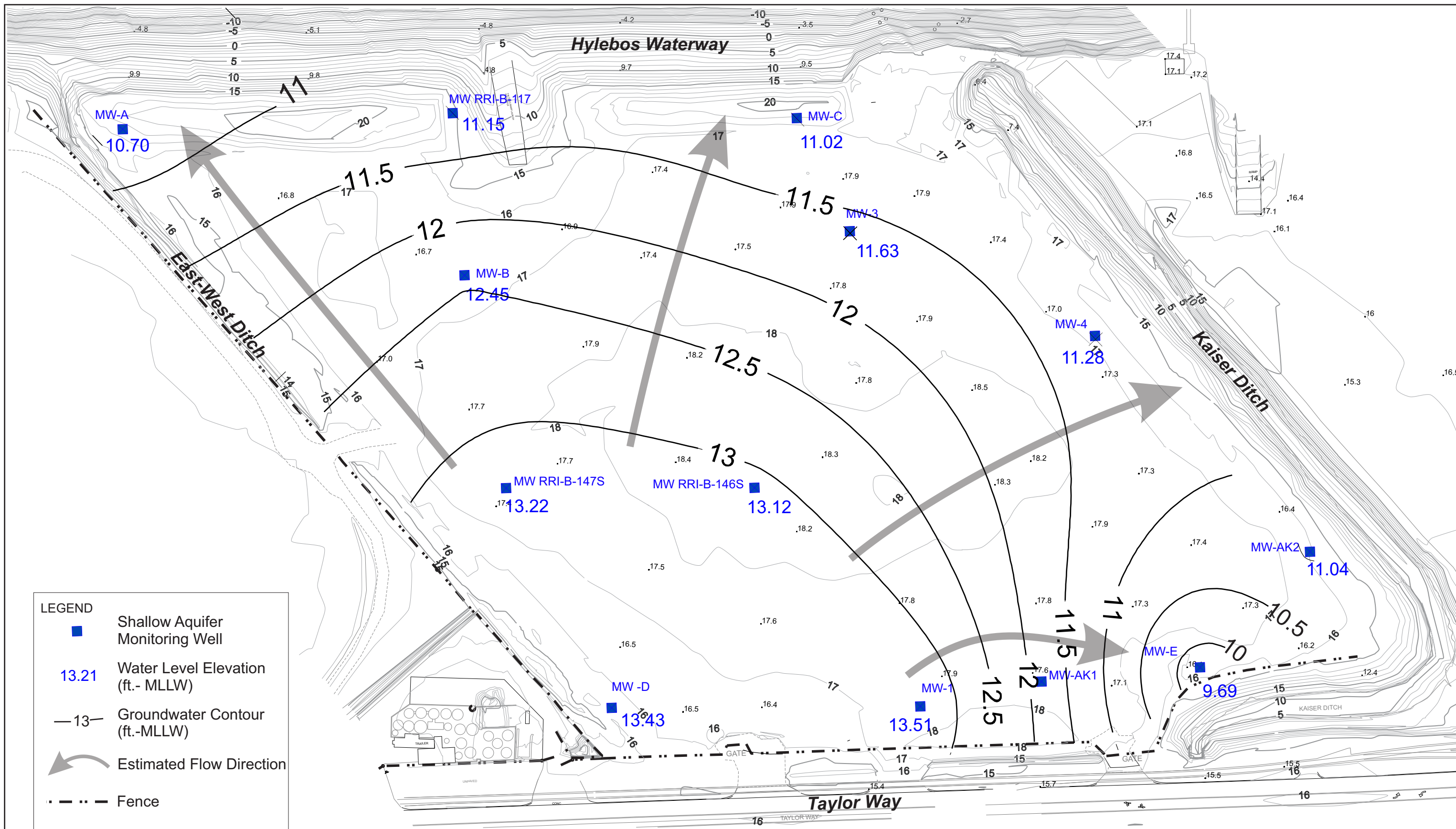
General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



Port of Tacoma
Tacoma, Washington
Arkema Mound RI/FS
**Groundwater Contours
Upper Aquifer
December 8, 2009**
Dalton, Olmsted & Fuglevand, Inc.

FIGURE 3-4c
May 2015

Ref: Fig 2-3c Akw GW contours 12-09.cdr

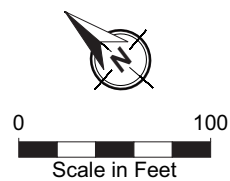


LEGEND

- Shallow Aquifer Monitoring Well
- 13.21 Water Level Elevation (ft.- MLLW)
- 13— Groundwater Contour (ft.-MLLW)
- ➔ Estimated Flow Direction
- - - - - Fence

Measurements made on out-going tide @ 0.0 ft. MLLW

General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



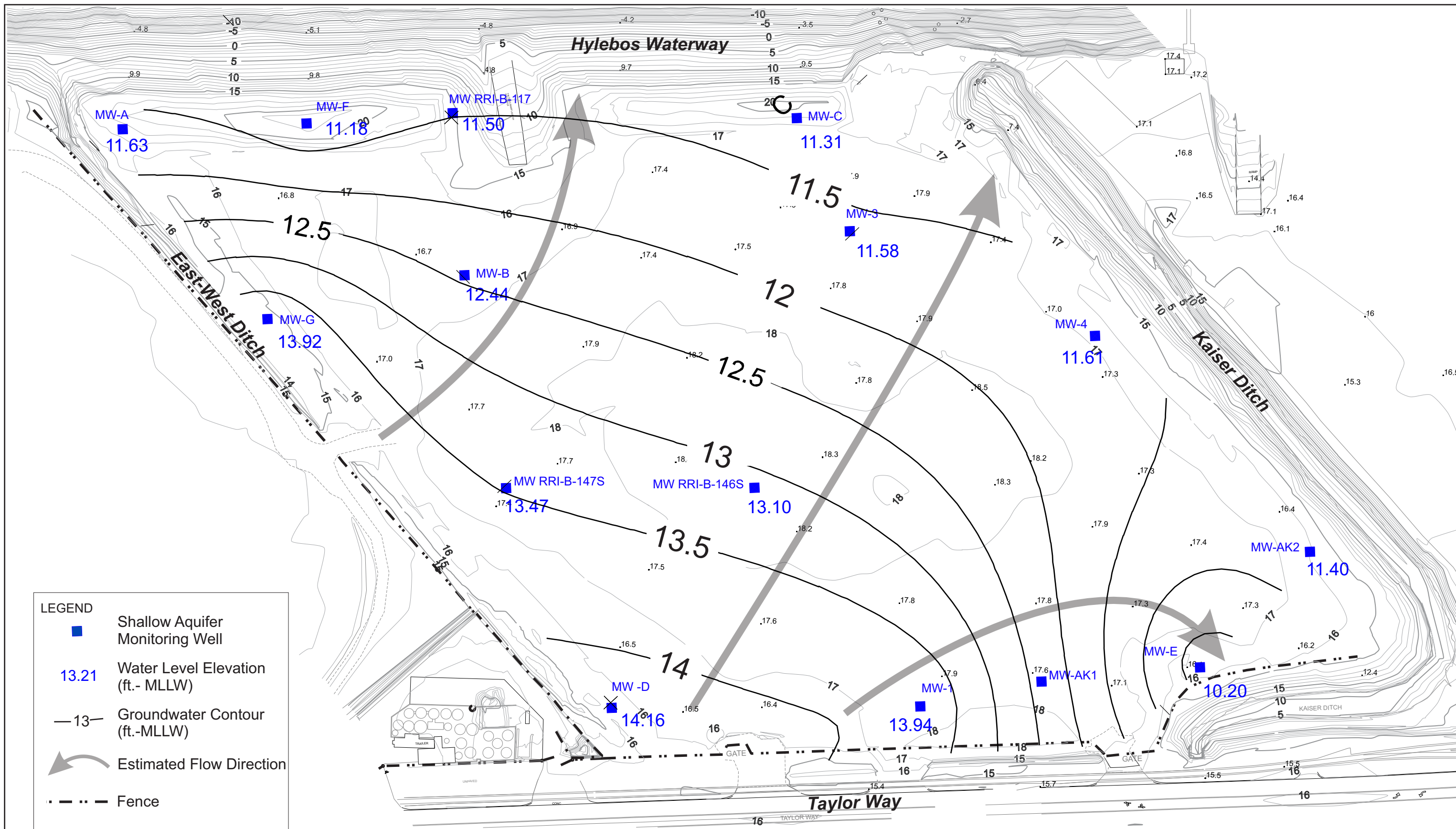
Port of Tacoma
 Tacoma, Washington
 Arkema Mound RI/FS
**Groundwater Contours
 Upper Aquifer
 March 22, 2010**

Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
 3-4d**

May 2015

Ref: Fig2- 3d Akw GW contours 03-2010.cdr

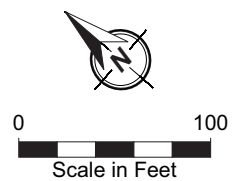


LEGEND

- Shallow Aquifer Monitoring Well
- 13.21 Water Level Elevation (ft.- MLLW)
- 13— Groundwater Contour (ft.-MLLW)
- Estimated Flow Direction
- - - - Fence

Measurements made on out-going tide @ 3.3 ft. MLLW

General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



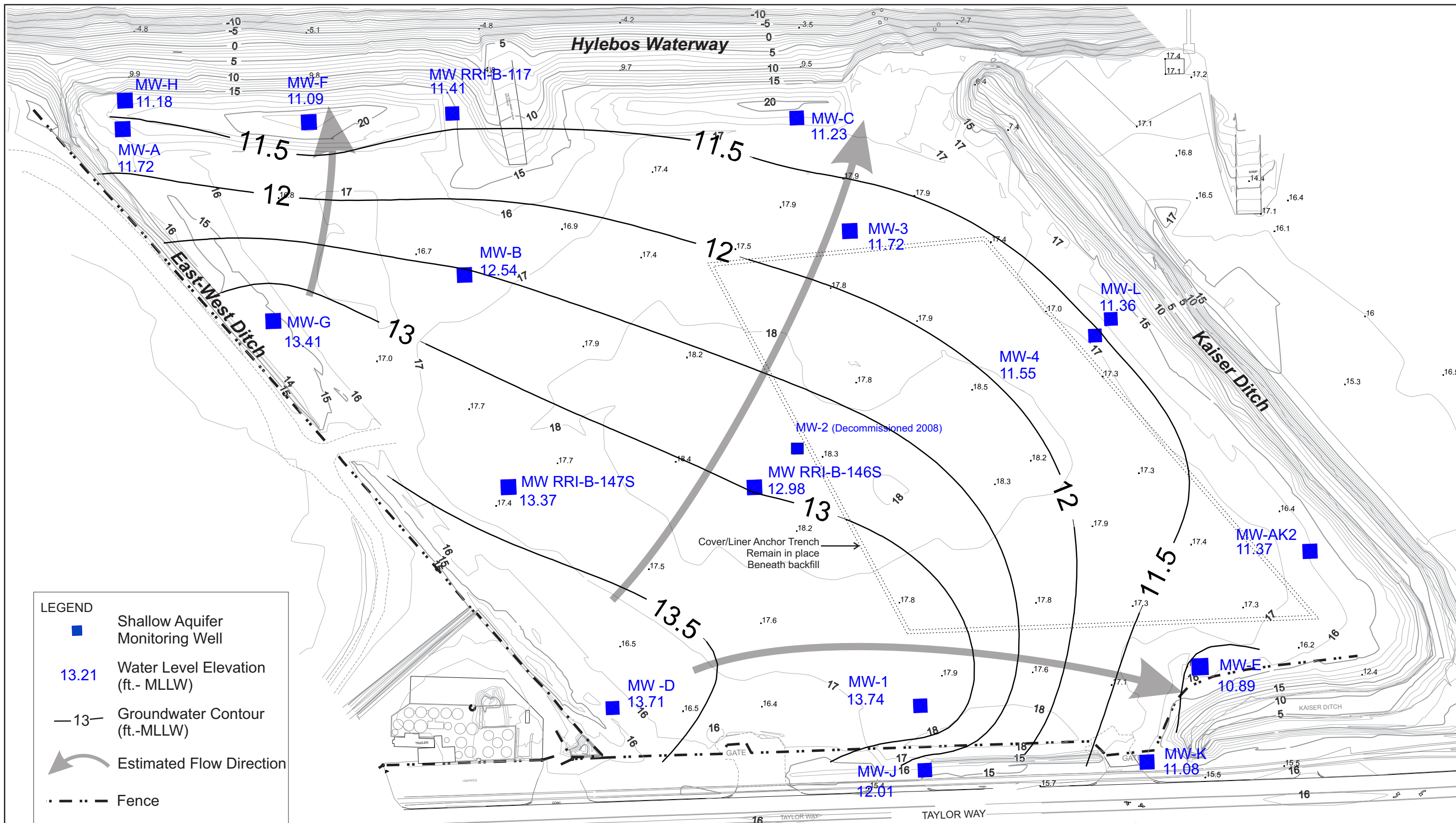
Port of Tacoma
 Tacoma, Washington
 Arkema Mound RI/FS
Groundwater Contours
Upper Aquifer
June 4, 2010

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 3-4e

May 2015

Ref: Fig 3e Akw shallow GW contours 06-2010.cdr

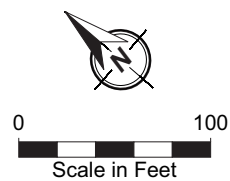


LEGEND

- Shallow Aquifer Monitoring Well
- 13.21 Water Level Elevation (ft.- MLLW)
- 13— Groundwater Contour (ft.-MLLW)
- Estimated Flow Direction
- - - - Fence

Measurements made on out-going tide @ 10.7 ft. MLLW

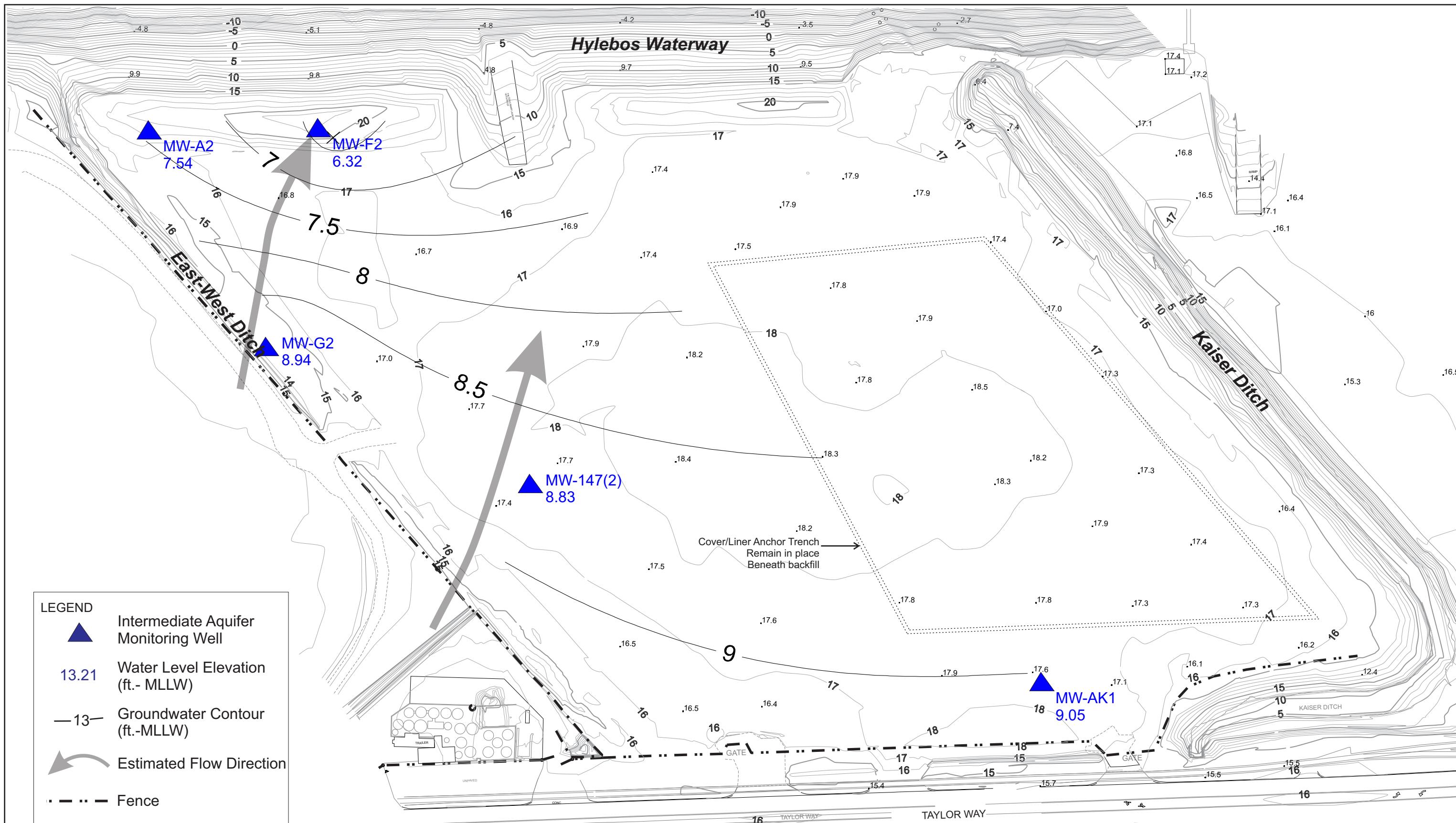
General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



Port of Tacoma
Tacoma, Washington
Arkema Mound RI/FS
**Groundwater Contours
Upper Aquifer
February 1, 2011**
Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
3-4f**
May 2015

Ref: Fig 2-3f Akw shallow GW contours 02-2011.CDR

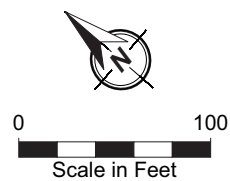


LEGEND

- Intermediate Aquifer Monitoring Well
- 13.21** Water Level Elevation (ft.- MLLW)
- Groundwater Contour (ft.-MLLW)
- Estimated Flow Direction
- Fence

Measurements made on out-going tide @ 3.3 ft. MLLW

General Note:
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 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



Port of Tacoma
 Tacoma, Washington
 Arkema Mound RI/FS

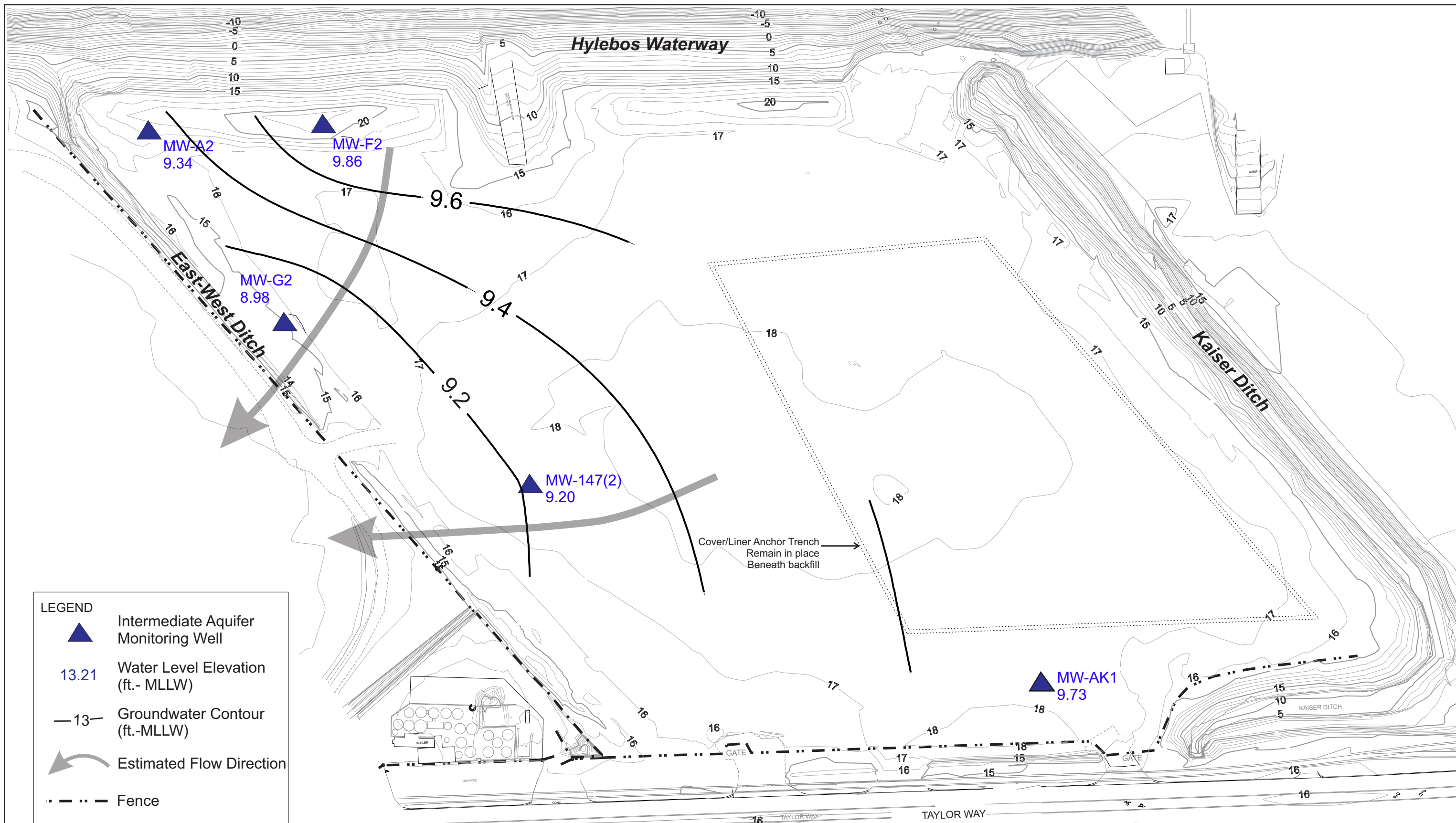
**Groundwater Contours
 Intermediate Aquifer
 June 4, 2010**

Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
 3-4g**

May 2015

Ref: Fig 2-3g Akw Intermediate GW Contours Jun 2010.cdr

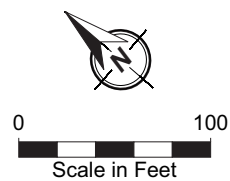


LEGEND

- Intermediate Aquifer Monitoring Well
- 13.21** Water Level Elevation (ft.- MLLW)
- Groundwater Contour (ft.-MLLW)
- Estimated Flow Direction
- Fence

Measurements made at high tide @ 10.7 ft. MLLW

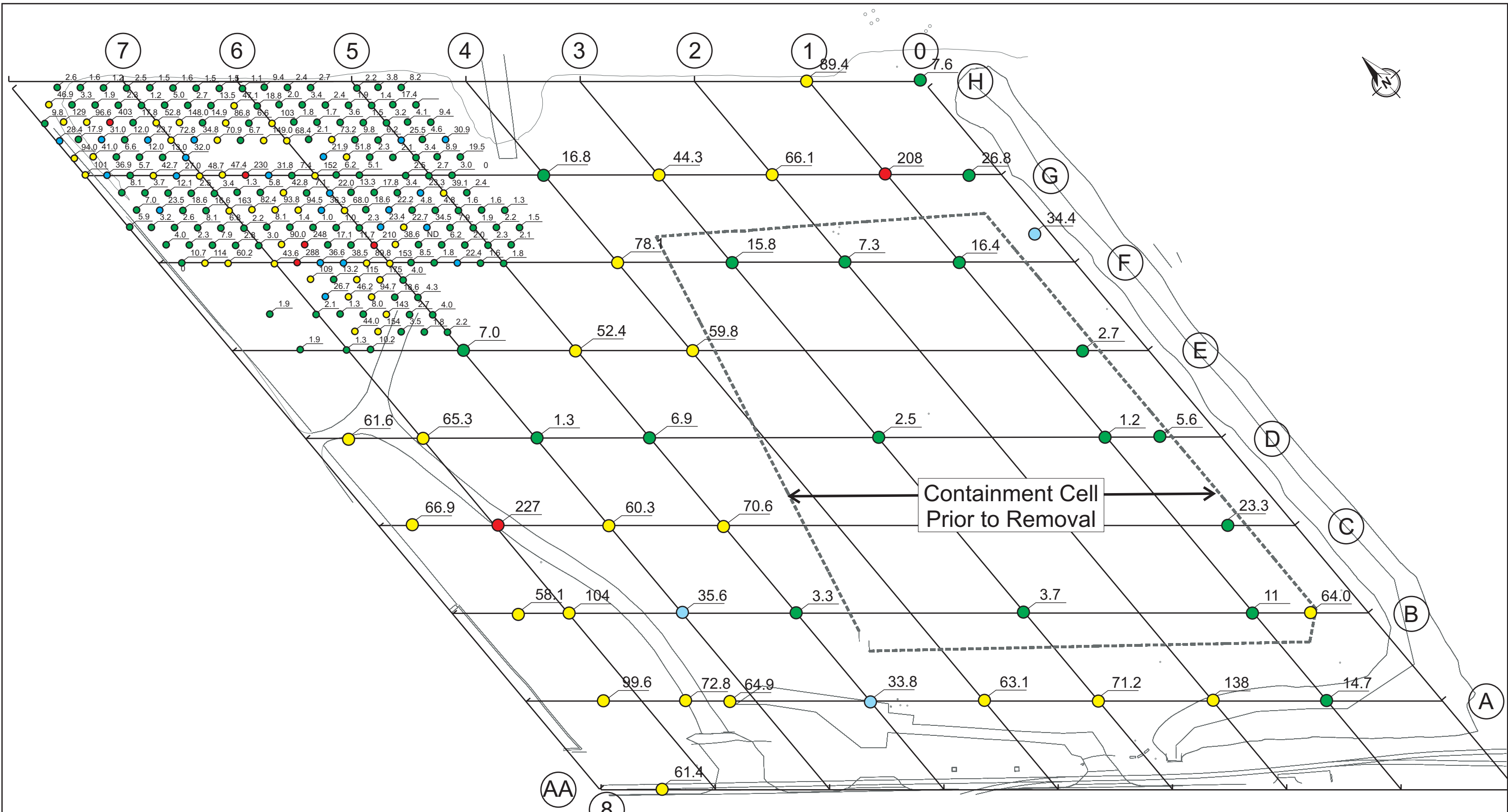
General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



Port of Tacoma
 Tacoma, Washington
 Arkema Mound RI/FS
**Groundwater Contours
 Intermediate Aquifer
 February 1, 2011**
 Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
 3-4h**
 May 2015

Ref: Fig 2-3h Akw Intermediate GW Contours Feb 2011.cdr



1992 Surface Soil Testing (Arsenic)

Single Point

- 0-20 mg/kg
- 21-40 mg/kg
- 41-200 mg/kg
- >200 mg/kg



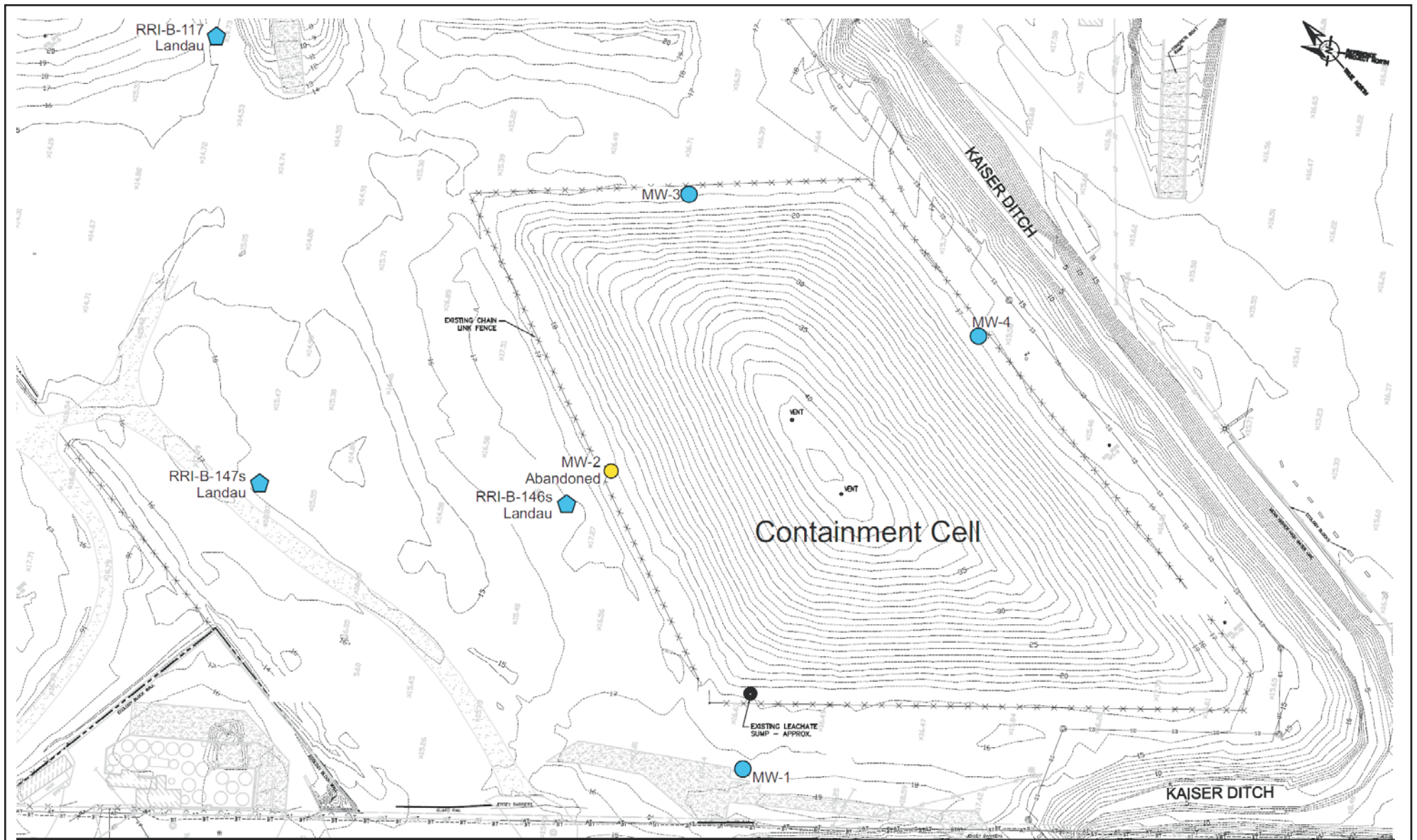
Arsenic data from Appendix D Confirmation Samples from Final Construction Quality Assurance / Quality Control Report ENSR, April 1993

Port of Tacoma
Tacoma, Washington
Arkema Mound Remedial Investigation
3009 Taylor Way, Tacoma WA
**1992 Post Remediation Arsenic Concentrations
Surface Soils**

**FIGURE
4-1**

Dalton, Olmsted & Fuglevand, Inc.

April 2011



Groundwater Monitoring Wells, Shallow Aquifer

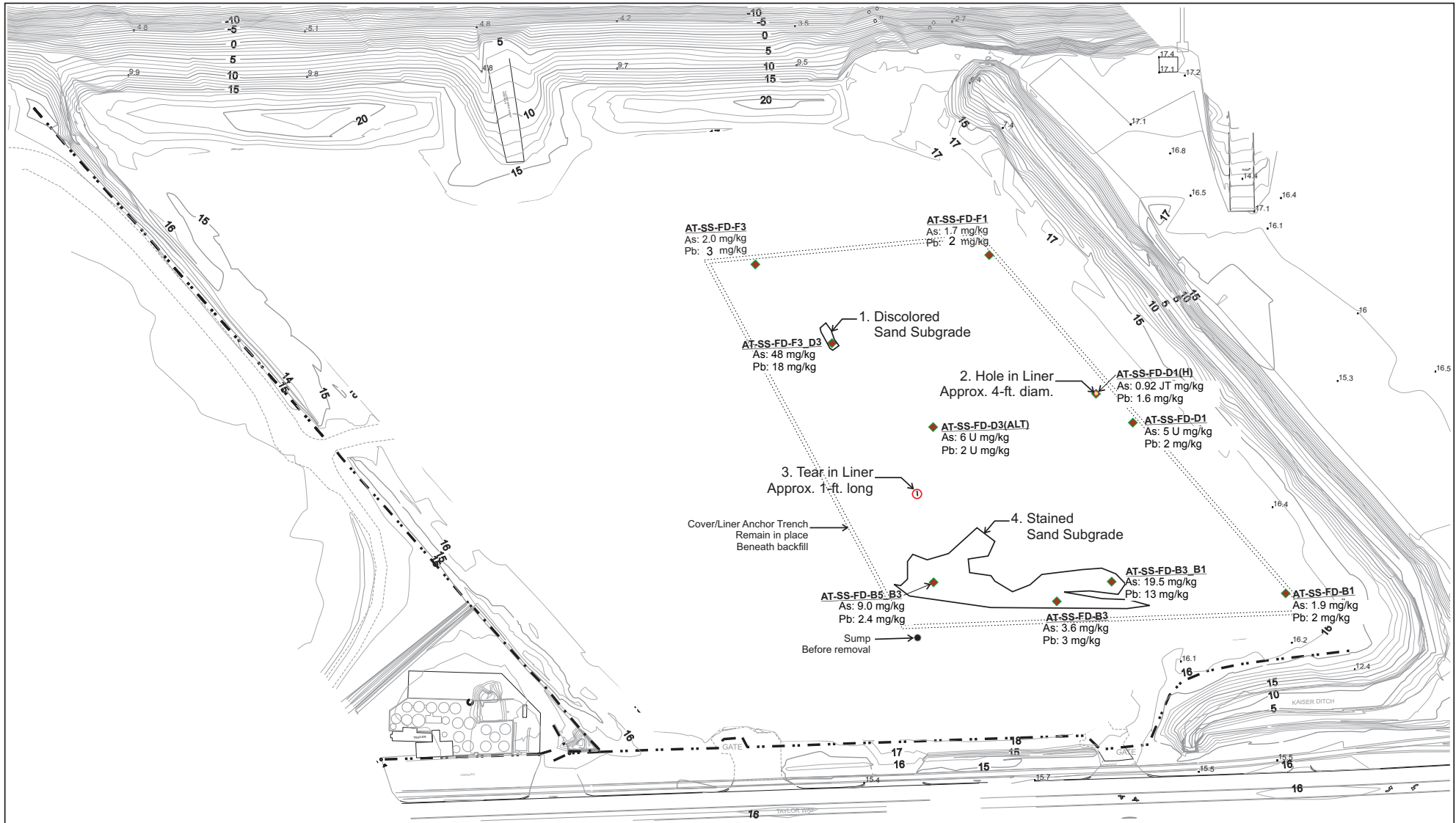
- ENSR, existing ⬠ Landau, existing
- ENSR, abandoned

Port of Tacoma
Tacoma, Washington
Arkema Mound Remedial Investigation
3009 Taylor Way, Tacoma WA
Monitoring Well Locations
May 2009

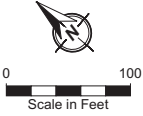
**FIGURE
4-2**

Dalton, Olmsted & Fuglevand, Inc.

April 2011



LEGEND	
◆	AT-SS-FD-F3 Liner subgrade soil sample
	As: 2.0 mg/kg Location and ID
	Pb: 3.0 mg/kg Arsenic and Lead Conc.



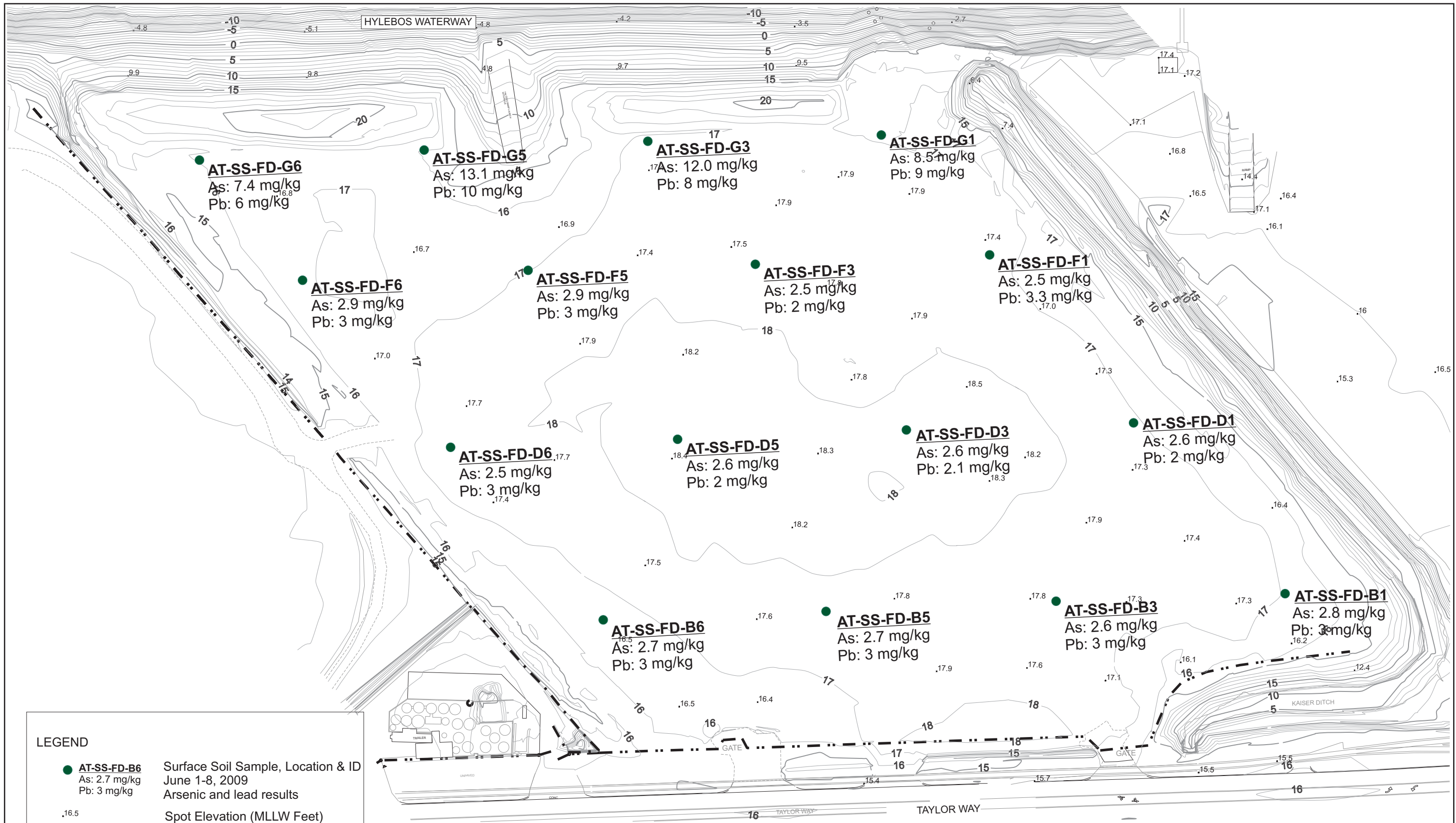
Port of Tacoma
Tacoma, Washington
Arkema Mound Remedial Investigation
3009 Taylor Way, Tacoma WA

**LINER SUBGRADE
Observations and Testing**

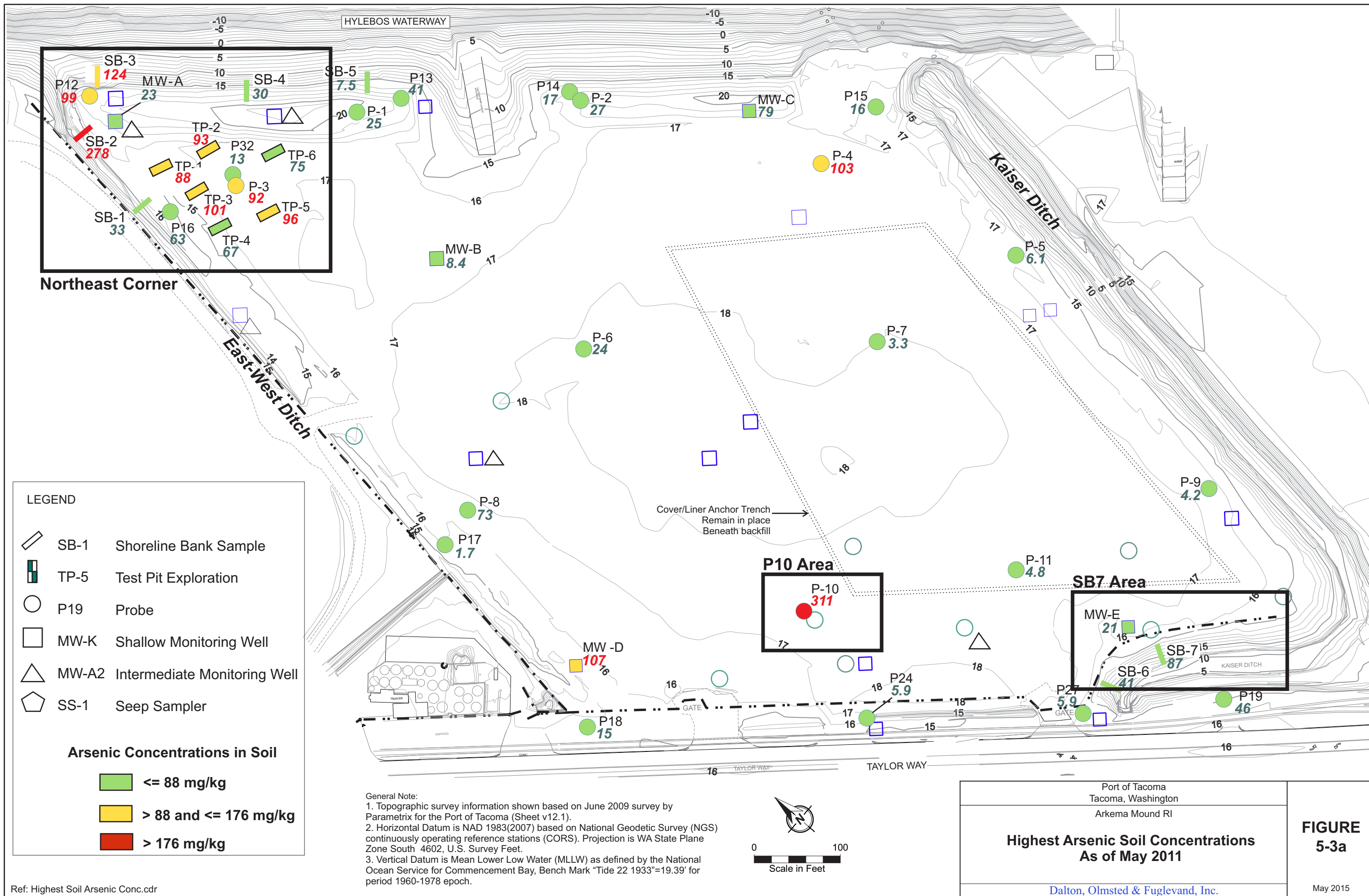
Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
5-1**

April 2011



Port of Tacoma Tacoma, Washington Arkema Mound Remedial Investigation 3009 Taylor Way, Tacoma WA		FIGURE 5-2 April 2011
FINISHED GRADE Surface Soil Samples		
Dalton, Olmsted & Fuglevand, Inc.		



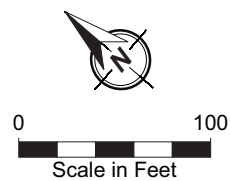
LEGEND

- SB-1 Shoreline Bank Sample
- TP-5 Test Pit Exploration
- P19 Probe
- MW-K Shallow Monitoring Well
- MW-A2 Intermediate Monitoring Well
- SS-1 Seep Sampler

Arsenic Concentrations in Soil

- <= 88 mg/kg
- > 88 and <= 176 mg/kg
- > 176 mg/kg

General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
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Port of Tacoma
 Tacoma, Washington
 Arkema Mound RI

**Highest Arsenic Soil Concentrations
 As of May 2011**

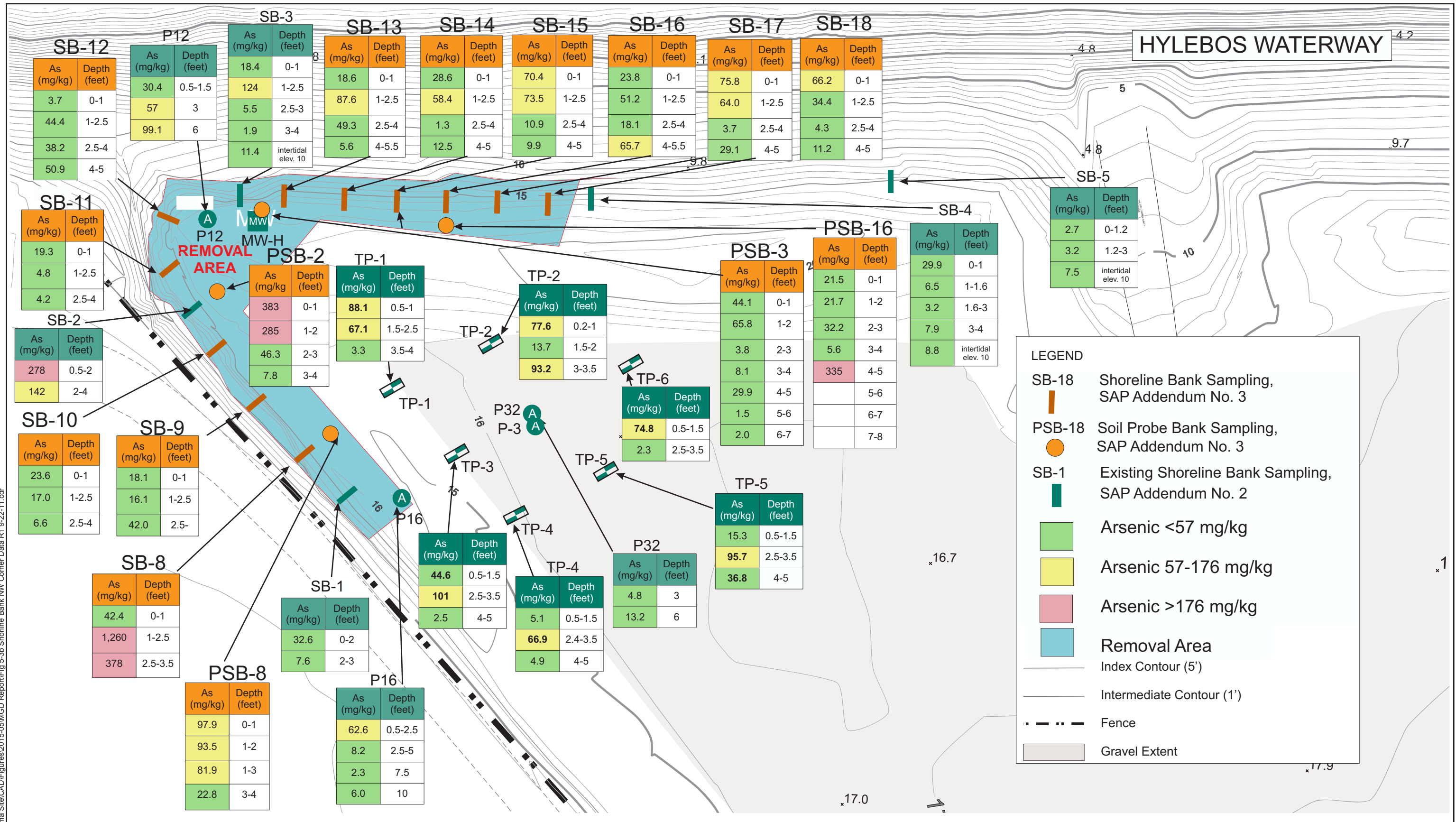
Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
 5-3a**

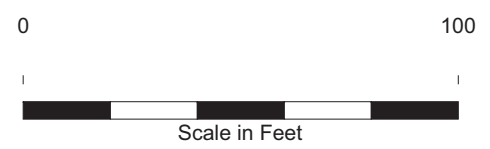
May 2015

Ref: Highest Soil Arsenic Conc.cdr

FILE:D:\Projects\Port of Tacoma\Arkema Site\CAD\Figures\2015-05\MGD Report\Fig 5-3b Shoreline Bank NW Corner Data R1 9-22-11.cdr

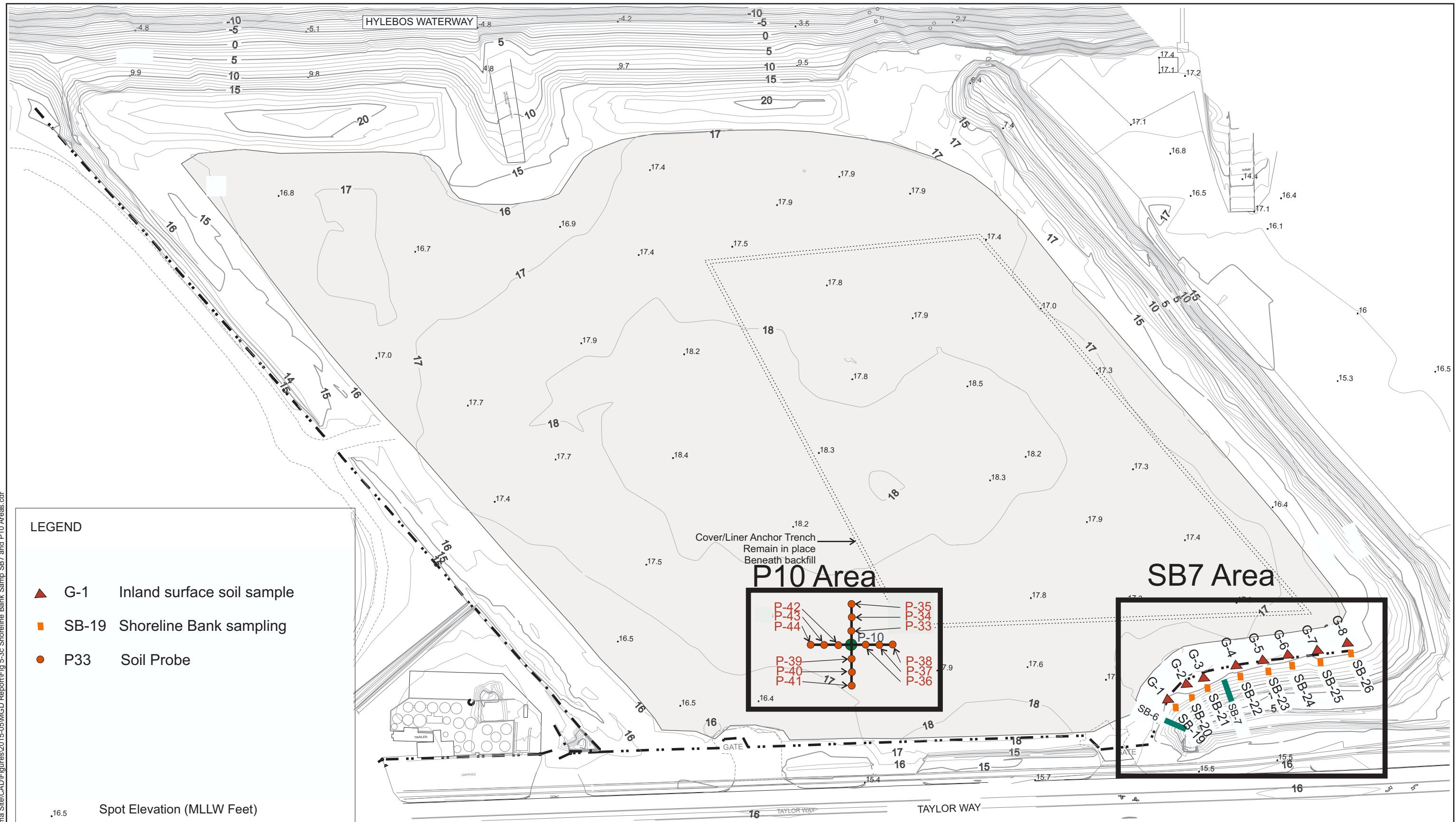


General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



Port of Tacoma Tacoma, Washington Arkema Mound Interim Action Work Plan 3009 Taylor Way, Tacoma, WA Northwest Area Arsenic in Soil Dalton, Olmsted & Fuglevand, Inc.		FIGURE 5-3b May 2015

FILE:D:\Projects\Port of Tacoma\Arkema Site\CAD\Figures\2015-05\MGD Report\Fig 5-3c Shoreline Bank Samp SB7 and P10 Areas.cdr



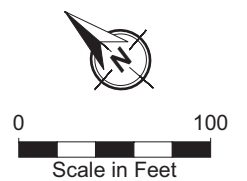
LEGEND

- ▲ G-1 Inland surface soil sample
- SB-19 Shoreline Bank sampling
- P33 Soil Probe

- Spot Elevation (MLLW Feet)
- Index Contour (5')
- Intermediate Contour (1')
- Fence
- Gravel Extent

General Note:

- Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
- Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
- Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.



Port of Tacoma
Tacoma, Washington

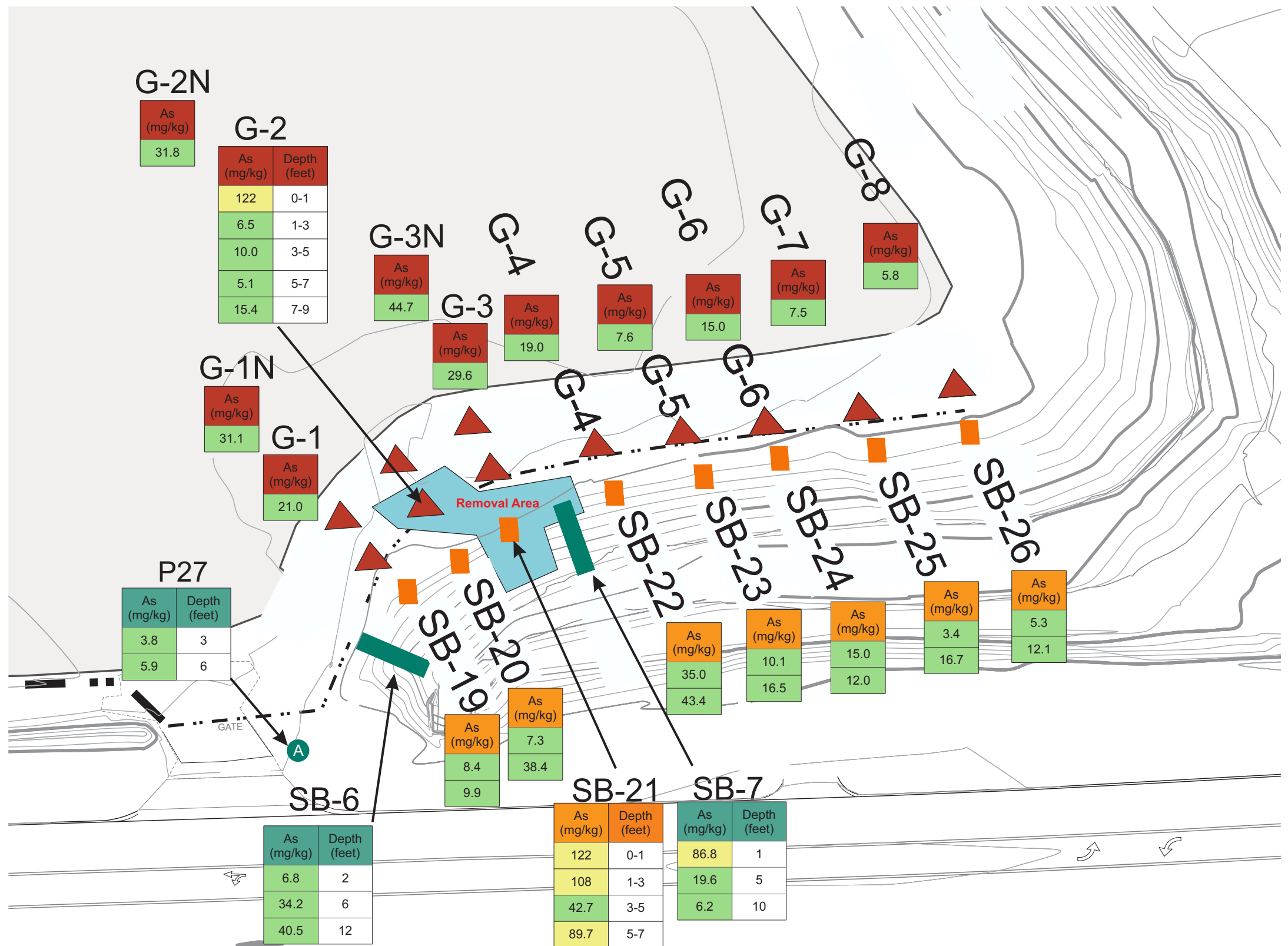
Arkema Mound Interim Action Work Plan
3009 Taylor Way, Tacoma, WA

**Shoreline Bank Sampling SB7 Area
Soil Probes P10 Area**

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 5-3c

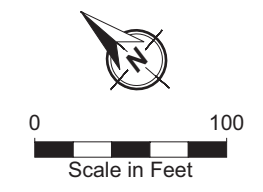
May 2015



LEGEND

- ▲ G-1 Inland surface soil sample (0-1')
- SB-19 Shoreline Bank sampling (0-1', 2-4', 5-7', 9-10')
- Arsenic <57 mg/kg
- Arsenic 57-176 mg/kg
- Arsenic >176 mg/kg
- Removal Area
- .16.5 Spot Elevation (MLLW Feet)
- Index Contour (5')
- Intermediate Contour (1')
- Fence
- Gravel Extent

General Note:
 1. Topographic survey information shown based on June 2009 survey by Parametrix for the Port of Tacoma (Sheet v12.1).
 2. Horizontal Datum is NAD 1983(2007) based on National Geodetic Survey (NGS) continuously operating reference stations (CORS). Projection is WA State Plane Zone South 4602, U.S. Survey Feet.
 3. Vertical Datum is Mean Lower Low Water (MLLW) as defined by the National Ocean Service for Commencement Bay, Bench Mark "Tide 22 1933"=19.39' for period 1960-1978 epoch.

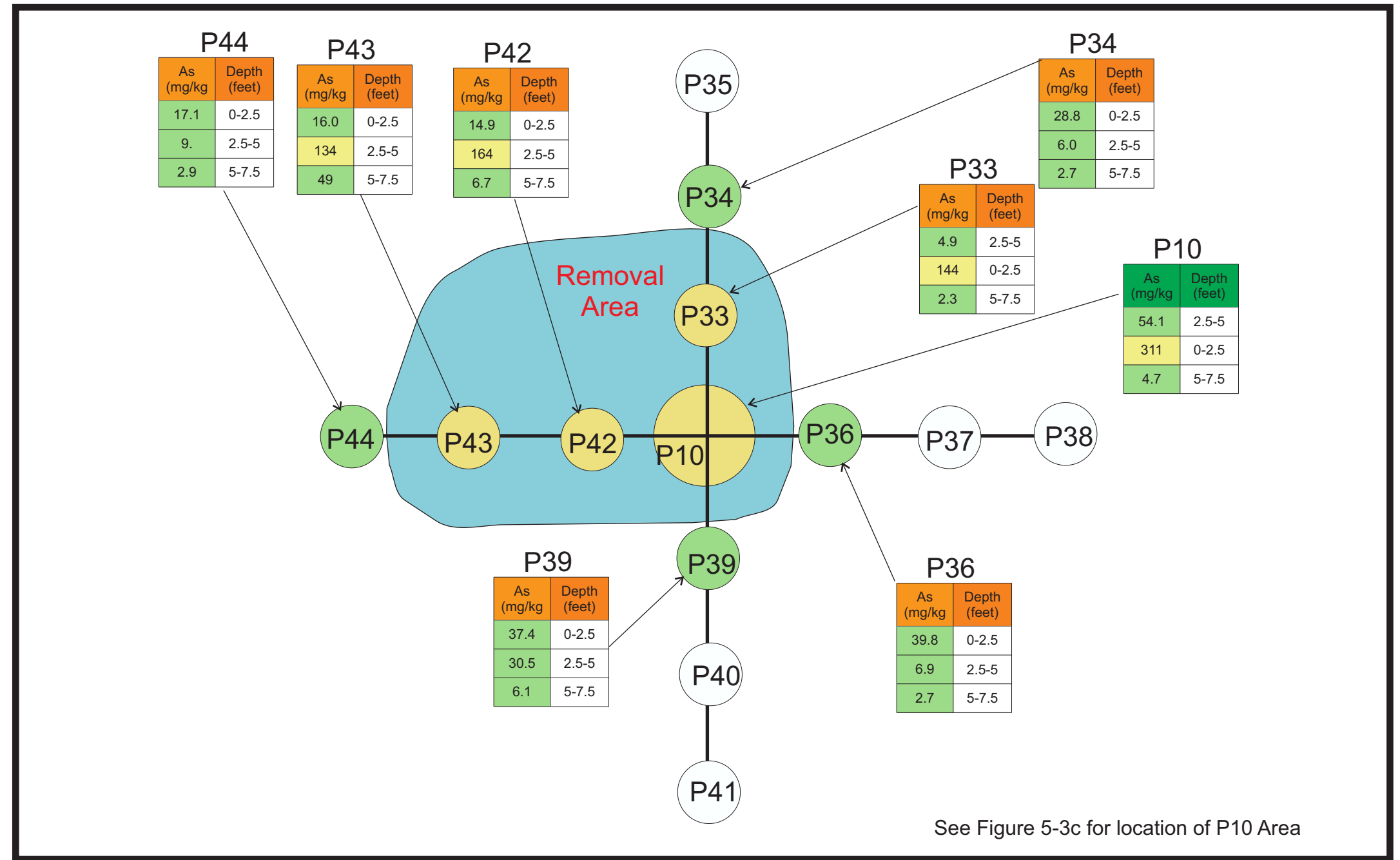


See Figure 2-1 for location of SB7 Area

Port of Tacoma Tacoma, Washington Arkema Mound Interim Action Work Plan 3009 Taylor Way, Tacoma, WA	FIGURE 5-3d May 2015
SB7 Area Arsenic in Soil Dalton, Olmsted & Fuglevand, Inc.	

FILE:D:\Projects\Port of Tacoma\Arkema Site\CAD\Figures\2015-05\MGD Report\Fig 5-3d Sb7 Area AS in Soil.cdr

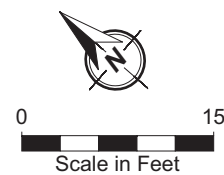
P10 Area



See Figure 5-3c for location of P10 Area

LEGEND

- Soil Probe
- Arsenic <57 mg/kg
- Arsenic 57-176 mg/kg
- Arsenic >176 mg/kg
- Removal Area



Port of Tacoma Tacoma, Washington		FIGURE 5-3e
Arkema Mound Interim Action Work Plan 3009 Taylor Way, Tacoma, WA		
P10 Area Arsenic in Soil		
Dalton, Olmsted & Fuglevand, Inc.		May 2015

PLOT TIME: 5/26/2015 10:21 AM MOD TIME: 5/26/2015 10:20 AM USER: Lee Barras DWG: D:\Projects\Port of Tacoma Arkenia Site\CAD\Figures\2015-05\MGD Report\2015-05-26 POT ArkeniaAs-Built Report Fig 5-4.dwg

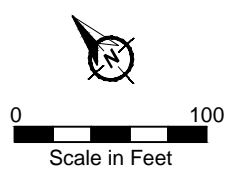
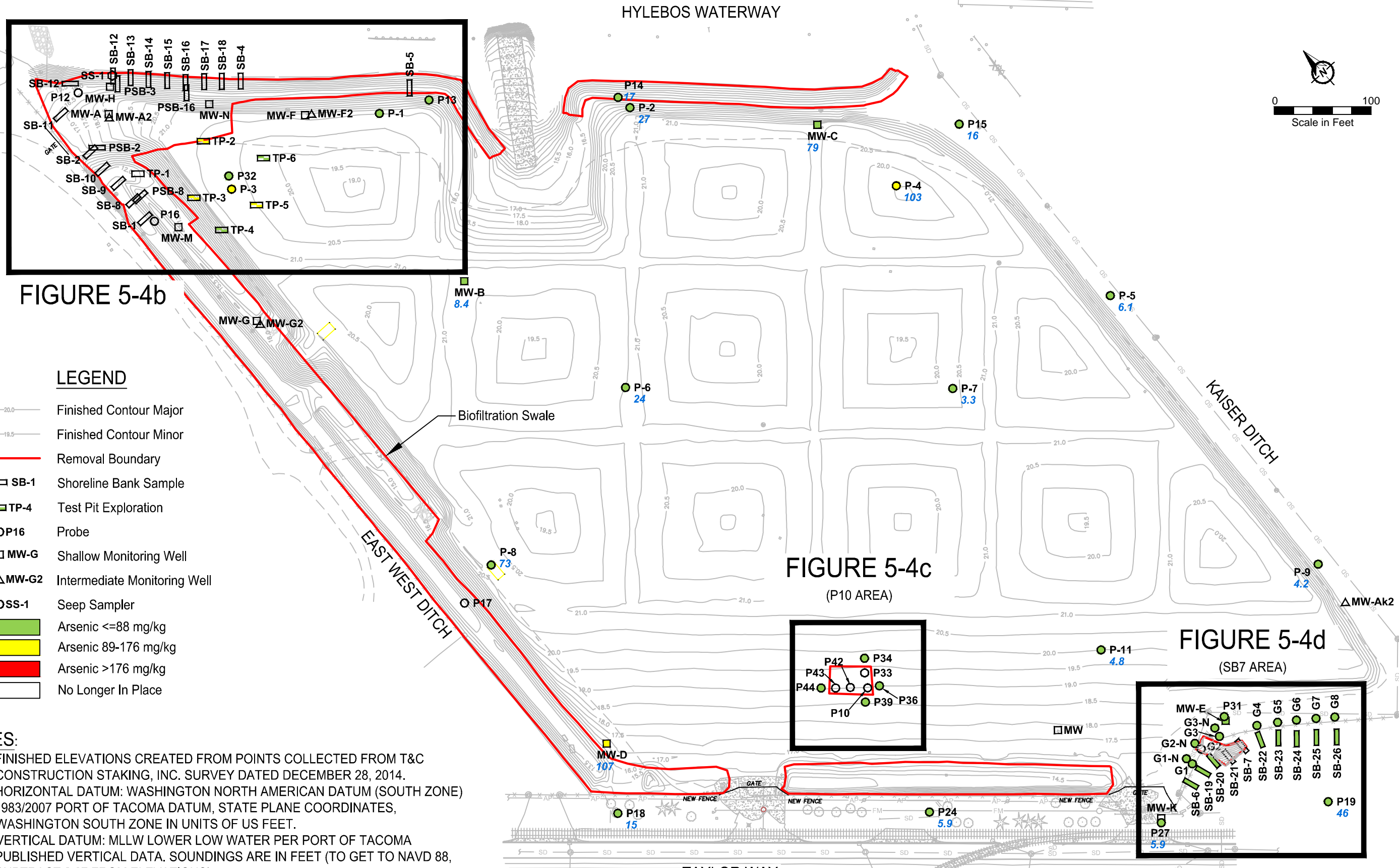


FIGURE 5-4b

FIGURE 5-4c
(P10 AREA)

FIGURE 5-4d
(SB7 AREA)

LEGEND

- Finished Contour Major
- Finished Contour Minor
- Removal Boundary
- Shoreline Bank Sample
- Test Pit Exploration
- Probe
- Shallow Monitoring Well
- Intermediate Monitoring Well
- Seep Sampler
- Arsenic <=88 mg/kg
- Arsenic 89-176 mg/kg
- Arsenic >176 mg/kg
- No Longer In Place

NOTES:

1. FINISHED ELEVATIONS CREATED FROM POINTS COLLECTED FROM T&C CONSTRUCTION STAKING, INC. SURVEY DATED DECEMBER 28, 2014.
2. HORIZONTAL DATUM: WASHINGTON NORTH AMERICAN DATUM (SOUTH ZONE) 1983/2007 PORT OF TACOMA DATUM, STATE PLANE COORDINATES, WASHINGTON SOUTH ZONE IN UNITS OF US FEET.
3. VERTICAL DATUM: MLLW LOWER LOW WATER PER PORT OF TACOMA PUBLISHED VERTICAL DATA. SOUNDINGS ARE IN FEET (TO GET TO NAVD 88, SUBTRACT 2.67 FROM ELEVATIONS).

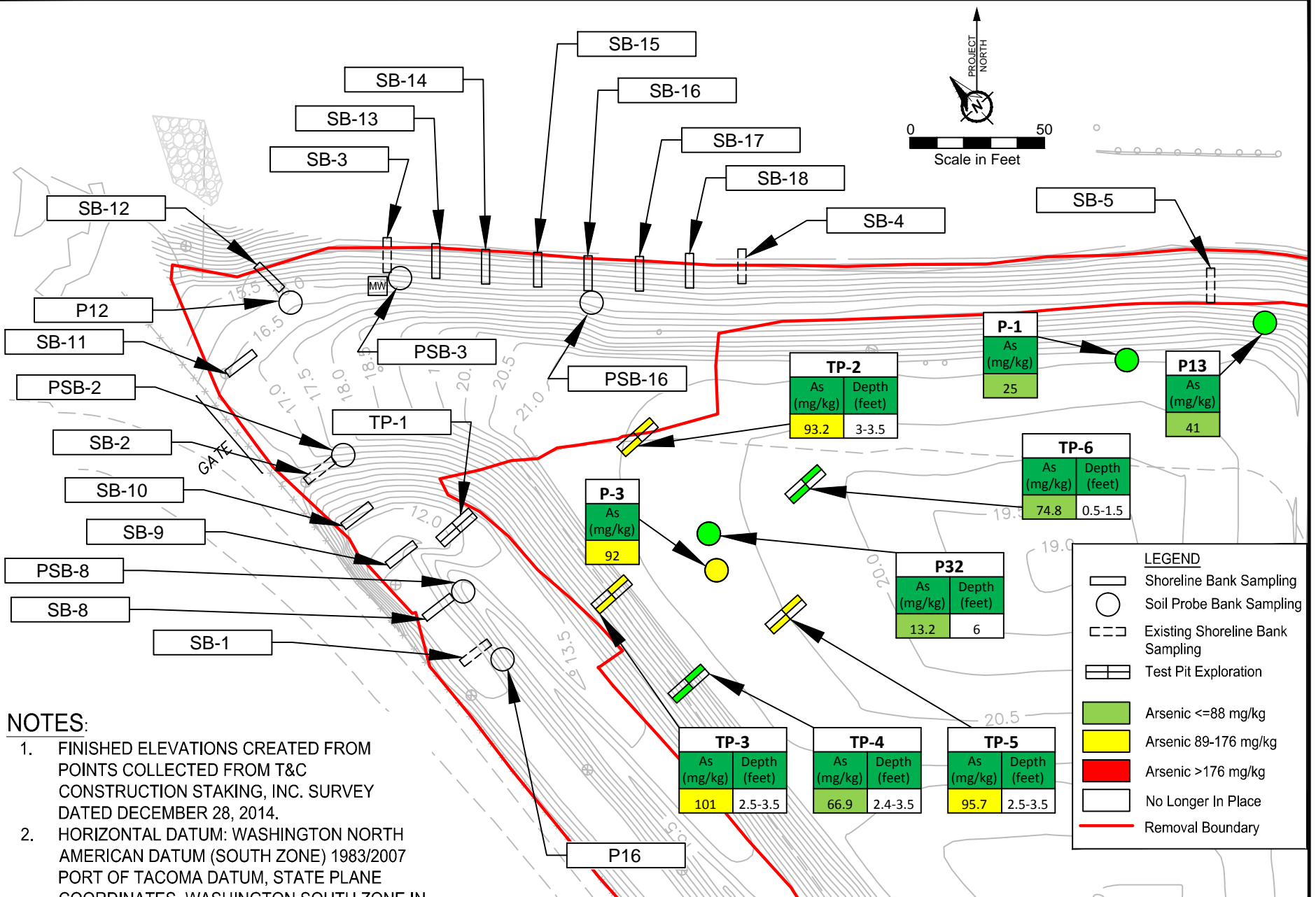
PORT OF TACOMA
 ONE SITCUM PLAZA TACOMA, WA 98401-1837
 3009 TAYLOR WAY MTCA INTERIM ACTION -
 ECOLOGY AGREED ORDER DE 6129
HIGHEST SOIL CONCENTRATIONS
AFTER INTERIM ACTION



FIGURE 5-4a

May 18, 2015

PLOT TIME: 5/18/2015 9:54 AM MOD TIME: 5/18/2015 9:53 AM USER: Lee Barros DWG: D:\Projects\Port of Tacoma Artna Site\CADD\Figures\2015-0511MCD Report\2015-05-18 POT ArtnaAs-Built Report Fig 5-4b.dwg



NOTES:

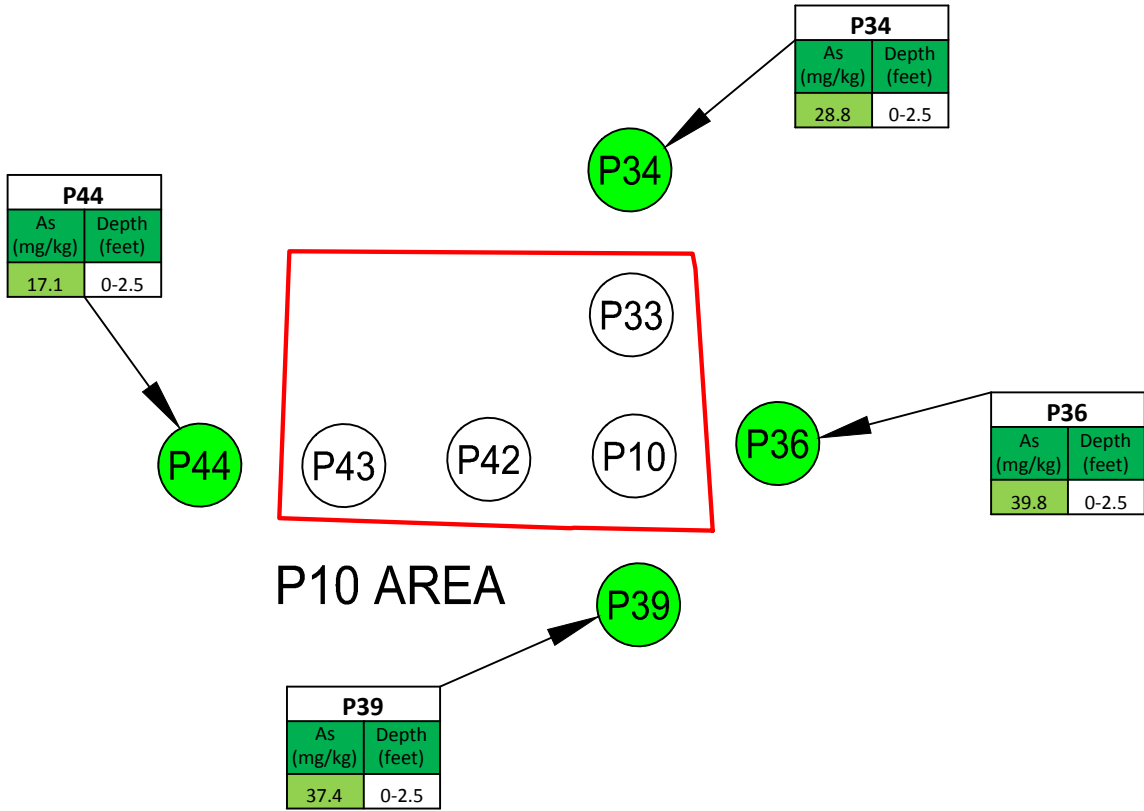
1. FINISHED ELEVATIONS CREATED FROM POINTS COLLECTED FROM T&C CONSTRUCTION STAKING, INC. SURVEY DATED DECEMBER 28, 2014.
2. HORIZONTAL DATUM: WASHINGTON NORTH AMERICAN DATUM (SOUTH ZONE) 1983/2007 PORT OF TACOMA DATUM, STATE PLANE COORDINATES, WASHINGTON SOUTH ZONE IN UNITS OF US FEET.
3. VERTICAL DATUM: MLLW LOWER LOW WATER PER PORT OF TACOMA PUBLISHED VERTICAL DATA. SOUNDINGS ARE IN FEET (TO GET TO NAVD 88, SUBTRACT 2.67 FROM ELEVATIONS).

PORT OF TACOMA
ONE SITCUM PLAZA TACOMA, WA 98401-1837
3009 TAYLOR WAY MTCA INTERIM ACTION -
ECOLOGY AGREED ORDER DE 6129
HIGHEST SOIL CONCENTRATIONS
AFTER INTERIM ACTION -
NORTHEAST CORNER AREA



FIGURE 5-4b

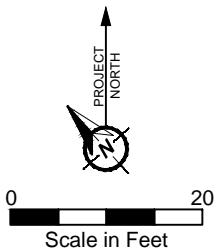
May 18, 2015



P10 AREA

LEGEND

- Soil Probe
- Arsenic <=88 mg/kg
- Arsenic 89-176 mg/kg
- Arsenic >176 mg/kg
- No Longer In Place
- Removal Boundary



PORT OF TACOMA
 ONE SITCUM PLAZA TACOMA, WA 98401-1837
 3009 TAYLOR WAY MTCA INTERIM ACTION -
 ECOLOGY AGREED ORDER DE 6129

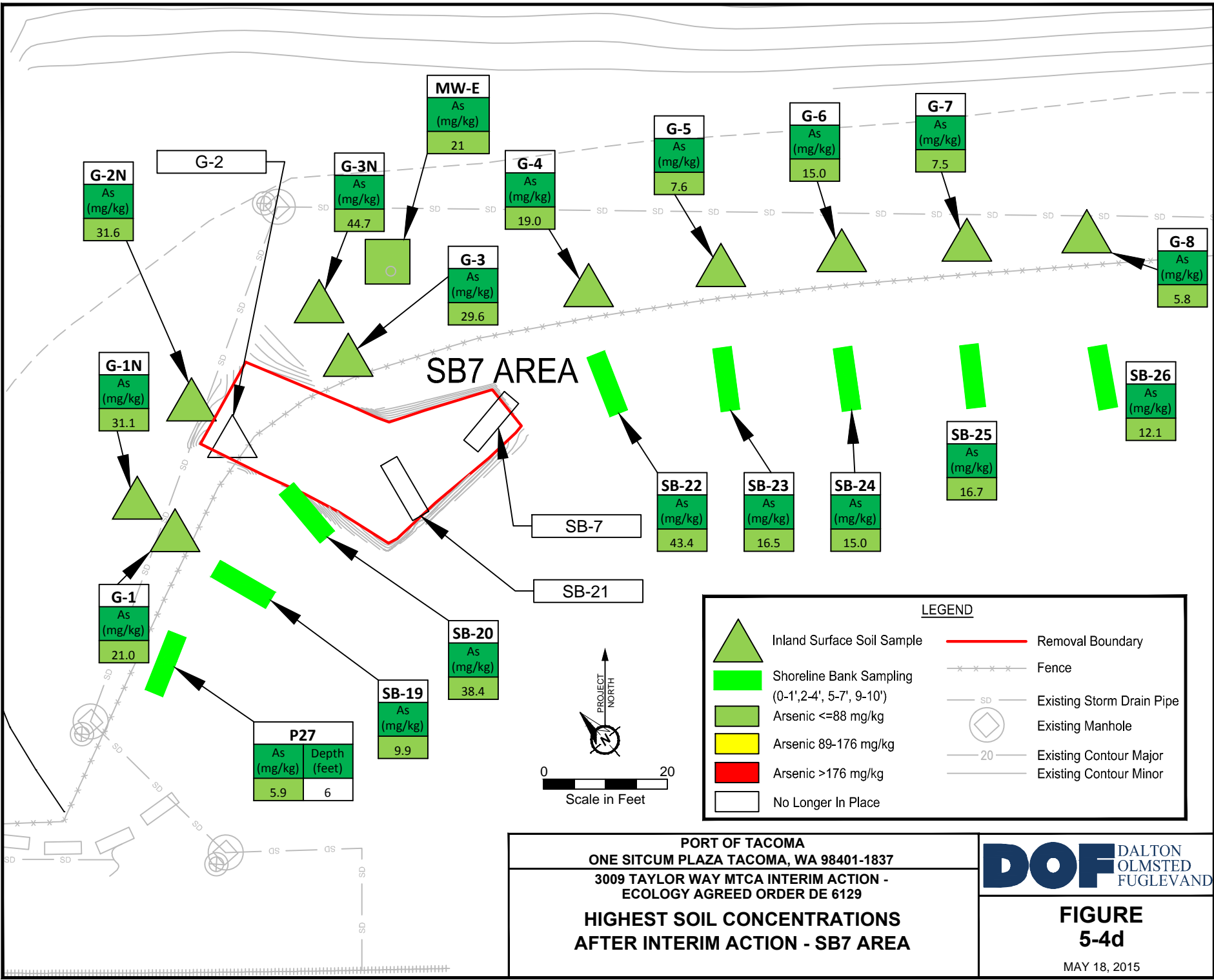
**HIGHEST SOIL CONCENTRATIONS
 AFTER INTERIM ACTION - P10 AREA**

DOF DALTON
 OLMSTED
 FUGLEVAND

**FIGURE
 5-4c**

MAY 18, 2015

PLOT TIME: 5/28/2015 10:21 AM, MOD TIME: 5/28/2015 10:20 AM, USER: Lee Barrios, DIV: D:\Projects\Port of Tacoma Arsenic Site\CAD\Figures\2015-05-28 POT Arsenic-Built Report Fig 5-4.dwg



LEGEND

- Inland Surface Soil Sample
- Shoreline Bank Sampling (0-1', 2-4', 5-7', 9-10')
- Arsenic <=88 mg/kg
- Arsenic 89-176 mg/kg
- Arsenic >176 mg/kg
- No Longer In Place
- Removal Boundary
- Fence
- Existing Storm Drain Pipe
- Existing Manhole
- Existing Contour Major
- Existing Contour Minor

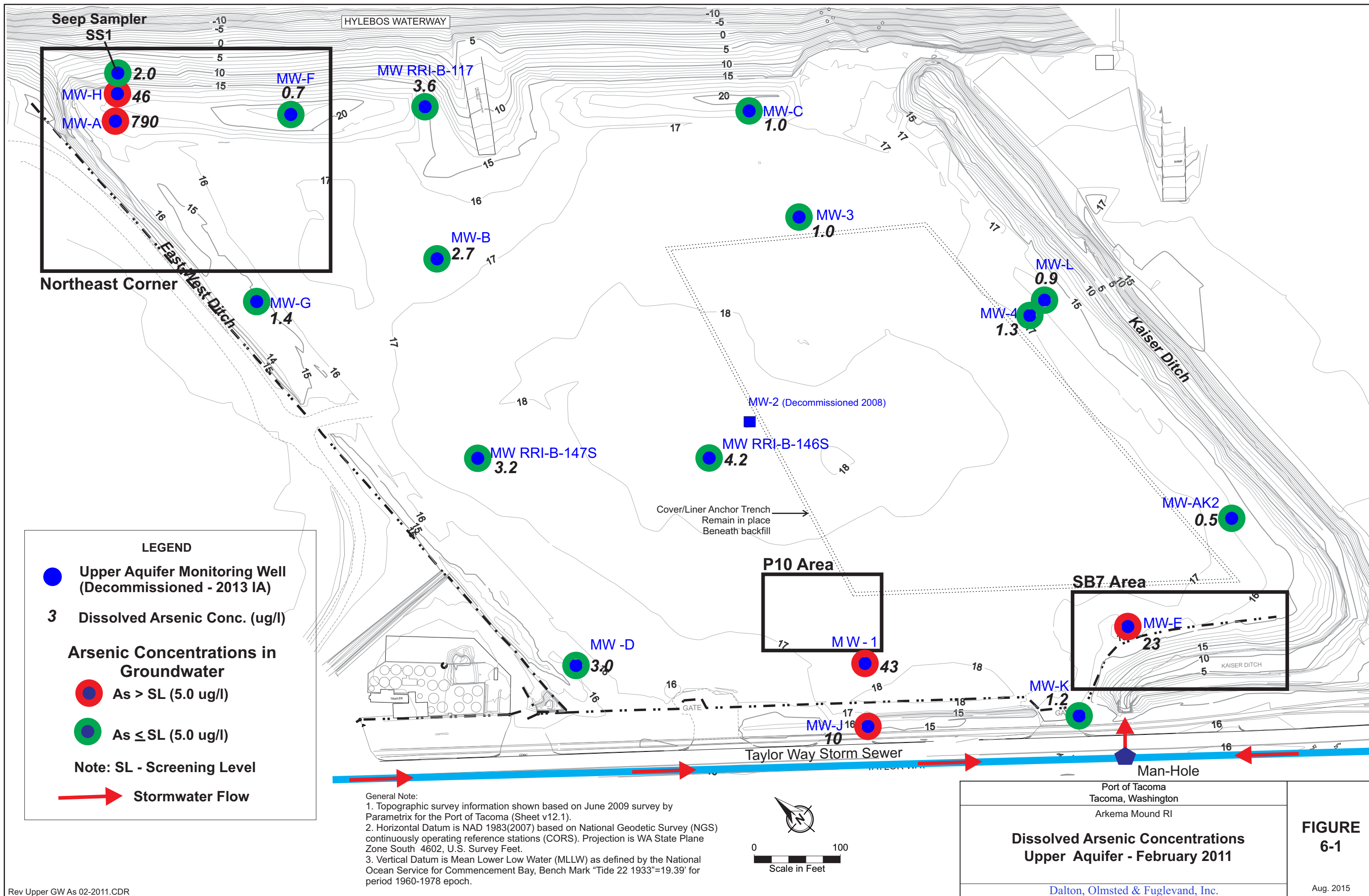
PROJECT NORTH

Scale in Feet

0 20

PORT OF TACOMA
ONE SITCUM PLAZA TACOMA, WA 98401-1837
3009 TAYLOR WAY MTCA INTERIM ACTION -
ECOLOGY AGREED ORDER DE 6129
HIGHEST SOIL CONCENTRATIONS
AFTER INTERIM ACTION - SB7 AREA

FIGURE
5-4d
 MAY 18, 2015



Port of Tacoma
Tacoma, Washington
Arkema Mound RI

**Dissolved Arsenic Concentrations
Upper Aquifer - February 2011**

Dalton, Olmsted & Fuglevand, Inc.

**FIGURE
6-1**

Aug. 2015

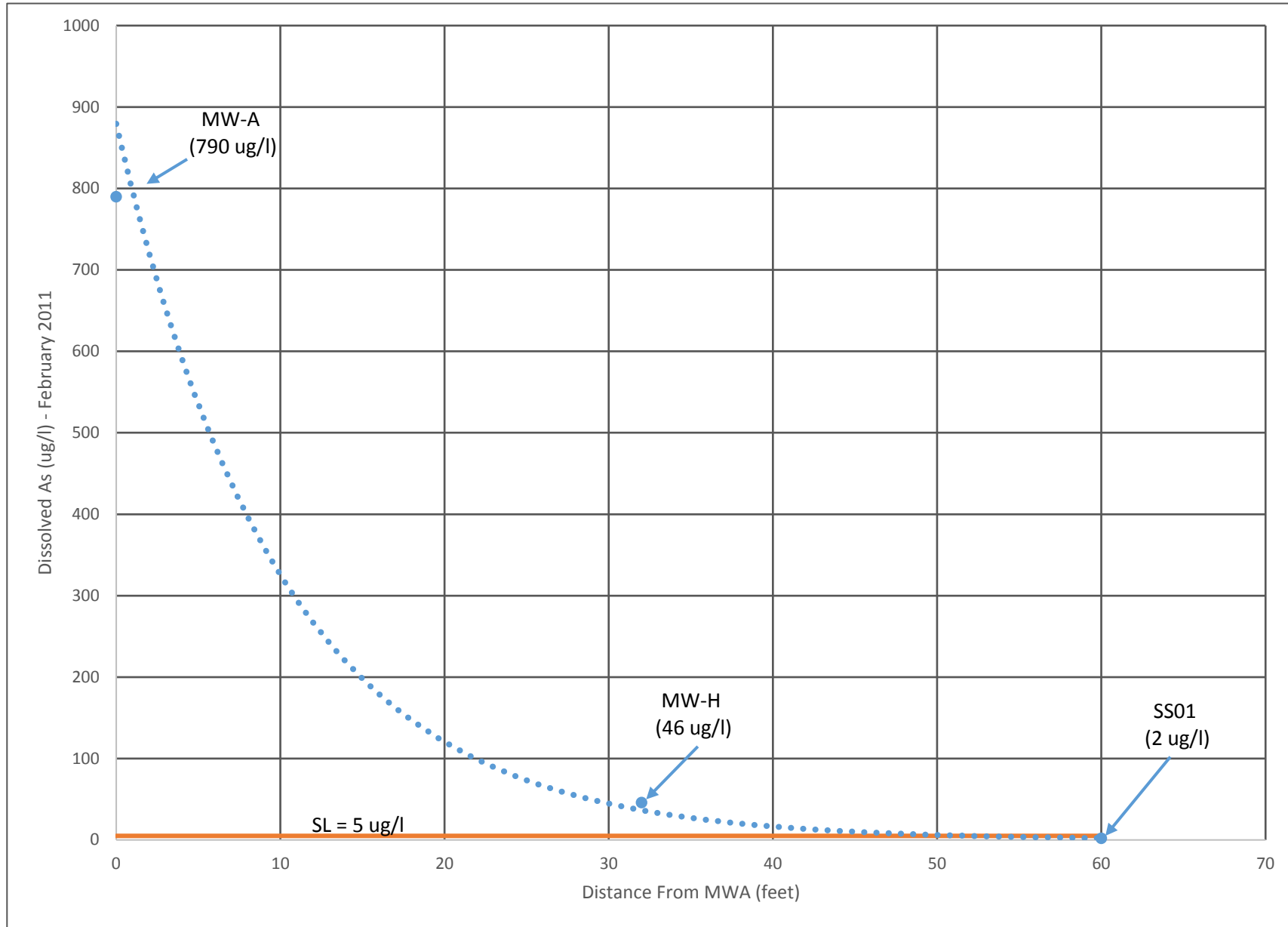
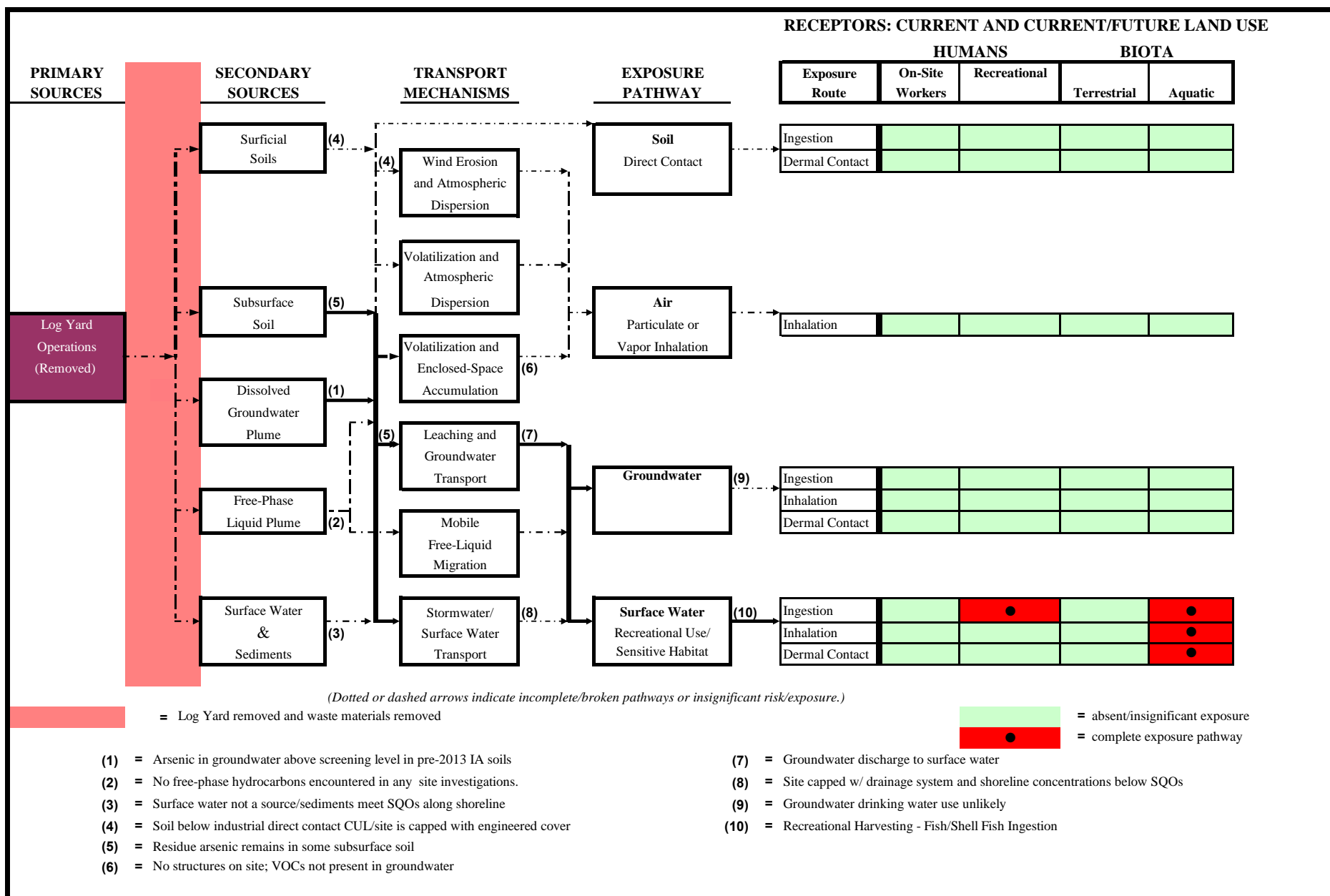
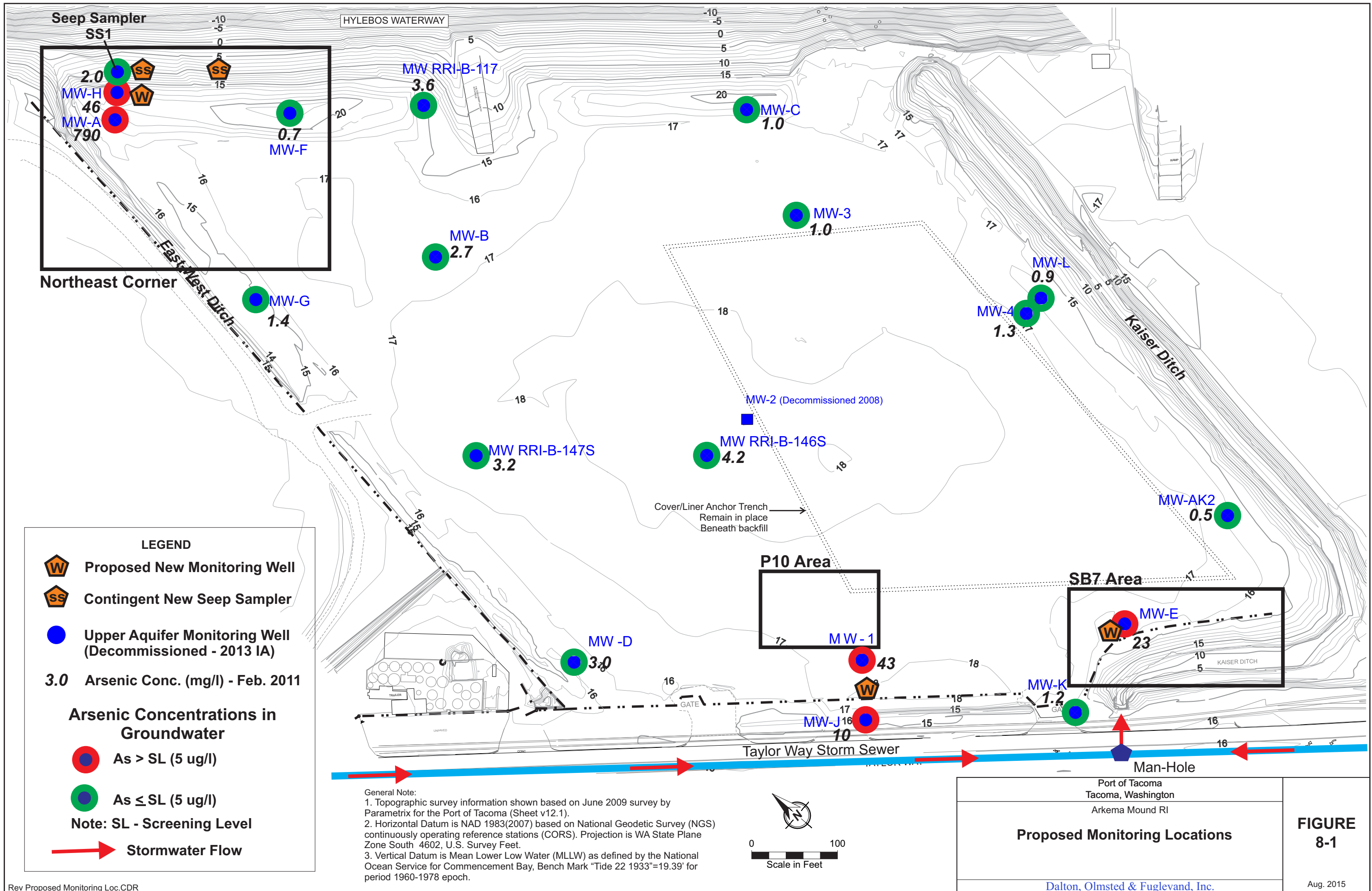


FIGURE 6-2
Dissolved Arsenic Decline
Northeast Corner





DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

Seep Sampler SS-1

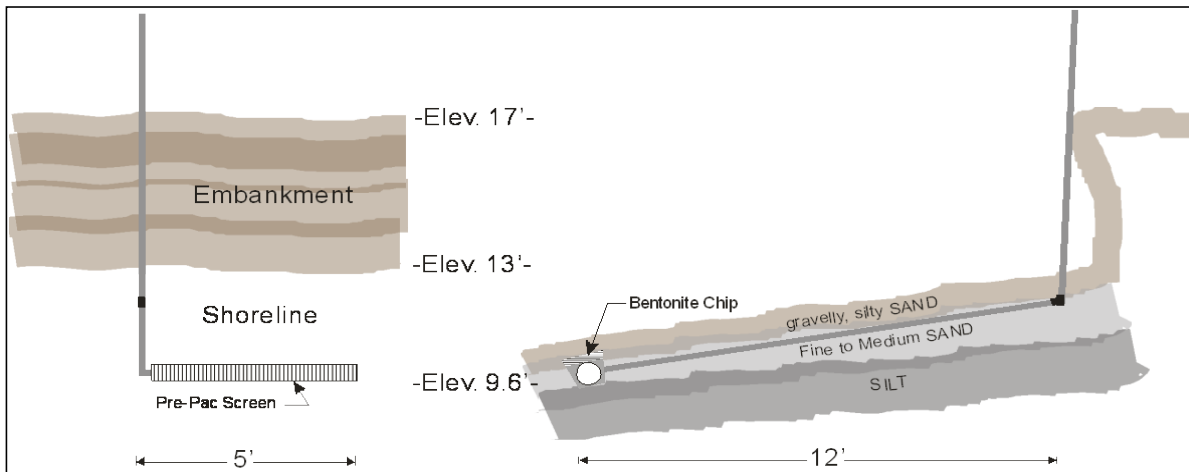
Field Rep: D. Cooper	Location: N710543 E1175859 (Riser location) / N710543 E1175850 (Screen Location)
Drilling Co.: Cascade	Ground surface elevation: 9.6 ft. MLLW
Driller: Frank Scott	Date Completed: 12/10/2010
Drill Type: Hand Excavated	Weather: Cloudy 45F
Size/Type Casing: N/A	Sampler: N/A



Looking South



Looking East



SEEP SAMPLER INFORMATION

Riser: 2" dia. SCH 40 PVC
 Length: 20'
 Screen: 2" dia. SCH 40 PVC Pre-Pac
 Slot size: 0.010"
 Length: 5'
 Horizontal @ Elev. 9.6' MLLW
 0.3' end cap
 Sandpack: 2/12 Colorado sand
 Seal: Hydrated bentonite chip

**APPENDIX A
GEOLOGIC LOGS AND
WELL CONSTRUCTION DIAGRAMS
ARKEMA MOUND RI**

TEST PIT LOGS
DOF-TP1 to DOF-TP6
FORMER ARKEMA MOUND SITE

TEST PIT DOF-TP1 - DESCRIPTION OF SAMPLES AND TESTS

Field Rep: DG Cooper		Location: N710435 E1175836	
Excavating: Rons Earthworks		Elevation : 15	
Operator Rob Harris		Date Completed: 1/27/11	
Excavator Type: JD 310		Weather: clear 40F	
Depth (Ft) From - To	DESCRIPTION		
Surface	Grass		
0-1	Loose, wet, dark brown, silty, SAND, with some gravel, scattered organics, thin roots		
1-3	Medium dense, wet, dark brown, gravelly, SAND, with some silt, scattered organics, woody debris, wood chip		
3-4	Medium dense, wet to saturated, gray, fine to medium SAND		
	rapid groundwater seepage @ 3.5'		
	Samples: AKW-S-TP1-0.5-012711 grab @ 0.5-1' AKW-S-TP1-2-012711 grab @ 1.5-2' AKW-S-TP1-4-012711 grab @ 3.5-4'		

TEST PIT DOF-TP2 - DESCRIPTION OF SAMPLES AND TESTS

Field Rep: DG Cooper		Location: N710430 E1175884	
Excavating: Rons Earthworks		Elevation : 16.5	
Operator Rob Harris		Date Completed: 1/27/11	
Excavator Type: JD 310		Weather: clear 40F	
Depth (Ft) From - To	DESCRIPTION		
Surface	0.2' of 5/8" minus Crushed Rock		
0.2-1	Medium Dense, wet, dark brown, gravelly, SAND, with some silt, scattered organics, wood chip		
1-2.5	Medium dense, wet, brown, sandy GRAVEL, with some silt		
2.5-4	Medium dense, wet to saturated, brown, sandy, GRAVEL, with minor silt, oxidation (groundwater flux)		
	Rapid seepage @ 3.5'		
	Samples: AKW-S-TP2-0.5-012711 grab @ 0.2-1' AKW-S-TP2-2-012711 grab @ 1.5-2' AKW-S-TP2-3-012711 grab @ 3-3.5'		

TEST PIT DOF-TP3 - DESCRIPTION OF SAMPLES AND TESTS

Field Rep: DG Cooper		Location: N710393 E1175838	
Excavating: Rons Earthworks		Elevation : 16	
Operator Rob Harris		Date Completed: 1/27/11	
Excavator Type: JD 310		Weather: clear 40F	
Depth (Ft) From - To	DESCRIPTION		
Surface	0.5' of 5/8" -minus Crushed Rock		
0.5-2.5	Medium Dense, wet, dark brown, silty, SAND, with minor gravel, scattered organics, thin roots		
2.5-4	Medium dense, wet, dark brown, silty, SAND, with some gravel, wood chip, metal & wood debris		
4-5	Medium dense, saturated, gray, Fine to Medium SAND		
rapid groundwater seepage @ 4.0'			
Samples: AKW-S-TP3-1-012711 grab @ 0.5-1.5' AKW-S-TP3-3-012711 grab @ 2.5-3.5' AKW-S-TP3-5-012711 grab @ 4-5'			

TEST PIT DOF-TP4 - DESCRIPTION OF SAMPLES AND TESTS

Field Rep: DG Cooper		Location: N710349 E1175837	
Excavating: Rons Earthworks		Elevation : 16	
Operator Rob Harris		Date Completed: 1/27/11	
Excavator Type: JD 310		Weather: clear 40F	
Depth (Ft) From - To	DESCRIPTION		
Surface	0.5' of 5/8" minus Crushed Rock		
0.5-2	Medium Dense, wet, mottled brown-gray, gravelly, SAND, with some silt, thin roots		
2-4	Medium dense, wet, dark brown, silty, SAND, with some gravel, scattered woody debris, organics		
4-5	Medium dense, saturated, gray, Fine to Medium SAND		
Rapid seepage @ 4.0'			
Samples: AKW-S-TP4-1-012711 grab @ 0.5-2' AKW-S-TP4-3-012711 grab @ 2-4' AKW-S-TP4-5-012711 grab @ 4-5'			

TEST PIT DOF-TP5 - DESCRIPTION OF SAMPLES AND TESTS

Field Rep: DG Cooper		Location: N710344 E1175881	
Excavating: Rons Earthworks		Elevation : 17	
Operator Rob Harris		Date Completed: 1/27/11	
Excavator Type: JD 310		Weather: clear 40F	
Depth (Ft) From - To	DESCRIPTION		
Surface	0.5' of 5/8" -minus Crushed Rock		
0.5-2	Medium Dense, wet, mottled gray-brown, gravelly, SAND, with some silt, thin roots		
2-4	Medium dense, wet, dark brown, silty, SAND, with some gravel, woody debris, metal scattered throughout		
4-5	Medium dense, saturated, gray, Fine to Medium SAND		
	rapid groundwater seepage @ 4.5' Samples: AKW-S-TP5-1-012711 grab @ 0.5-2' AKW-S-TP5-3-012711 grab @ 2-4' AKW-S-TP5-5-012711 grab @ 4-5'		

TEST PIT DOF-TP6 - DESCRIPTION OF SAMPLES AND TESTS

Field Rep: DG Cooper		Location: N710375 E1175919	
Excavating: Rons Earthworks		Elevation : 16.5	
Operator Rob Harris		Date Completed: 1/27/11	
Excavator Type: JD 310		Weather: clear 40F	
Depth (Ft) From - To	DESCRIPTION		
Surface	0.5' of 5/8" minus Crushed Rock		
0.5-2.5	Medium Dense, wet, mottled brown-gray, gravelly, SAND, with some silt, interbeds of dark brown, silty, SAND w/oxidation		
2.5-5	Medium dense, saturated, gray, Fine to Medium SAND		
	No seepage Samples: AKW-S-TP6-1-012711 grab @ 0.5-2.5' AKW-S-TP6-3-012711 grab @ 2.5-5'		

PROBE LOGS
P1 to P32
FORMER ARKEMA MOUND SITE

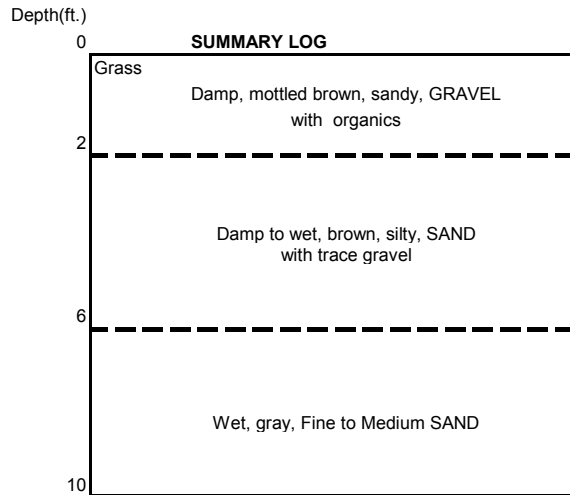
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N710328 E1176038		Ground Surface: Grass Berm		
Drilling Co.: Cascade		Elevation (Ft.): 19.3				
Driller: C Goble		Date Completed: 06/11/09				
Drill Type: Powerpobe 6600		Weather: Cloudy 60F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	48		0-1' Damp, bwn, silty, SAND, w/roots
A	0-2'				0900	1-2' Damp, mot gry-bwn, sandy, GRAVEL, w/organics
B	2-5'				0910	2-5' Wet, bwn, silty, SAND, w/trace gravel
C	6-8'		5-10	48	0915	5-6' As above
D	8-10'				0920	6-8' Wet, gry, F-M SAND
						8-10' Wet, gry, F-M SAND, w/some silt

LABORATORY SAMPLES:

Soil:
 AKW-S-P1-A
 AKW-S-P1-B
 AKW-S-P1-C
 AKW-S-P1-D

Notes: Samples over selected interval composited in stainless steel bowl
 Completed boring backfilled with granular bentonite



(Bottom of Boring)
 NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

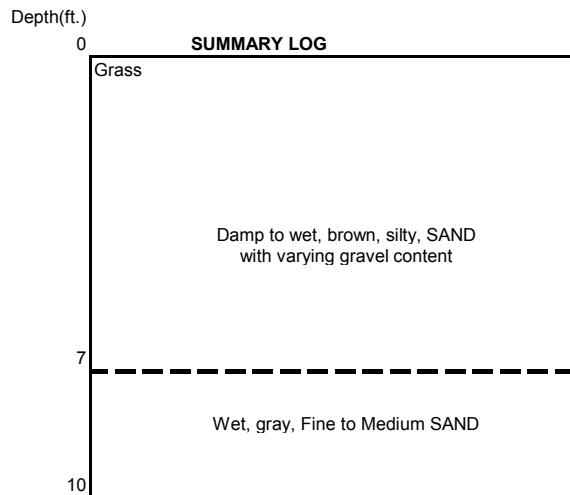
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N710158 E1176234		Ground Surface: Grass Berm		
Drilling Co.: Cascade		Elevation (Ft.): 18.3		Date Completed: 06/11/09		
Driller: C Goble		Weather: Cloudy 60F		Hammer Type: Direct push		
Drill Type: Powerpobe 6600		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		Size/Type Casing: 1.5" Rod		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	60		0-1' Damp, lt bwn, silty, SAND, w/some gravel, roots
A	0-2.5'				0945	1-2.5' Moist, bwn, gravelly, silty, SAND, w/trace organics
B	2.5-5'				0950	2.5-5' Wet, mot gry, silty, SAND, w/some gravel, wood
C	5-7'		5-10	60	0955	5-7' As above
D	7-10'				1000	7-10' Wet, gry, F-M SAND

LABORATORY SAMPLES:

Soil:
 AKW-S-P2-A
 AKW-S-P2-B
 AKW-S-P2-C
 AKW-S-P2-D

Notes: Samples over selected interval composited in stainless steel bowl
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

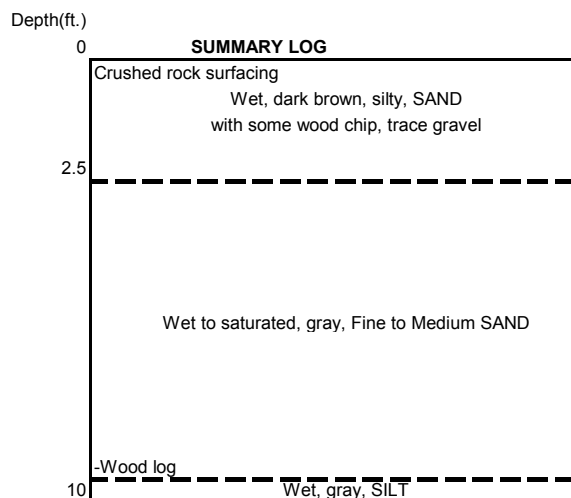
Field Rep: DG Cooper		Location: N710360 E1175875		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 16.3				
Driller: C Goble		Date Completed: 06/11/09				
Drill Type: Powerpobe 6600		Weather: Cloudy 70F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	36		0-0.5' 5/8" minus crushed rock
A	0-2.5'				0925	0.5-2.5' Wet, dk bwn, silty, SAND, w/some wood chip, gravel
B	2.5-5'				0930	2.5-5' Wet, gry, silty, F-M SAND, w/minor silt
C	5-8.5'		5-10	60	0935	5-8.5' Sat, gry, F-M SAND
D	8.5-10'				0940	8.5-9.5' Fibrous wood (log)
						9.5-10' Wet, gry, SILT

LABORATORY SAMPLES:

Soil:
AKW-S-P3-A
AKW-S-P3-B
AKW-S-P3-C
AKW-S-P3-D

Notes: Samples over selected interval composited in stainless steel bowl

Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

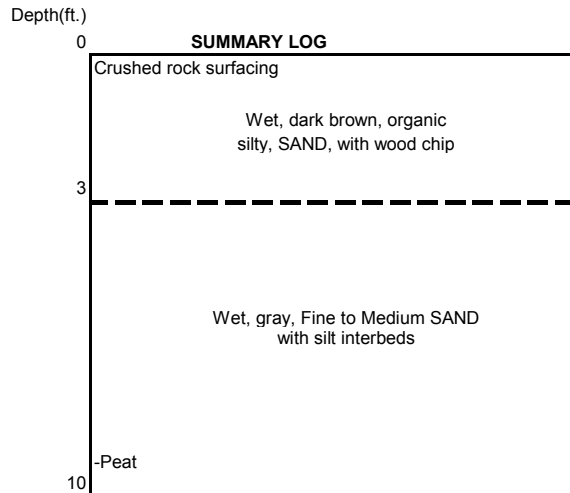
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709912 E1176384		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 17.9				
Driller: C Goble		Date Completed: 06/11/09				
Drill Type: Powerpobe 6600		Weather: Cloudy 70F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	48		0-1' 5/8" to 1.5" minus crushed rock
A	0-3'				1005	1-3' Wet, dk bwn, organic, silty, SAND, w/wood chip
B	3-5'				1010	3-5' Wet, gry, F-M SAND, w/some gravel, trace silt
C	5-7.5'		5-10	60	1015	5-6' Wet, gry, F-M SAND, w/silt interbeds
D	7.5-10'				1020	6-10' Wet, gry, F-M SAND
						thin peat layer @ 9.5'

LABORATORY SAMPLES:

Soil:
 AKW-S-P4-A
 AKW-S-P4-B
 AKW-S-P4-C
 AKW-S-P4-D

Notes: Samples over selected interval composited in stainless steel bowl
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

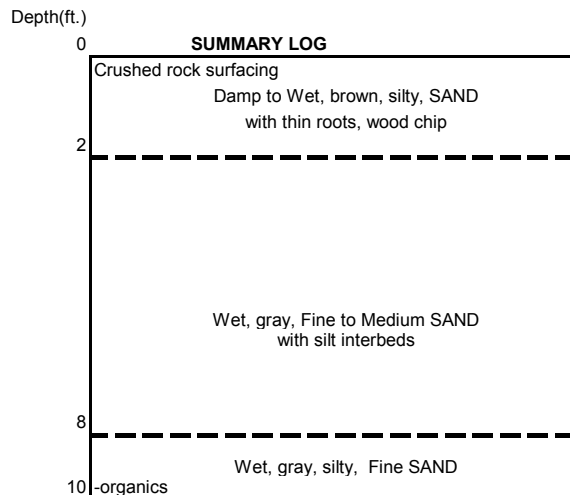
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709678 E1176473		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 16.2		Date Completed: 06/11/09		
Driller: C Goble		Weather: Cloudy 70F		Hammer Type: Direct push		
Drill Type: Powerprobe 6600		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		Size/Type Casing: 1.5" Rod		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	60		0-1' Damp, bwn, silty, SAND, w/thin roots
A	0-2'				1030	1-2' Moist, mot bwn, F-M SAND, w/wood chip
B	2-5'				1035	2-5' Moist, gry, F-M SAND
C	5-8'		5-10	60	1040	5-8' As above with silt clasts, interbeds
D	8-10'				1045	8-10' Wet, gry, silty, F SAND, grading finer, organic

LABORATORY SAMPLES:

Soil:
 AKW-S-P5-A
 AKW-S-P5-B
 AKW-S-P5-C
 AKW-S-P5-D

Notes: Samples over selected interval composited in stainless steel bowl
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

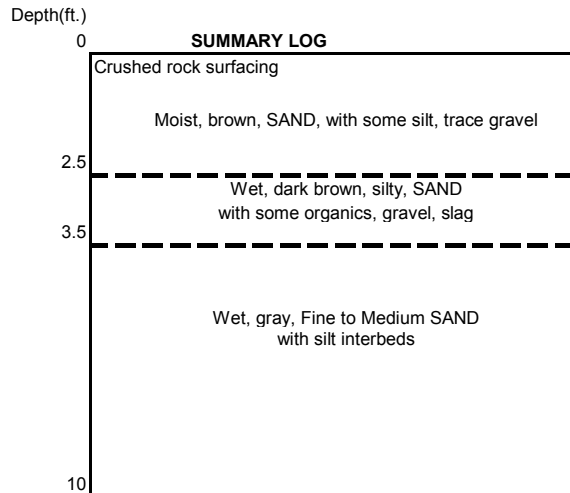
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709950 E1176035		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 18				
Driller: C Goble		Date Completed: 06/11/09				
Drill Type: Powerpobe 6600		Weather: Cloudy 75F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	60		0-0.5' 5/8" minus crushed rock
A	0.5-2.5				1120	0.5-2.5' Moist, bwn, SAND, w/some silt, trace gravel
B	2.5-3.5'				1125	2.5-3.5' Wet, dk bwn, silty, SAND, w/some gravel, organics, small piece of slag
						3.5-5' Moist, bwn, F-M SAND, w/silt interbeds
C	6.5-9'		5-10	60	1130	5-6.5' As above
D	9-10'				1135	6.5-9' Wet, gry, silty, F SAND, w/silt interbeds
						9-10' Sat, gry, F-M SAND

LABORATORY SAMPLES:

Soil:
 AKW-S-P6-A
 AKW-S-P6-B
 AKW-S-P6-C
 AKW-S-P6-D

Notes: Samples over selected interval composited in stainless steel bowl
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

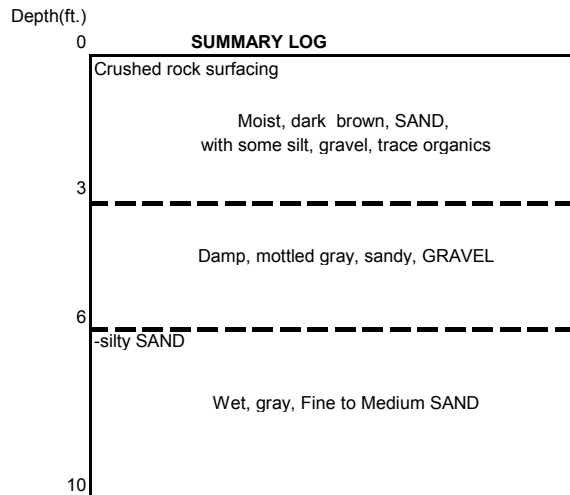
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709719 E1176287		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 18				
Driller: C Goble		Date Completed: 06/11/09				
Drill Type: Powerpobe 6600		Weather: Cloudy 75F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	48		0-0.5' 5/8" minus crushed rock
A	0.5-3				1055	0.5-3' Moist, dk bwn, SAND, w/some silt, gravel, trace organics
B	3-5'				1100	3-5' Damp, mot gry, sandy, GRAVEL
C	5-6.5'		5-10	60	1105	5-6' As above
D	6.5-10'				1110	6-6.5' Wet, bwn, silty, SAND, w/scattered organics
						6.5-10' Wet. gry, F-M SAND

LABORATORY SAMPLES:

Soil:
 AKW-S-P7-A
 AKW-S-P7-B
 AKW-S-P7-C
 AKW-S-P7-D

Notes: Samples over selected interval composited in stainless steel bowl
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

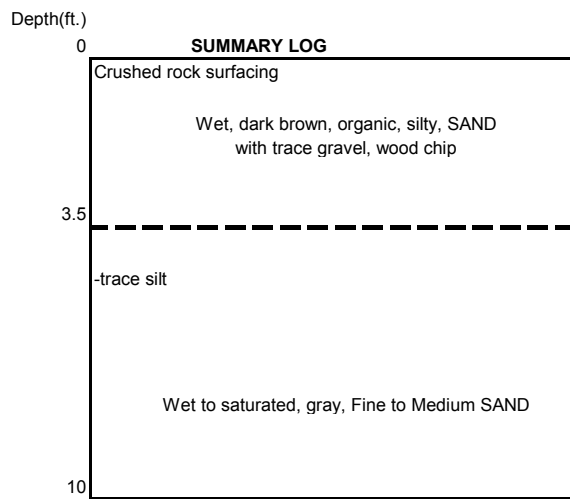
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709906 E1175809		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 16.6				
Driller: C Goble		Date Completed: 06/11/09				
Drill Type: Powerpobe 6600		Weather: Cloudy 75F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	60		0-1' 5/8"-1.5" minus crushed rock
A	1-3.5'				1155	1-3.5' Wet, dk bwn, organic, silty, SAND, w/trace gravel, wood chip
B	3.5-5'				1200	3.5-5' Wet, gry, F-M SAND
C	5-7'		5-10	60	1205	5-7' Wet-sat, gry F-M SAND, w/trace silt
D	7-10'				1210	7-10' Sat, gry, F-M SAND

LABORATORY SAMPLES:

Soil:
 AKW-S-P8-A
 AKW-S-P8-B
 AKW-S-P8-C
 AKW-S-P8-D

Notes: Samples over selected interval composited in stainless steel bowl
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

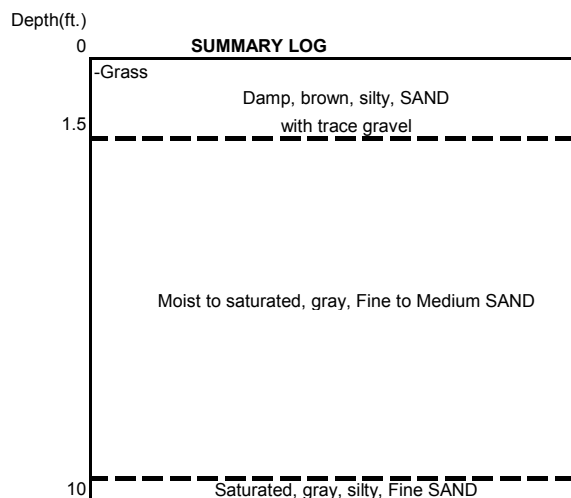
Field Rep: DG Cooper		Location: N709328 E1176445		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 16.3		Date Completed: 06/11/09		
Driller: C Goble		Weather: Cloudy 75F		Hammer Type: Direct push		
Drill Type: Powerpobe 6600		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		Size/Type Casing: 1.5" Rod		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	60		0-0.5' Damp, bwn, silty, SAND, w/thin roots
A	0-1.5'				1240	0.5-1.5' Damp, bwn,silty, SAND, w/trace gravel
B	1.5-5'				1245	1.5-5' Moist, gry, F-M SAND
C	5-7.5'		5-10	60	1250	5-9.5' Wet to sat, As above
D	7.5-10'				1255	9.5-10' Sat, gry, silty, F SAND

LABORATORY SAMPLES:

Soil:
AKW-S-P9-A
AKW-S-P9-B
AKW-S-P9-C
AKW-S-P9-D

Notes: Samples over selected interval composited in stainless steel bowl

Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

P10

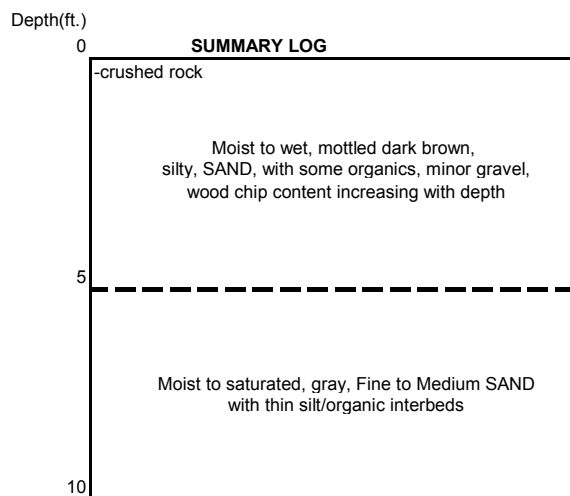
Field Rep: DG Cooper		Location: N709551 E1176009		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 17.4				
Driller: C Goble		Date Completed: 06/11/09				
Drill Type: Powerpobe 6600		Weather: Cloudy 75F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	60		0-1' 5/8"-1.5" minus crushed rock
A	1-2.5'				1220	1-5' Moist to wet, mot dk bwn, silty, SAND, w/some organics
B	2.5-5'				1225	wood chip increasing with depth, minor gravel
C	5-7.5'		5-10	60	1230	5-10' Wet to sat, gry, F-M SAND, w/thin silt organic interbeds
D	7.5-10'				1235	

LABORATORY SAMPLES:

Soil:
AKW-S-P10-A
AKW-S-P10-B
AKW-S-P10-C
AKW-S-P10-D

Notes: Samples over selected interval composited in stainless steel bowl

Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

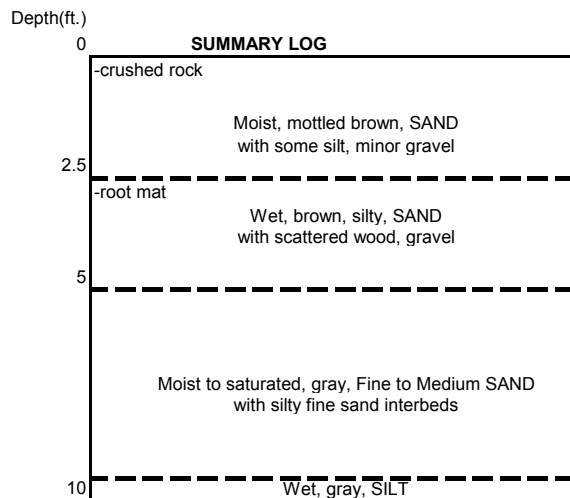
Field Rep: DG Cooper		Location: N709415 E1176218		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 17.5				
Driller: C Goble		Date Completed: 06/11/09				
Drill Type: Powerpobe 6600		Weather: Cloudy 75F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Dia. X 5' Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
	Composite	Smooth	0-5	60		0-1' 5/8"-1.5" minus crushed rock
A	1-2.5'				1300	1-2.5' Moist, mot bwn, SAND, w/some silt, minor gravel
B	2.5-5'				1305	2.5-5' Wet, bwn, silty, SAND, scattered wood, gravel
C	5-7.5'		5-10	60	1310	5-9.5' Wet-sat, gry, F-M SAND, w/silty F Sand iinterbeds
D	7.5-9.5'				1315	9.5-10' Wet, gry, SILT

LABORATORY SAMPLES:

Soil:
 AKW-S-P11-A
 AKW-S-P11-B
 AKW-S-P11-C
 AKW-S-P11-D

Notes: Samples over selected interval composited in stainless steel bowl

Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

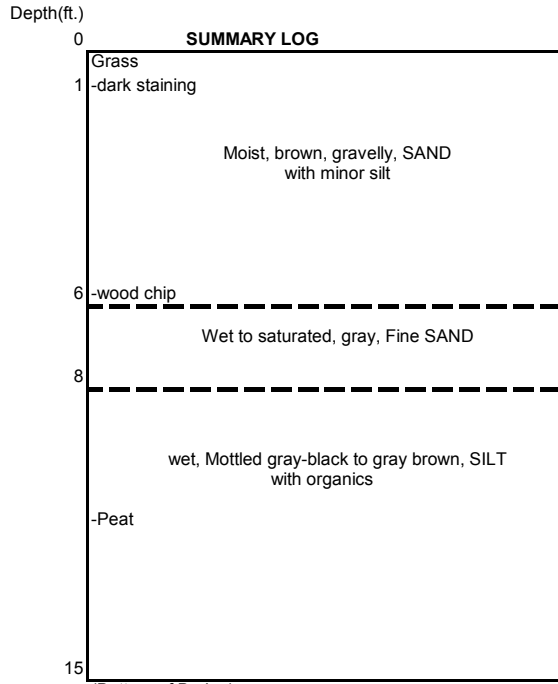
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N710554 E1175822		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 17				
Driller: Frank Scott		Date Completed: 05/12/10				
Drill Type: Geoprobe 9630		Weather: Cloudy 50F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	36		
0/1.5	composite 0-1.5'				0800	0-5' Moist, bwn, gravelly, SAND, w/minor silt
3	grab @ 3'				0805	dark staining @ 1.0'
			5-10	48		5-6' As above, wood chip @ 6'
6	grab @ 6'				0810	6-8' Wet-sat, gry, F SAND
9	grab @ 9'				1815	8-10' Soft, mot gry-blk, SILT
			10-15	60		10-11.5' As above with organic, sandy interbeds
12	grab @ 12'				0820	11.5-12' Wet, bwn, fibrous PEAT
15	grab @ 15'				0825	12-15' Wet, gry-bwn, clayey SILT, w/organics, marsh grass

LABORATORY SAMPLES:

Soil:
 AKW-S-P12-0/1.5-051210 @ 0800
 AKW-S-P12-3-051210 @ 0805
 AKW-S-P12-6-051210 @ 0810
 AKW-S-P12-9-051210 @ 0815
 AKW-S-P12-12-051210 @ 0820
 AKW-S-P12-15-051210 @ 0825
Water:
 AKW-W-P12-051210 @ 0850

Notes: Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Poor yield/recovery
 Field filtered through 0.45um
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown

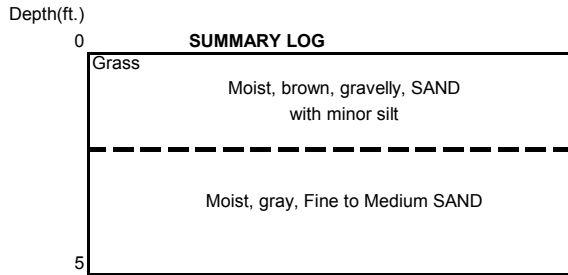
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N7103329 E1176080		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 15.5		Date Completed: 05/12/10		
Driller: Frank Scott		Weather: Cloudy 60F		Hammer Type: Direct push		
Drill Type: Geoprobe 9630		Sampler Type: 2" Macro w/ acrylic liner		Size/Type Casing: 1.5" Rod		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	60		0-0.2' Sod
0/2	composite 0-2'				0945	0.2-2' Moist, mot bwn, gravelly, SAND, w/minor silt
2/5	composite 2-5'				0950	2-5' Moist, gry, F-M SAND

LABORATORY SAMPLES:

Soil:
 AKW-S-P13-0/2-051210 @ 0945
 AKW-S-P13-2/5-051210 @ 0950

Notes: Completed boring backfilled with granular bentonite

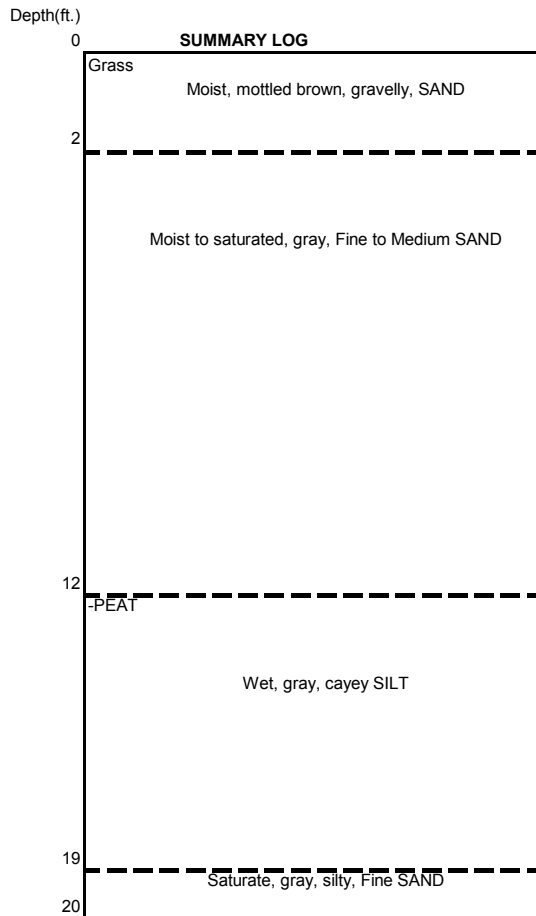


NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N710192 E1176218		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 16		Date Completed: 05/12/10		
Driller: Frank Scott		Weather: Cloudy 60F		Hammer Type: Direct push		
Drill Type: Geoprobe 9630		Sampler Type: 2" Macro w/ acrylic liner				
Size/Type Casing: 1.5" Rod						
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
0.5	grab @ 0.5'	Smooth	0-5	36	1015	
2.5	grab @ 2.5'				1020	0-2' Moist, mot bwn, gravelly, SAND
5	grab @ 5'				1025	2-5' Moist-wet, gry, F-M SAND
			5-10	60		5-9.5' As above, wood fiber @ 7'
7.5	grab @ 7.5'				1030	9.5-10' Sat, gry, F SAND, w/trace organics, shell frag
10	grab @ 10'				1035	
			10-15	60		10-12' As above, with silty sand/organic interbeds
12.5	grab @ 12.5'				1040	12-12.5' Soft, wet, gry, clayey SILT, w/minot organics
						12.5-13' Wet, bwn, fibrous PEAT
15	grab @ 15'				1045	13-15' Wet, gry-bwn, organic, clayey SILT, w/marsh grass
			15-20	60		15-19' As above, less organics below 18'
17.5	grab @ 17'				1050	19-20' Sat, gry, silty, F SAND / F SAND interbeds
20	grab @ 20'				1055	

Notes: Completed boring backfilled with granular bentonite



LABORATORY SAMPLES:

- Soil:
- AKW-S-P14-0.5-051210 @ 1015
 - AKW-S-P14-2.5-051210 @ 1020
 - AKW-S-P14-5-051210 @ 1025
 - AKW-S-P14-7.5-051210 @ 1030
 - AKW-S-P14-10-051210 @ 1035
 - AKW-S-P14-12.5-051210 @ 10350825
 - AKW-S-P14-15-051210 @ 1045
 - AKW-S-P14-17.5-051210 @ 1050
 - AKW-S-P14-20-051210 @ 1055

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation.

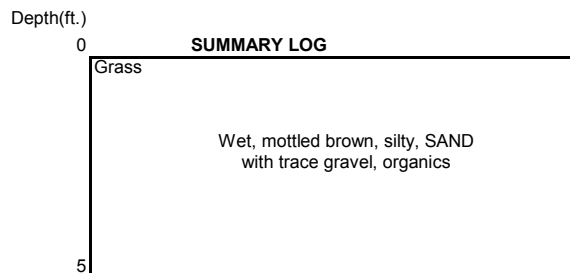
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709919 E1176489		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 17		Date Completed: 05/12/10		
Driller: Frank Scott		Weather: Cloudy 60F		Hammer Type: Direct push		
Drill Type: Geoprobe 9630		Sampler Type: 2" Macro w/ acrylic liner		Size/Type Casing: 1.5" Rod		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	60		0-0.5' Roots/Sod
1/3	composite 1-3'				1100	0.5-5' Wet, Mot bwn, silty, SAND, w/trace gravel, organics

LABORATORY SAMPLES:

Soil:
 AKW-S-P15-1/3-051210 @ 1100

Notes: Completed boring backfilled with granular bentonite



(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

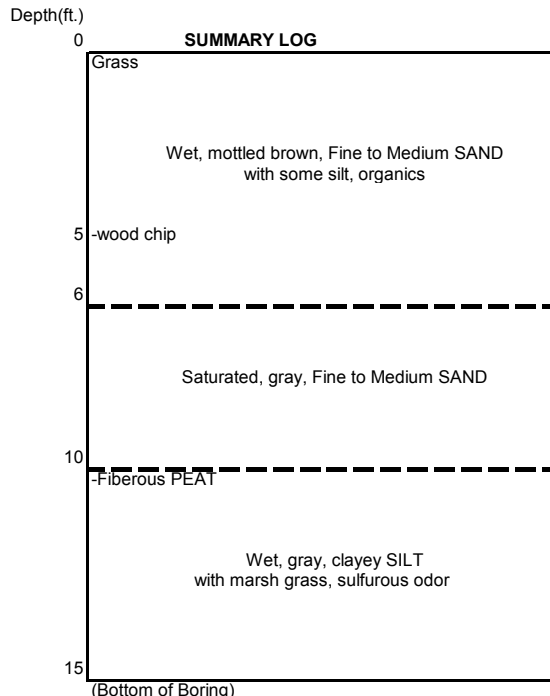
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N710402 E1175791		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 15.5		Date Completed: 05/11/10		
Driller: Frank Scott		Weather: Cloudy 50F		Hammer Type: Direct push		
Drill Type: Geoprobe 9630		Sampler Type: 2" Macro w/ acrylic liner		Size/Type Casing: 1.5" Rod		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	48		0-0.5' Sod/grass
0.5/2.5	composite 0.5-2.5'				1330	0.5-4' Wet, mot bwn, F-M SAND, w/some silt, organics
2.5/5	composite 2.5-5'				1335	4-5' Wet, dk bwn, organic, SAND, w/some silt, wood chip
			5-10	36		5-6' As above, wet
7.5	grab @ 7.5'				1340	6-10' Sat, gry, F-M SAND
10	grab @ 10'				1345	
			10-15	60		10-10.5' Wet., gry, clayey SILT
						10.5-11.5' Wet, bwn, fibrous PEAT
12.5	grab @ 12.5'				1350	11.5-14' Wet, gry-bwn, organic, SILT, w/marsh grass
15	grab @ 15'				1355	14-15' Wet, gry, SILT, w/trace F sand, sulfurous odor

LABORATORY SAMPLES:

Soil:
 AKW-S-P16-0.5/2.5-051110 @ 1330
 AKW-S-P16-2.5/5-051110 @ 1335
 AKW-S-P16-7.5-051110 @ 1340
 AKW-S-P16-10-051110 @ 1345
 AKW-S-P16-12.5-051110 @ 1350
 AKW-S-P16-15-051110 @ 1355
Water:
 AKW-W-P16-051110 @ 1410

Notes: Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Purged 1 gallon
 Field filtered through 0.45um
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709873 E1175765		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 16				
Driller: Frank Scott		Date Completed: 05/11/10				
Drill Type: Geoprobe 9630		Weather: Cloudy 50F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	48		0-1' Wet, mot bwn, gravelly, SAND, w/trace sit
1/3.5	composite 0.5-2.5'				1530	1-5' Wet, gry, F-M SAND
			5-10	36		
6	grab @ 6'				1535	5-10' Sat, gry, F-M SAND
9	grab @ 9'				1540	
			10-15	48		10-11' Wet, mot bwn, organic, SILT
12	grab @ 12'				1545	11-11.5' Wet, bwn, fibrous PEAT
15	grab @ 15'				1550	11.5-15' Wet, gry-bwn, clayey SILT, w/organics, marsh grass

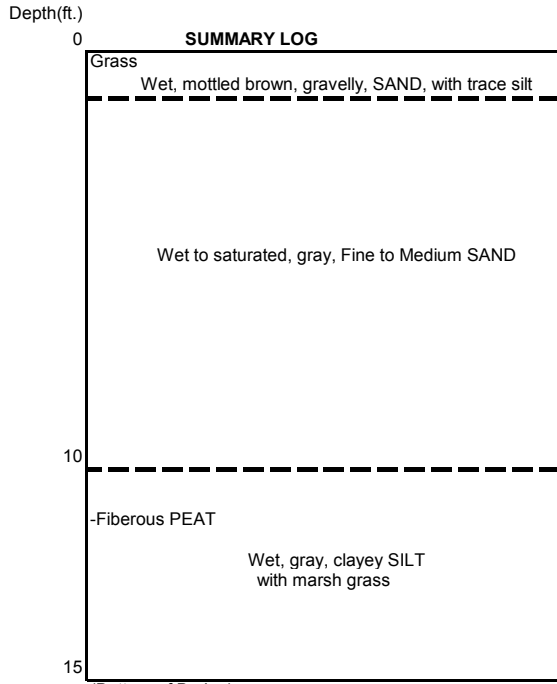
LABORATORY SAMPLES:

Soil:
AKW-S-P17-1/3.5-051110 @ 1530
AKW-S-P17-6-051110 @ 1535
AKW-S-P17-9-051110 @ 1540
AKW-S-P17-12-051110 @ 1545
AKW-S-P17-15-051110 @ 1550

Water:
AKW-W-P17-051110 @ 1600

Notes: Moved adjacent to boring for separate screen push.
Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
Purged 1 gallon
Field filtered through 0.45um

Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown

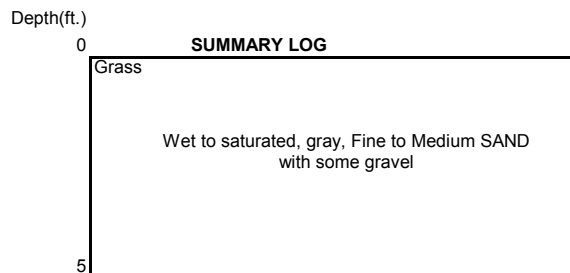
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709601 E1175764		Ground Surface: Gravel		
Drilling Co.: Cascade		Elevation (Ft.): 16		Date Completed: 05/12/10		
Driller: Frank Scott		Weather: Cloudy 60F		Hammer Type:		
Drill Type: Hand auger		Sampler Type: Grab		Size/Type Casing: 4"		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-4			Gravel surfacing
2.5-4	composite 2.5-4'				1120	0-4' Wet-sat, gray, F-M SAND, w/some gravel

LABORATORY SAMPLES:

Soil:
 AKW-S-P18-2.5/4-051210 @ 1120

Notes: Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

P19

Field Rep: DG Cooper		Location: N709178 E1176227		Ground Surface: Railroad ballast		
Drilling Co.: Cascade		Elevation (Ft.): 15.5				
Driller: Frank Scott		Date Completed: 05/12/10				
Drill Type: Geoprobe 9630		Weather: Cloudy 65F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	18		
0/1.5	composite 0-1.5'				1435	0-5' Moist, mot bwn, gravelly, SAND Poor recovery
			5-10	36		5-7' Wet, bwn, gravelly, SAND
6	grab @ 6'				1440	7-10' Wet, dk gry, clayey SILT, w/organics
9	grab @ 9'				1445	
			10-15	60		10-11.5' As Above
12	grab @ 12'				1455	11.5-15' Sat, gry, F SAND, w/scattered organics
15	grab @ 15'				1500	

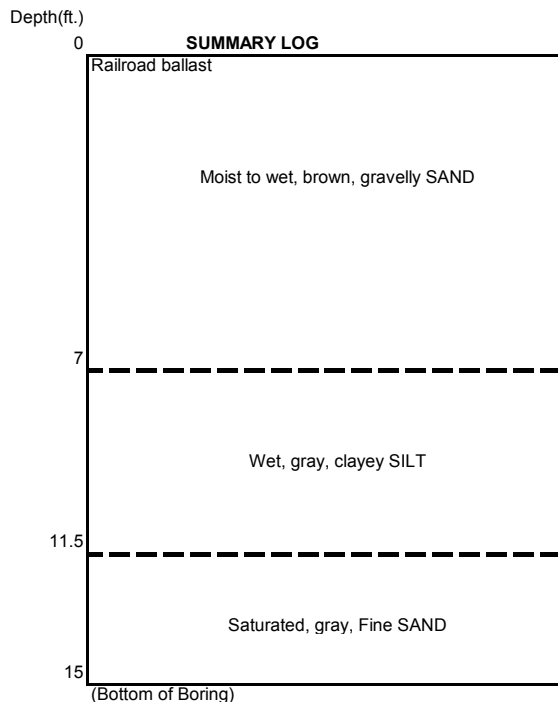
LABORATORY SAMPLES:

Soil:
AKW-S-P19-0/1.5-051210 @ 1435
AKW-S-P19-6-051210 @ 1440
AKW-S-P19-9-051210 @ 1445
AKW-S-P19-12-051210 @ 1450
AKW-S-P19-15-051210 @ 1500

Water:
AKW-W-P19-051210 @ 1515

Notes: Moved adjacent to boring for separate screen push.
Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
Purged 0.5 gallon
Field filtered through 0.45um

Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown

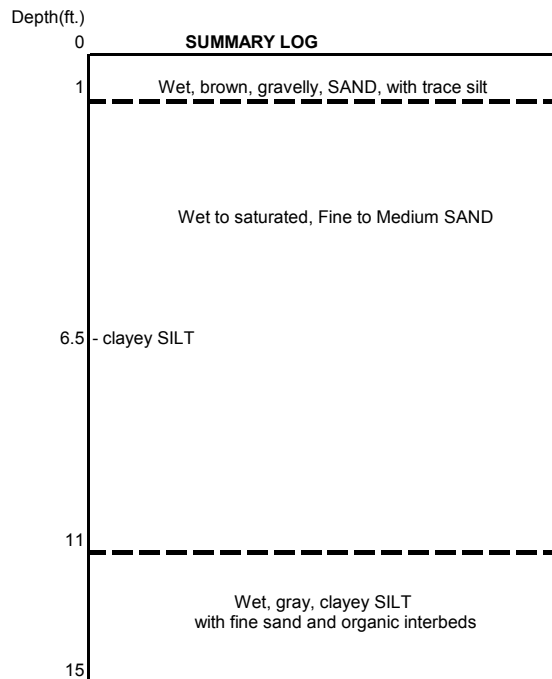
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N710054 E1175774		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 16				
Driller: Frank Scott		Date Completed: 05/11/10				
Drill Type: Geoprobe 9630		Weather: Cloudy 65F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	48		
1	grab @ 1'				1430	0-1' Wet, bwn, gravelly, SAND, w/trace silt
3	grab @ 3'				1435	1-5' Wet, gry, F-M SAND
			5-10	60		5-6.5' As above
6	grab @ 6'				1440	6.5-7' Wet, gry, clayey SILT
9	grab @ 9'				1445	7-9.5' Sat, gry, F-M SAND
						9.5-10' Wet, gry, F SAND, w/some organics, shell
			10-15	60		10-11' As above
12	grab @ 12'				1450	11-13' Wet, gry, clayey SILT
15	grab @ 15'				1455	13-14.5' Sat, dk gry, F SAND, w/silty interbeds
						14.5-15' Wet, bwn, SILT, w/organics

LABORATORY SAMPLES:

Soil:
 AKW-S-P20-1-051110 @ 1430
 AKW-S-P20-3-051110 @ 1435
 AKW-S-P20-6-051110 @ 1440
 AKW-S-P20-9-051110 @ 1445
 AKW-S-P20-12-051110 @ 1450
 AKW-S-P20-15-051110 @ 1455
Water:
 AKW-W-P20-051110 @ 1500

Notes: Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Purged 0.5 gallon
 Field filtered through 0.45um
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown

BORING - DESCRIPTION OF SAMPLES & DATA

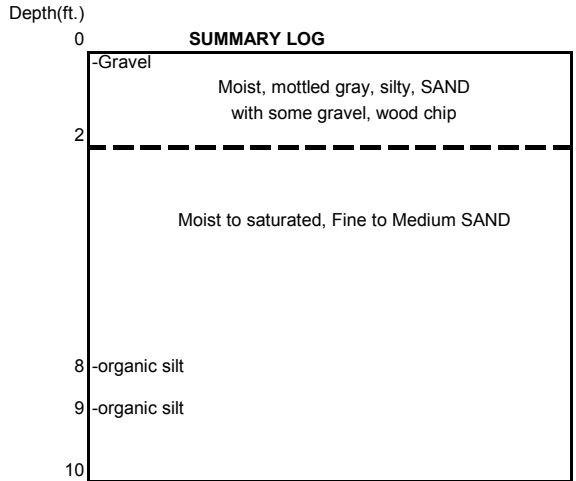
Field Rep: DG Cooper		Location: N709960 E1175936		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 18				
Driller: Frank Scott		Date Completed: 05/13/10				
Drill Type: Geoprobe 9630		Weather: Clear 65F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	40		0-0.3 5/8' minus crushed rock
1	grab @ 1'				1555	0.3-2' Moist, mot gry, silty, SAND, w/some gravel, wood chip
3	grab @ 3'				1600	2-5' Moist, gry, F-M SAND
			5-10	60		5-10' Sat, gry, F-M SAND
6	grab @ 6'				1605	thin organic silt layers @ 8-9'
9	grab @ 9'				1610	

LABORATORY SAMPLES:

Soil:
 AKW-S-P21-1-051310 @ 1555
 AKW-S-P21-3-051310 @ 1600
 AKW-S-P21-6-051310 @ 1605
 AKW-S-P21-9-051310 @ 1610

Water:
 AKW-W-P21-051310 @ 1630

Notes: Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Purged 0.5 gallon
 Field filtered through 0.45um
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709553 E1175894		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 16.5				
Driller: Frank Scott		Date Completed: 05/13/10				
Drill Type: Geoprobe 9630		Weather: Clear 65F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	40		0-0.8' 5/8' minus crushed rock surfacing
						0.8-5' Wet, gry, F-M SAND, w/oxidation @ 3'
3	grab @ 3'				1500	
			5-10	40		5-6' As above
6	grab @ 6'				1505	6-10' Sat. gry, F sandy, SILT interbedded with Silty F SAND
9	grab @ 9'				1510	

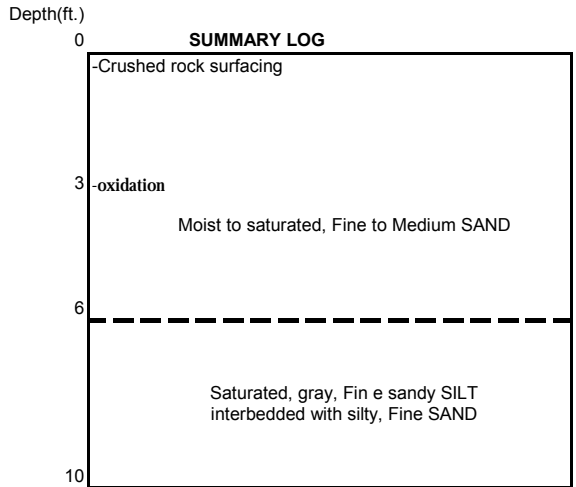
LABORATORY SAMPLES:

Soil:
 AKW-S-P22-3-051310 @ 1500
 AKW-S-P22-6-051310 @ 1505
 AKW-S-P22-9-051310 @ 1510

Water:
 AKW-W-P22-051310 @ 1520

Notes: Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Poor yeild/recovery
 Field filtered through 0.45um

 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

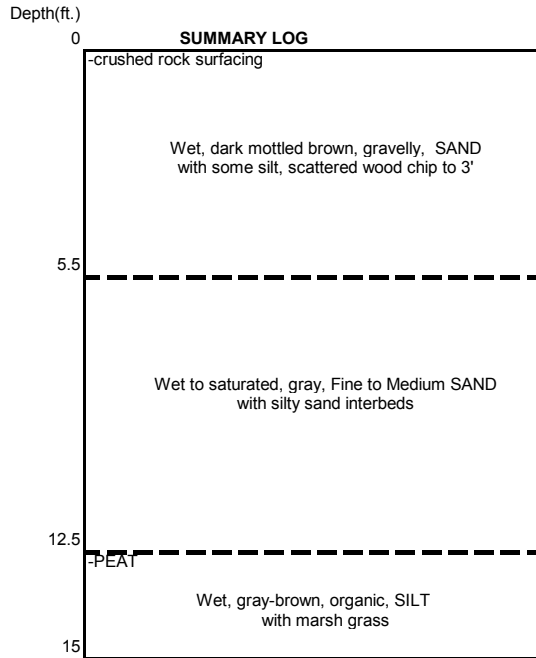
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709551 E1176016		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 17.5				
Driller: Frank Scott		Date Completed: 05/12/10				
Drill Type: Geoprobe 9630		Weather: Cloudy 65F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	48		0-0.8' 5/8" minus crushed rock
1	grab @ 1'				1520	0.8-5' Wet, dk mot, bwn, gravelly, SAND, w/ some silt
3	grab @ 3'				1525	Scattered wood chip to 3'
			5-10	60		5-5.5' As above
6	grab @ 6'				1530	5.5-10' Wet-sat, gry, F SAND
9	grab @ 9'				1535	with silty sand interbeds
			10-15	60		10-12.5' As above w/ organics, grass below 11.5'
12	grab @ 12'				1540	12.5-13' Wet, mot gry, clayey, SILT
15	grab @ 15'				1545	13-13.5' Wet, bwn, fibrous PEAT
						13.5-15' Wet, gry-bwn, organic, SILT, w/marsh grass

LABORATORY SAMPLES:

Soil:
 AKW-S-P23-1-051210 @ 1520
 AKW-S-P23-3-051210 @ 1525
 AKW-S-P23-6-051210 @ 1530
 AKW-S-P23-9-051210 @ 1535
 AKW-S-P23-12-051210 @ 1540
 AKW-S-P23-15-051210 @ 1545
Water:
 AKW-W-P23-051210 @ 1600

Notes: Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Purged 1 gallon
 Field filtered through 0.45um
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

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BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709410 E1175968		Ground Surface: Gravel surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 15		Date Completed: 05/12/10		
Driller: Frank Scott		Date Completed: 05/12/10		Weather: Cloudy 65F		
Drill Type: Geoprobe 9630		Weather: Cloudy 65F		Hammer Type: Direct push		
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	36		0-5' Moist, bwn, gravelly, SAND
3	grab @ 3'				1230	
			5-10	36		5-10' Sat, gry, gravelly, silty, SAND
6	grab @ 6'				1235	
9	grab @ 9'				1240	
			10-15	60		10-11' As above
12	grab @ 12'				1245	11-12' Wet, bwn fibrous PEAT
15	grab @ 15'				1250	12-15' Wet, gry-bwn, organic, SILT, w/ marsh grass

LABORATORY SAMPLES:

Soil:

- AKW-S-P24-3-051210 @ 1230
- AKW-S-P24-6-051210 @ 1235
- AKW-S-P24-9-051210 @ 1240
- AKW-S-P24-12-051210 @ 1245
- AKW-S-P24-15-051210 @ 1250

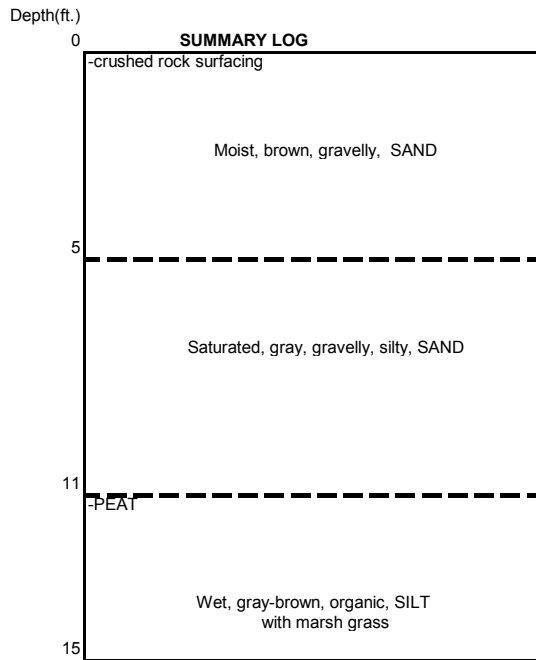
Water:

- AKW-W-P24-051210 @ 1340

Notes: Moved adjacent to boring for separate screen push.

Temporary Screen set @ 7-11' below ground surface consisting of SS geoprobe SP16 Sampler.
Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 11' bgs.
Very low yield
Field filtered through 0.45um - brown color, filter intact

Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709459 E1176194		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 17.8				
Driller: Frank Scott		Date Completed: 05/13/10				
Drill Type: Geoprobe 9630		Weather: Clear 65F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	50		0-0.3' Crushed rock
						0.3-3' Wet, mot gry, silty, SAND, w/minor gravel, trace roots
3	grab @ 3'				1420	3-4' 3/4"-minus crushed rock
						4-5' Wet, gry, F-M SAND
			5-10	60		5-9.5' As above sat
6	grab @ 6'				1425	9.5-10' Wet, gry, SILT, w/trace F sand
9	grab @ 9'				1430	

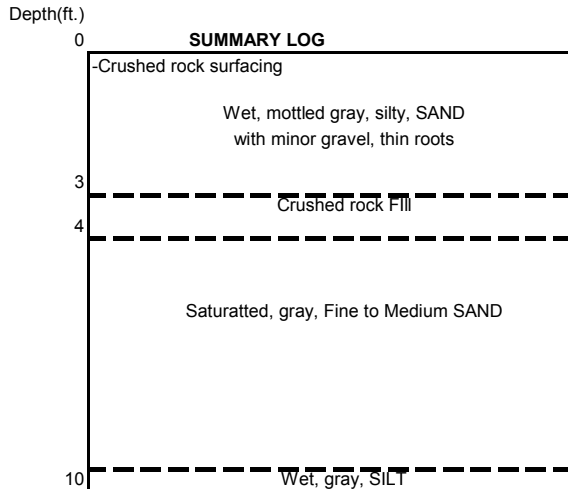
LABORATORY SAMPLES:

Soil:
 AKW-S-P25-3-051310 @ 1420
 AKW-S-P25-6-051310 @ 1425
 AKW-S-P25-9-051310 @ 1430

Water:
 AKW-W-P25-051310 @ 1440

Notes: Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Purged 0.5 gallons
 Field filtered through 0.45um

Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

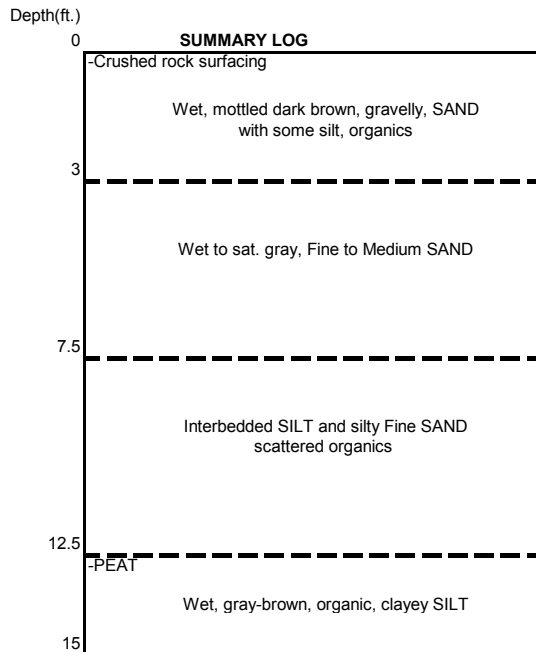
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709391 E1176124		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 17.6				
Driller: Frank Scott		Date Completed: 05/13/10				
Drill Type: Geoprobe 9630		Weather: Clear 65F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	40		0-0.5' Crushed rock
1	grab @ 1'				1030	0.5-3' Wet, mot dk bwn, gravelly, SAND, w/some silt, organics
3	grab @ 3'				1035	3-5' Wet, gry, F-M SAND
			5-10	60		5-7.5' Sat, gry, F-M SAND
6	grab @ 6'				1040	7.5-8' Stiff, wet, gry, SILT, w/trace organics
9	grab @ 9'				1045	8-10' Sat, gry, F SAND, w/silty interbeds, scattered organics
			10-15	60		10-11.5' Wet, gry, SILT
12	grab @ 12'				1050	11.5-12.5' Sat, gry, silty, F SAND, w/organics, grass
15	grab @ 15'				1055	12.5-13' Wet, bwn, fibrous PEAT
						13-15, Wet, gry-bwn, organic, clayey SILT

LABORATORY SAMPLES:

Soil:
 AKW-S-P26-1-051310 @ 1030
 AKW-S-P26-3-051310 @ 1035
 AKW-S-P26-6-051310 @ 1040
 AKW-S-P26-9-051310 @ 1045
 AKW-S-P26-12-051310 @ 1050
 AKW-S-P26-15-051310 @ 1055
Water:
 AKW-W-P26-051310 @ 1100

Notes: Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Purged 0.5 gallons
 Field filtered through 0.45um
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709245 E1176149		Ground Surface: Gravel		
Drilling Co.: Cascade		Elevation (Ft.): 16		Date Completed: 05/12/10		
Driller: Frank Scott		Weather: Clear 65F		Hammer Type: Direct push		
Drill Type: Geoprobe 9630		Sampler Type: 2" Macro w/ acrylic liner		Size/Type Casing: 1.5" Rod		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	40		0-5' Moist, mot bwn, gravelly, SAND, w/trace silt
3	grab @ 3'				1400	
			5-10	40		5-6' As above
6	grab @ 6'				1405	6-6.5' Wet, dk gry, clayey SILT, w/organics
9	grab @ 9'				1410	6.5-7' Brown fibrous PEAT
						7-10' Wet, gry-bwn, organic, SILT
			10-15	60		10-11.5' As above
12	grab @ 12'				1415	11.5-15' Sat, gry, F SAND, w/silty zones
15	grab @ 15'				1420	

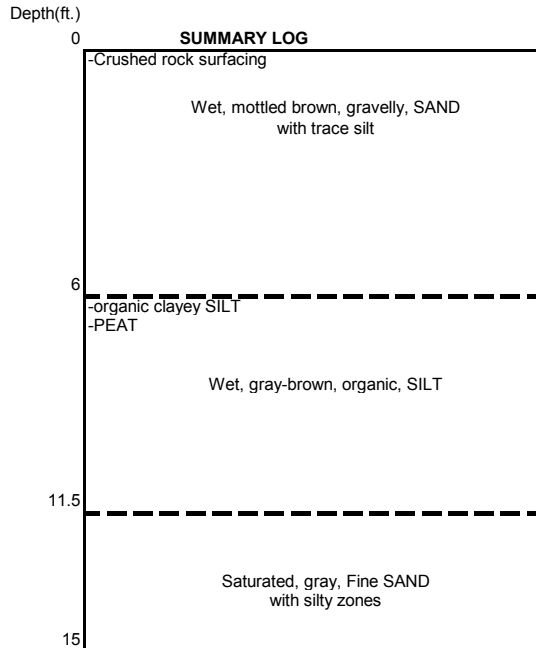
LABORATORY SAMPLES:

Soil:

- AKW-S-P27-3-051210 @ 1400
- AKW-S-P27-6-051210 @ 1405
- AKW-S-P27-9-051210 @ 1410
- AKW-S-P27-12-051210 @ 1415
- AKW-S-P27-15-051210 @ 1420
- Water:**
- AKW-W-P27-051310 @ 1430

Notes:

Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 4-8' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Purged 0.5 gallons
 Field filtered through 0.45um
 Completed boring backfilled with granular bentonite



(Bottom of Boring)
 NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709340 E1176334		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 17.3				
Driller: Frank Scott		Date Completed: 05/13/10				
Drill Type: Geoprobe 9630		Weather: Clear 65F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	50		0-0.3' Crushed rock
						0.3-2' Wet, mot bwn, silty, SAND, w/some gravel, thin roots
3	grab @ 3'				1340	2-3' 3/4"-minus crushed rock
						3-5' Wet, gry, F-M SAND, w/ trace organics
			5-10	60		5-9' As above, F Sand interbeds
6	grab @ 6'				1345	9-10' Wet, gry, F sandy, SILT
9	grab @ 9'				1350	

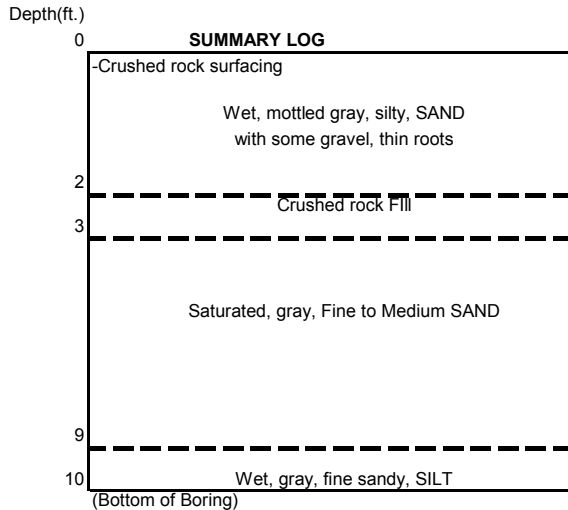
LABORATORY SAMPLES:

Soil:
 AKW-S-P28-3-051310 @ 1340
 AKW-S-P28-6-051310 @ 1345
 AKW-S-P28-9-051310 @ 1350

Water:
 AKW-W-P28-051310 @ 1500

Notes: Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Purged 1 gallon
 Field filtered through 0.45um

 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709175 E1176431		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 15.5				
Driller: Frank Scott		Date Completed: 05/13/10				
Drill Type: Geoprobe 9630		Weather: Clear 65F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	48		
						0-2' Wet, mot bwn, silty, SAND, w/trace gravel, organics
3	grab @ 3'				1250	2-5' Wet, gry, F SAND
			5-10	60		5-7.5' As above, organics @ 6'
6	grab @ 6'				1255	7.5-10' Wet, gry, SILT, w/trace F sand
9	grab @ 9'				1300	

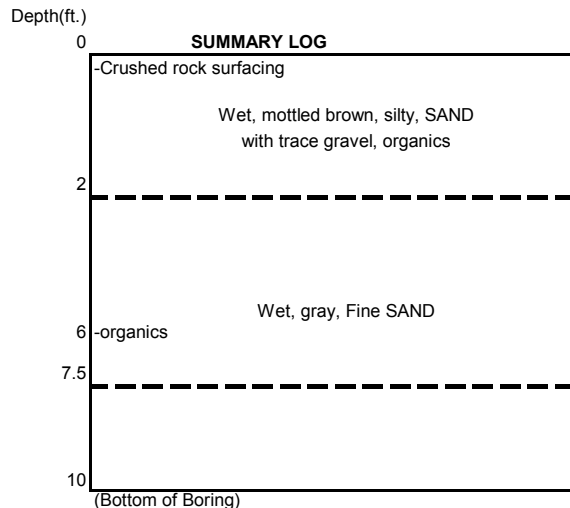
LABORATORY SAMPLES:

Soil:
AKW-S-P29-3-051310 @ 1250
AKW-S-P29-6-051310 @ 1255
AKW-S-P29-9-051310 @ 1300

Water:
NONE

Notes: Moved adjacent to boring for separate screen push.
Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
NO WATER COLLECTED AFTER 1 HOUR

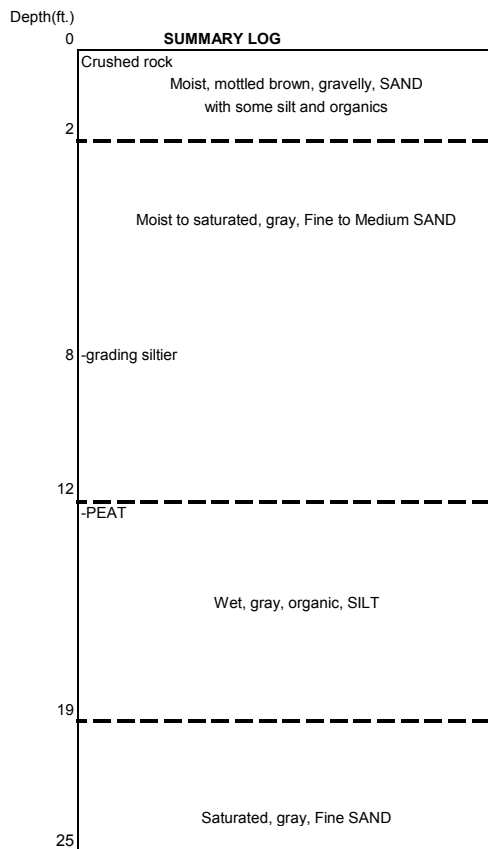
Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N709461 E1176028		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 17.7		Date Completed: 05/13/10		
Driller: Frank Scott		Weather: Cloudy 60F		Hammer Type: Direct push		
Drill Type: Geoprobe 9630		Sampler Type: 2" Macro w/ acrylic liner				
Size/Type Casing: 1.5" Rod						
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	48		0-0.5' Crushed rock
1	grab @ 1'				0910	0.5-2' Wet, mot bwn, gravelly, SAND, w/some silt, organics
3	grab @ 3'				0915	2-5' Wet-sat, gry, F-M SAND
			5-10	60		5-8' As above
6	grab @ 6'				0920	8-10' Sat, gry, F SAND, w/some silt
9	grab @ 9'				0925	grading siltier
			10-15	60		10-11' As above, grading to SILT
12	grab @ 12'				0930	11-12' Sat, gry, F sandy, SILT, w/fibrous organics, grass
15	grab @ 15'				0935	12-12.5' Wet, bwn fibrous PEAT
						12.5-15' Wet, gry-bwn, organic, SILT, w/marsh grass
			15-20	60		15-19' As above, trace sand
18	grab @ 18'				0940	19-20' Sat, gry, F SAND
			20-25	60		20-25' As above
21	grab @ 21'				0945	
25	grab @ 25'				0950	



LABORATORY SAMPLES:

Soil:
 AKW-S-P30-1-051310 @ 0910
 AKW-S-P30-3-051310 @ 0915
 AKW-S-P30-6-051310 @ 0920
 AKW-S-P30-9-051310 @ 0925
 AKW-S-P30-12-051310 @ 0930
 AKW-S-P30-15-051310 @ 0935
 AKW-S-P30-18-051310 @ 0940
 AKW-S-P30-21-051310 @ 0945
 AKW-S-P30-25-051310 @ 0950

Water:
 AKW-W-P30-051310 @ 1000 (Intermediate Aquifer)

Notes:
 Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 21-25' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 24' bgs.
 Purged 1 gallon
 Field filtered through 0.45um

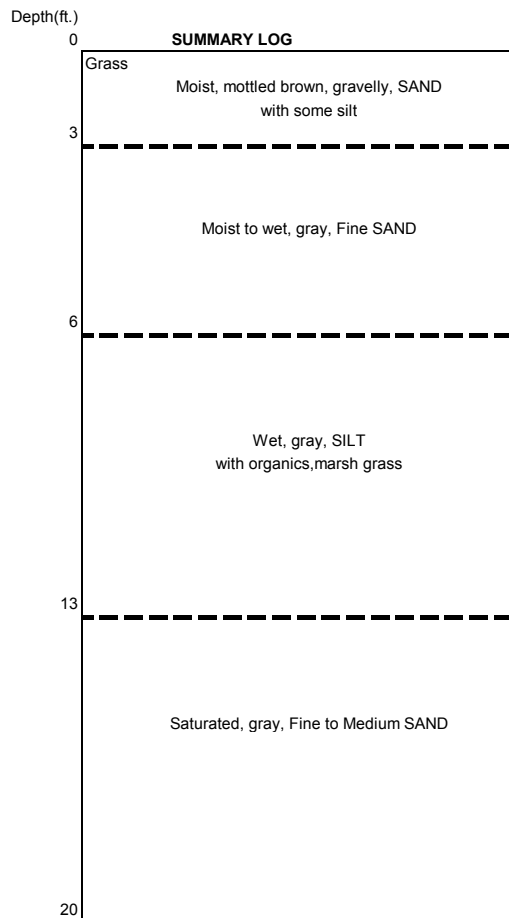
Completed boring backfilled with granular bentonite

(Bottom of Boring)
 NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

P31

Field Rep: DG Cooper		Location: N709283 E1176270		Ground Surface: Grass		
Drilling Co.: Cascade		Elevation (Ft.): 16.4				
Driller: Frank Scott		Date Completed: 05/13/10				
Drill Type: Geoprobe 9630		Weather: Cloudy 60F				
Size/Type Casing: 1.5" Rod		Hammer Type: Direct push		Sampler Type: 2" Macro w/ acrylic liner		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	40		0-3' Wet, mot bwn, gravelly, SAND, w/some SILT
						3-5' Moist, gry, F SAND
3	grab @ 3'				1120	
			5-10	40		5-6' As above
6	grab @ 6'				1125	6-10' Wet, gry, SILT, w/trace organics
9	grab @ 9'				1130	
			10-15	60		10-12' Wet, mot gry, SILT w/marsh grass
12	grab @ 12'				1135	12-13' Wet, gry-bwn, organic, clayey SILT
15	grab @ 15'				1140	13-15' Sat, gry, F SAND
						grading to F-M SAND
			15-20	60		15-20' Sat, gry, F-M SAND
18	grab @ 18'				1145	



LABORATORY SAMPLES:

Soil:

- AKW-S-P31-3-051310 @ 1120
- AKW-S-P31-6-051310 @ 1125
- AKW-S-P31-9-051310 @ 1130
- AKW-S-P31-12-051310 @ 1135
- AKW-S-P31-15-051310 @ 1140
- AKW-S-P31-18-051310 @ 1140

Water:

AKW-W-P31-051310 @ 1200 (Intermediate Aquifer)

Notes:

Moved adjacent to boring for separate screen push.
Temporary Screen set @ 21-25' below ground surface consisting of SS geoprobe SP16 Sampler.
Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 24' bgs.
Purged 1 gallon
Field filtered through 0.45um

Completed boring backfilled with granular bentonite

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

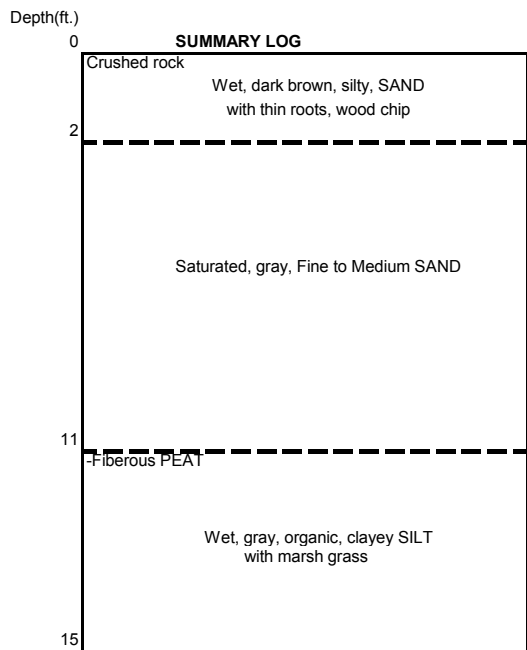
BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper		Location: N710386 E1175880		Ground Surface: Crushed rock surfacing		
Drilling Co.: Cascade		Elevation (Ft.): 16.4		Date Completed: 05/12/10		
Driller: Frank Scott		Weather: Cloudy 55F		Hammer Type: Direct push		
Drill Type: Geoprobe 9630		Sampler Type: 2" Macro w/ acrylic liner		Size/Type Casing: 1.5" Rod		
Spl.No.	Type sample saved	Drill Action	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		Smooth	0-5	36		0-0.5' Crushed rock
1/2	composite 1-2'				0900	0.5-1' Wet, dk bwn, silty, SAND, w/many thin roots
						1-2' Wet, dk bwn, silty, SAND, w/ some gravel, wood chips
3	grab @ 3'				0905	2-5' Weet, gry, F-M SAND
6	grab @ 6'		5-10	60		5-9' As above
9	grab @ 9'				0910	9-10' Sat, mot gry, F-M SAND, w/minor silt, organics
					0915	
			10-15	60		10-11' Wet., gry, clayey SILT
12	grab @ 12'					11-12' Wet, bwn, fibrous PEAT
15	grab @ 15'				0920	12-15' Wet, gry, organic, clayey SILT, w/marsh grass
					0925	

LABORATORY SAMPLES:

Soil:
 AKW-S-P32-1/2-051210 @ 0900
 AKW-S-P32-3-051210 @ 0905
 AKW-S-P32-6-051210 @ 0910
 AKW-S-P32-9-051210 @ 0915
 AKW-S-P32-12-051210 @ 0920
 AKW-S-P32-18-051210 @ 0925
Water:
 AKW-W-P32-051210 @ 0930

Notes: Moved adjacent to boring for separate screen push.
 Temporary Screen set @ 6-10' below ground surface consisting of SS geoprobe SP16 Sampler.
 Water sample collected using peristaltic pump through 1/4" diameter polyethylene tubing with intake @ 10' bgs.
 Purged 1 gallon
 Field filtered through 0.45um
 Completed boring backfilled with granular bentonite



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

MONITORING WELLS
FORMER ARKEMA MOUND SITE

LITHOLOGIC LOG and MONITORING WELL DIAGRAM: MW-1

Client : ELF ATOCHEM North America
 Project Name : 3009 Taylor Way Site
 Project Location : Tacoma, WA
 Project Number : 5370-015-300
 Geologist : Mark Chandler
 Drilled By : Holt Drilling

Date Drilled : 9/28/92
 Method : 6" Hollow Stem
 Top of Casing Elevation : 19.73
 Ground Surface Elevation : 17.5
 X-Coordinate :
 Y-Coordinate :
 Total Depth : 14

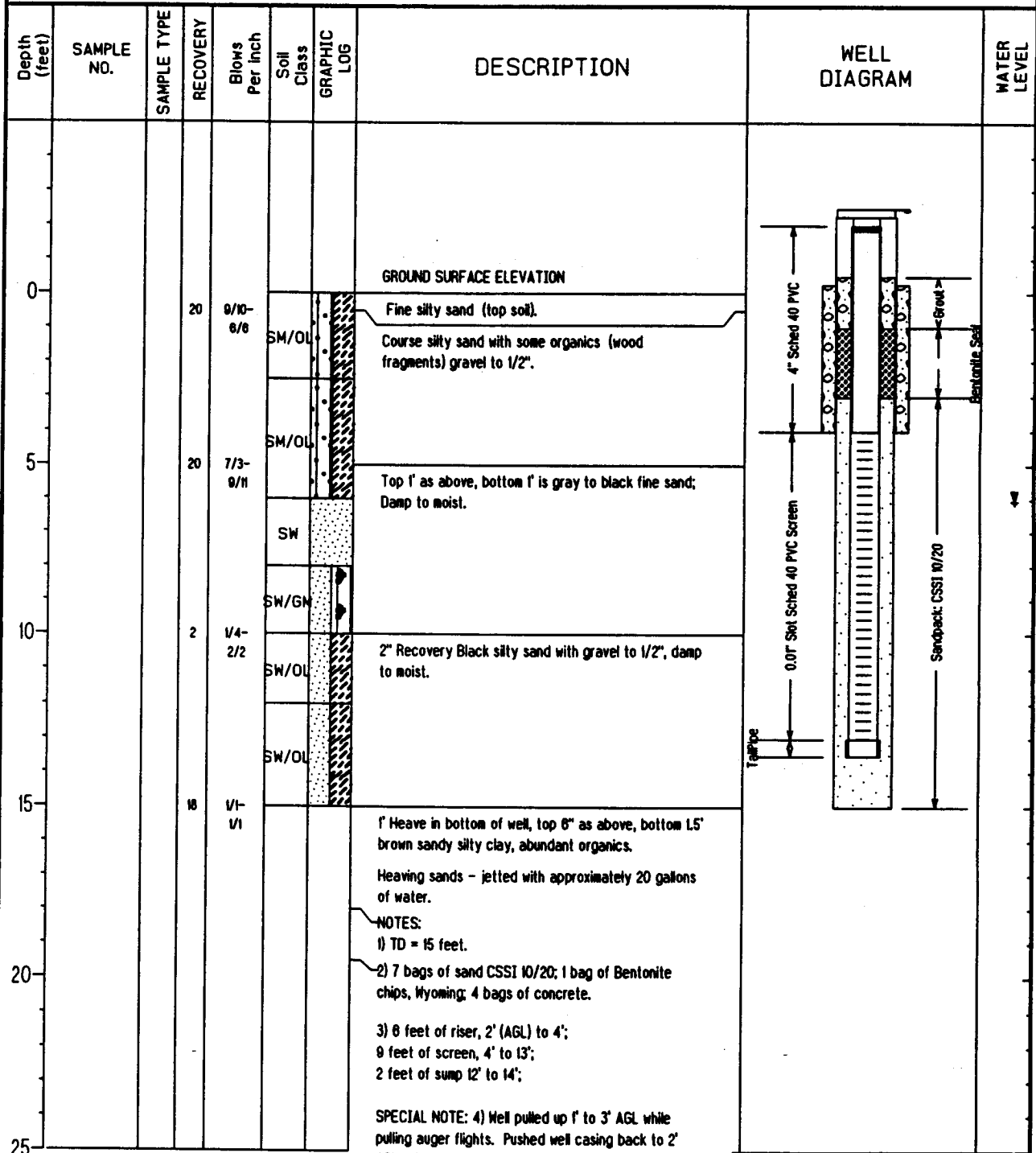
Depth (feet)	SAMPLE NO.	SAMPLE TYPE	RECOVERY	Blows Per Inch	Soil Class	GRAPHIC LOG	DESCRIPTION	WELL DIAGRAM	WATER LEVEL
0							GROUND SURFACE ELEVATION	<p>The well diagram shows a vertical cross-section of the monitoring well. From top to bottom, it includes: a 4" Sched 40 PVC casing section; a 0.01" Slot Sched 40 PVC Screen section; a Sandpack section made of CSSI 10/20; a Bentonite Seal section; and a riser section. The casing is labeled '4" Sched 40 PVC', the screen is '0.01" Slot Sched 40 PVC Screen', the sandpack is 'Sandpack: CSSI 10/20', and the riser is 'Riser'. The water level is indicated by a horizontal line on the right side of the diagram.</p>	
0 to 2	3/5-7/27	OL	18	3/5-7/27	OL	Organics, with some gravel to 2".			
2 to 3						Brown to Black organic silt with gravel to 1"; damp to moist.			
3 to 4	3/16-16/28	SW	18	3/16-16/28	SW	Gray to black fine sand with some gravel to 3/4"; damp.			
4 to 6						As above			
6 to 8	6/11-7/7	SC	18	6/11-7/7	SC	6" of heave - Drove through with sampler. Brown to black clayey sand; wet to saturated.			
8 to 10	2/2-V1	OH	20	2/2-V1	OH	12" of heave - Sampled through organic clay with some sand; damp to moist.			
10 to 12	V1-V1	OL	20	V1-V1	OL	8" of heave- sampled through organic clay with some sand, wood- waste @ approximately 11.5'; top 8" wet, bottom 1" dry.			
12 to 14	V1-V1	OL	18	V1-V1	OL	Overdrill to 13.5'; jetted hole with 10 gallons of water. Overdrill to 14'; added additional 15 gallons water.			
15 to 25									

- NOTES:
- 1) TD = 14 feet.
 - 2) 5 bags of sand CSSI 10/20; 1 bag bentonite chips, Wyoming; 3 bags of concrete.
 - 3) 8 ft. of riser, 2' (AGL) to 4';
 8 ft. of screen, 4' to 12';
 2 ft. of sump 12' to 14';

LITHOLOGIC LOG and MONITORING WELL DIAGRAM: MW-2

Client : ELF ATOCHEM North America
 Project Name : 3009 Taylor Way Site
 Project Location : Tacoma, WA
 Project Number : 5370-015-300
 Geologist : Mark Chandler
 Drilled By : Holt Drilling

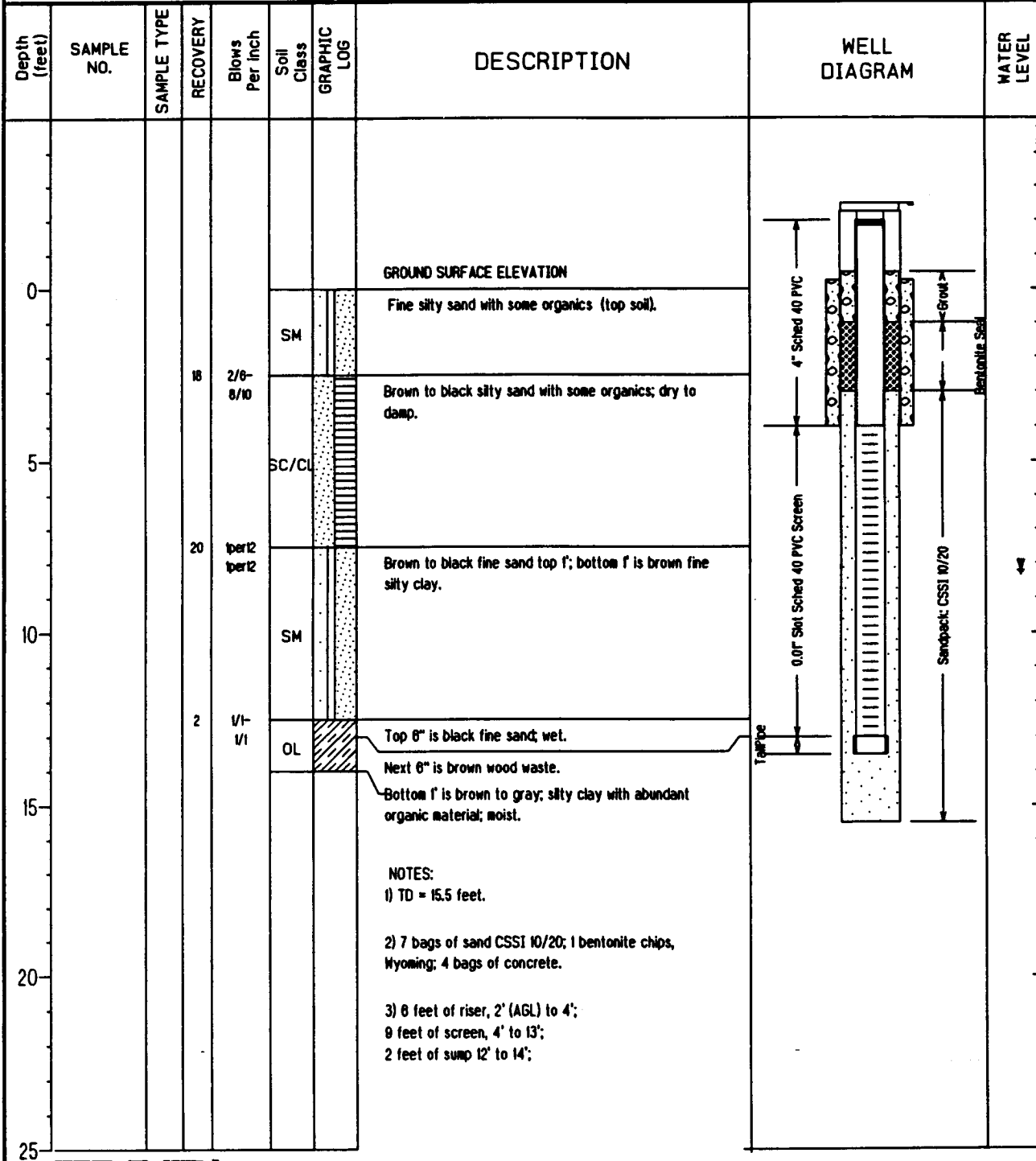
Date Drilled : 9/28/92
 Method : 6" Hollow Stem
 Top of Casing Elevation : 20.03
 Ground Surface Elevation : 17.9
 X-Coordinate :
 Y-Coordinate :
 Total Depth : 15



LITHOLOGIC LOG and MONITORING WELL DIAGRAM: MW-3

Client : ELF ATOCHEM North America
 Project Name : 3009 Taylor Way Site
 Project Location : Tacoma, WA
 Project Number : 5370-015-300
 Geologist : Mark Chandler
 Drilled By : Holt Drilling

Date Drilled : 9/29/92
 Method : 6" Hollow Stem
 Top of Casing Elevation : 19.07
 Ground Surface Elevation : 17.2
 X-Coordinate :
 Y-Coordinate :
 Total Depth : 15.5



LITHOLOGIC LOG and MONITORING WELL DIAGRAM: MW-4

Client : ELF ATOCHEM North America
 Project Name : 3009 Taylor Way Site
 Project Location : Tacoma, WA
 Project Number : 5370-015-300
 Geologist : Mark Chandler
 Drilled By : Holt Drilling

Date Drilled : 9/29/92
 Method : 8" Hollow Stem
 Top of Casing Elevation : 19.28
 Ground Surface Elevation : 17.2
 X-Coordinate :
 Y-Coordinate :
 Total Depth : 15.5

Depth (feet)	SAMPLE NO.	SAMPLE TYPE	RECOVERY	Blows Per Inch	Soil Class	GRAPHIC LOG	DESCRIPTION	WELL DIAGRAM	WATER LEVEL
0			20	3/8-7/7		SP/GM	GROUND SURFACE ELEVATION Gravelly sand, gravel to 4"-6". Fine sand, black with some gravel to 1"; organics (wood fragments); dry		
5			20	9/8-8/8	SW/CL	Black fine sand, some clay, moist.			
10			24	1/1-1/2	SC/OL	Top 6" as above, middle 1"; Gray to brown silty clay with increasing organic content, bottom 6" is brown with woodwaste. Next 6" is brown wood waste. 6 inch of heave in hole - Added 8 gallons water. Added additional 10 gallons of water.			
15							NOTES: 1) TD = 15.5 feet. 2) 6 bags of sand CSSI 10/20; 15 bags of bentonite chips, Wyoming; 3 bags of concrete. 3) 6 feet of riser, 2' (AGL) to 4'; 9 feet of screen, 4' to 13'; 2 feet of sump 13' to 15';		
20									
25									

MW-A

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

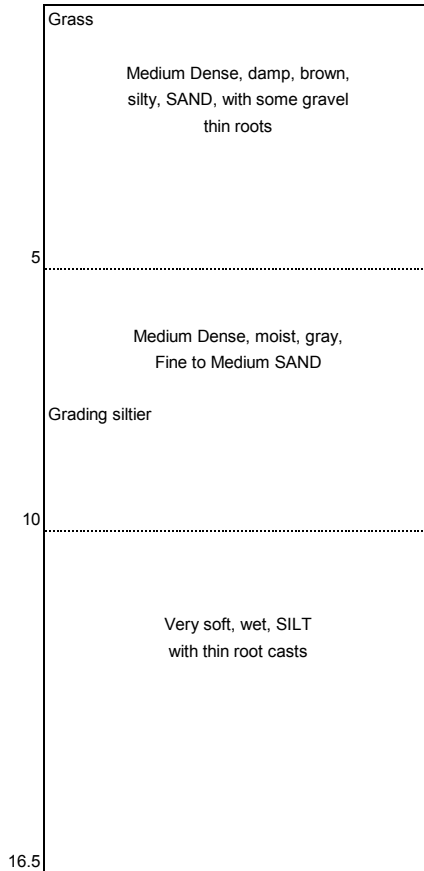
Field Rep: D. Cooper		Location: N710515 E1175829		Ecology ID# BBL963			
Drilling Co.: Cascade		Ground surface elevation: 17.7					
Driller: Steve Chote		Date Completed: 6/10/2009					
Drill Type: CME 75		Weather: Clear 75F					
Size/Type Casing: 4" I.D. Hollow-Stem Auger		Sampler: 3" SPT					
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
0/1.5	grab @ 0-1.5'		0-1.5	18	5/8/10	0845	M dense, damp, bwn, silty, SAND, w/minor gravel, thin roots
2.5/4	grab @ 2.5-4'		2.5-4	18	12/12/13		M Dense, damp, bwn, silty, SAND, w/some gravel, thin roots
5/6.5	grab @ 5-6.5'		5-6.5	18	10/12/14		M dense, moist, gry, F-M SAND, w/trace silt
7.5/9	grab @ 7.5-9'		7.5-9	18	1/2/1		as above to 8' V soft, wet, gry, F sandy, SILT, mottled w/roots at base
10/11.5	grab @ 10-11.5'		10-11.5	18	2/2/3		Soft, wet, gry/blk, SILT, w/some black organics
12.5/14	grab @ 12.5-14'		12.5-14	18	1/1/1		V soft, wet, gry, SILT, w/thin root casts
15/16.5	grab @ 15-16.5'		15-16.5	18	2/2/1	1000	V soft, wet, gry, SILT, w/thin root casts, trace sand at base

Bottom of boring @ 16.5'

MONITORING WELL DIAGRAM

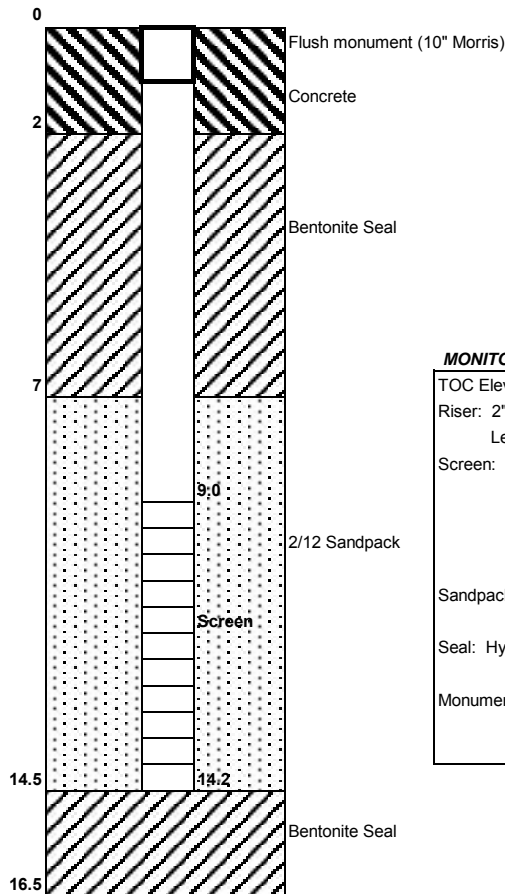
Depth(ft.)

SUMMARY LOG



(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.



MONITORING WELL INFORMATION

TOC Elevation: 17.33
 Riser: 2" dia. SCH 40 PVC
 Length: 8.9'
 Screen: 2" dia. SCH 40 PVC
 Slot size: 0.010"
 Length: 5'
 (top/bot) 9.0/14.2
 0.3' end cap
 Sandpack: 2/12 colorado sand
 (top/bot) 7/14
 Seal: Hydrated bentonite chip
 (top/bot) 2/7
 Monument: 10" dia. Flush Mount (Morris)
 -0.4' to top of PVC/TOC

MW-A2

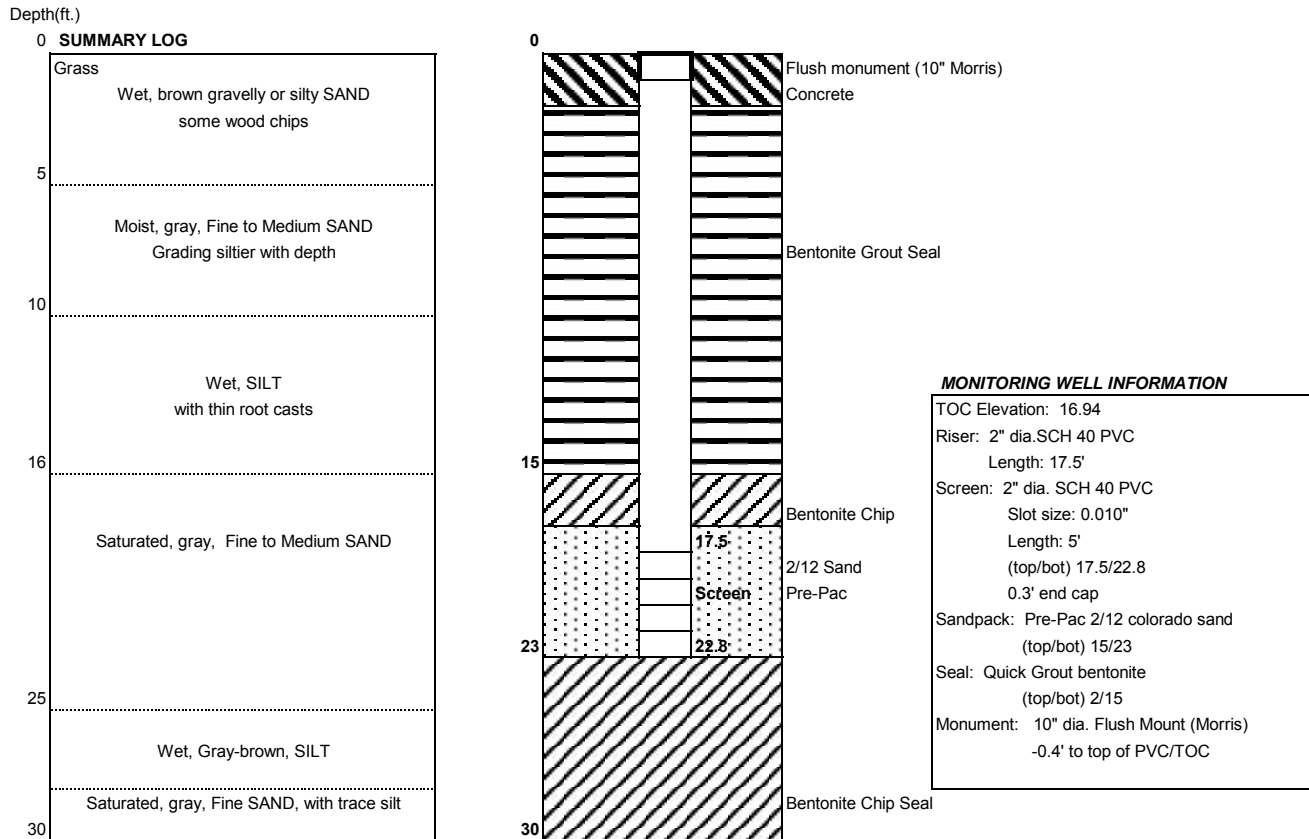
DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

Field Rep: D. Cooper		Location: N710513 E1175828		Ecology ID# BBL832	
Drilling Co.: Cascade		Ground surface elevation: 17.4			
Driller: Frank Scott		Date Completed: 5/13/2010			
Drill Type: Power Probe 9630		Weather: Clear 60F			
Size/Type Casing: 3.5"		Sampler: 2" macro w/acrylic liner, 5' continuous push			

Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
-	-	smooth	0-5	48	-	0730	0-1.5' Wet, bwn, gravelly, SAND, w/trace silt 2-5' Wet, mot dk bwn, silty, SAND, w/ wood chips
1	grab @ 0.5-1.5'						
3	grab @ 2.5-3.5'						
-	-		5-10	60	-		5-5.5' As above 5.5-8' Wet-sat, gry, F-M SAND, grading siltier w/depth 8-10' Wet, gry, SILT w/ minor F Sand
6	grab @ 5.5-6'						
9	grab @ 8.5-9.5'						
-	-		10-15	60	-		10-11.5' As above grading clayey 11.5-15' Firm, wet, gry, clayey, SILT, w/black mottling, trace organics
12	grab @ 11.5-12.5'						
15	grab @ 14.5-15.5'						
-	-		15-20	60	-		15-16' As above 16-20' Sat, gry, F-M SAND
18	grab @ 17.5-18.5'						
-	-		20-25	60	-		20-25' As above
21	grab @ 20.5-21.5'						
24	grab @ 23.5-24.5'						
-	-		25-30	60	-		25-27' Firm, wet, gry-bwn, SILT 27-30' Sat, gry F SAND, w/trace silt 0.1' organic silt @ 28'
27	grab @ 26.5-27.5'						
30	grab @ 29-30'					0820	

Bottom of boring @ 30.0'

MONITORING WELL DIAGRAM



(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

MW-B

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

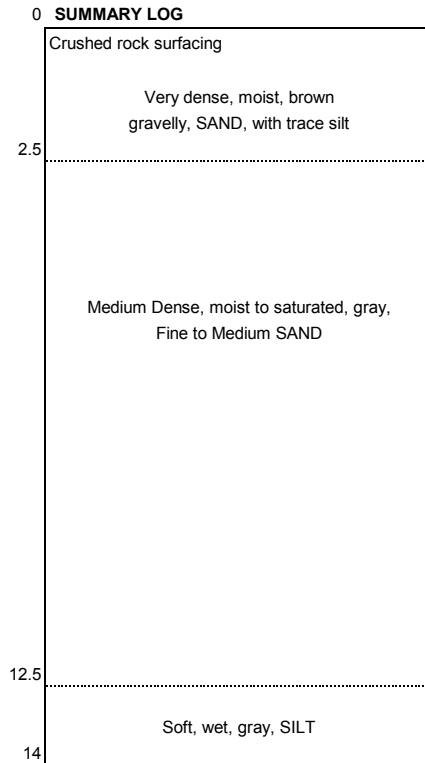
Field Rep: D. Cooper		Location: N710142 E1175986		Ecology ID# BBL964	
Drilling Co.: Cascade		Ground surface elevation: 16.8			
Driller: Steve Chote		Date Completed: 6/10/2009			
Drill Type: CME 75		Weather: Clear 75F			
Size/Type Casing: 4" I.D. Hollow-Stem Auger		Sampler: 3" SPT			

Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
1/2.5	grab @ 1-2.5'		1-2.5	18	50/5"	1020	V dense, moist, bwn, gravelly, SAND, w/trace silt
2.5/4	grab @ 2.5-4'		2.5-4	18	15/15/18		M Dense, moist, gry, F-M SAND
5/6.5	grab @ 5-6.5'		5-6.5	18	7/9/5		M Dense, wet, gry, F SAND
7.5/9	grab @ 7.5-9'		7.5-9	18	6/7/9		M Dense, wet, gry, F-M SAND
10/11.5	grab @ 10-11.5'		10-11.5	18	4/3/2		Loose, sat, gry, F-M SAND, w/trace silt
12.5/14	grab @ 12.5-14'		12.5-14	18	1/2/4	1110	Soft, wet, gry, SILT, plastic

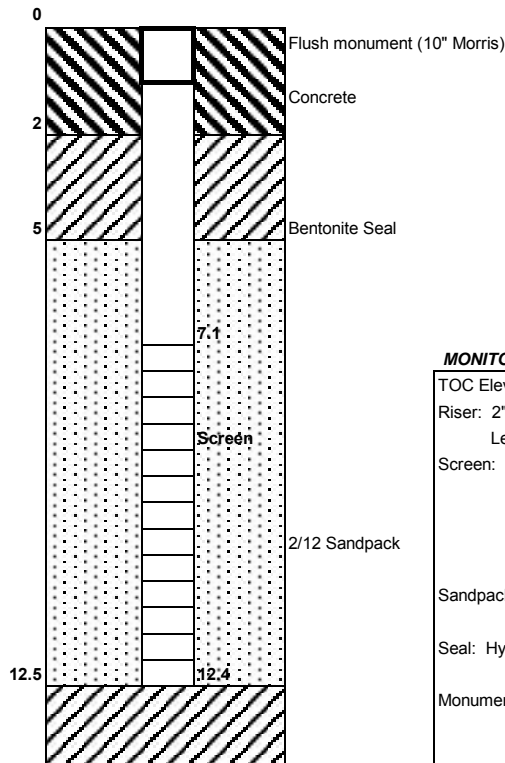
Bottom of boring @ 14.0'

MONITORING WELL DIAGRAM

Depth(ft.)



(Bottom of Boring)



Bentonite Seal

MONITORING WELL INFORMATION

TOC Elevation: 16.24
 Riser: 2" dia. SCH 40 PVC
 Length: 7.1'
 Screen: 2" dia. SCH 40 PVC
 Slot size: 0.010"
 Length: 5'
 (top/bot) 7.1/12.4
 0.3' end cap
 Sandpack: 2/12 colorado sand
 (top/bot) 5/12.5
 Seal: Hydrated bentonite chip
 (top/bot) 2/5
 Monument: 10" dia. Flush Mount (Morris)
 -0.4' to top of PVC/TOC

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

MW-C

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

Field Rep: D. Cooper		Location: N710013 E1176366		Ecology ID# BBL965	
Drilling Co.: Cascade		Ground surface elevation: 19.6			
Driller: Steve Chote		Date Completed: 6/10/2009			
Drill Type: CME 75		Weather: Clear 75F			
Size/Type Casing: 4" I.D. Hollow-Stem Auger		Sampler: 3" SPT			

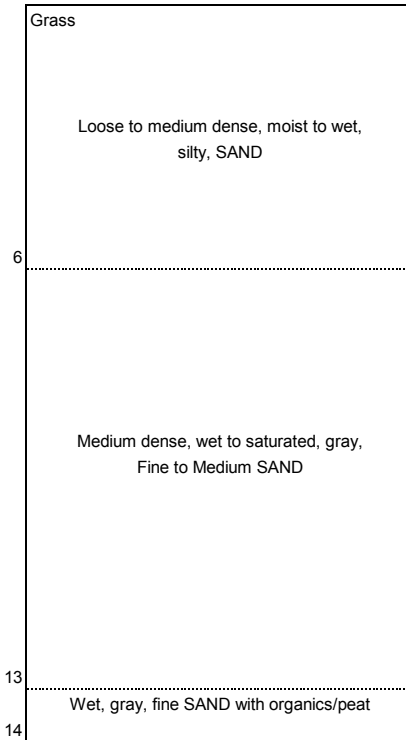
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
0/1.5	grab @ 0-1.5'		0-1.5	18	5/5/7	1115	Loose, moist, bwn, silty, SAND
2.5/4	grab @ 2.5-4'		2.5-4	18	12/13/17		M dense, wet, bwn, silty, SAND, w/some gravel, wood chip
5/6.5	grab @ 5-6.5'		5-6.5	18	50/5"		as above to 6' 6-6.5' Moist, gry, F-M SAND
7.5/9	grab @ 7.5-9'		7.5-9	18	8/13/12		M dense, wet, gry, F-M SAND, w/silty sand interbeds
10/11.5	grab @ 10-11.5'		10-11.5	18	5/5/6		M dense, sat, gry, F-M SAND
12.5/14	grab @ 12.5-14'		12.5-14	18	6/9/5	1200	as above to 13' 13-14' Wet, gry, F SAND, w/organics, peat

Bottom of boring @ 14.0'

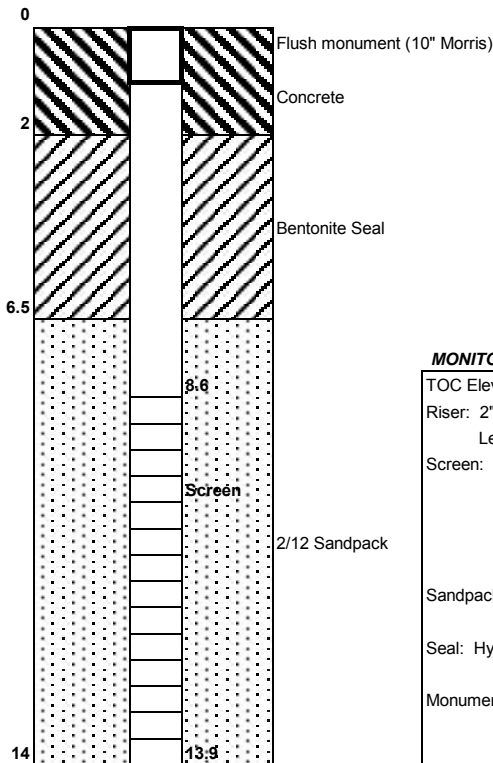
MONITORING WELL DIAGRAM

Depth(ft.)

0 SUMMARY LOG



(Bottom of Boring)



MONITORING WELL INFORMATION

TOC Elevation: 19.22
Riser: 2" dia. SCH 40 PVC
Length: 8.6'
Screen: 2" dia. SCH 40 PVC
Slot size: 0.010"
Length: 5'
(top/bot) 8.6/13.9
0.3' end cap
Sandpack: 2/12 colorado sand
(top/bot) 6.5/14
Seal: Hydrated bentonite chip
(top/bot) 2/6.5
Monument: 10" dia. Flush Mount (Morris)
-0.4' to top of PVC/TOC

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

MW-D

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

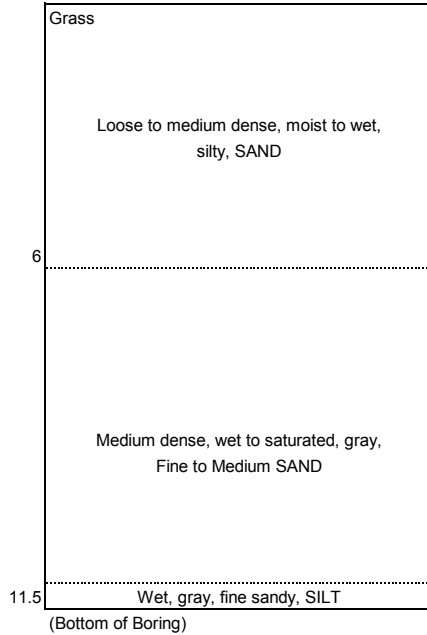
Field Rep: D. Cooper		Location: N709691 E1175774		Ecology ID# BBL967			
Drilling Co.: Cascade		Ground surface elevation: 15.7					
Driller: Steve Chote		Date Completed: 6/10/2009					
Drill Type: CME 75		Weather: Clear 75F					
Size/Type Casing: 4" I.D. Hollow-Stem Auger		Sampler: 3" SPT					
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
0/1.5	grab @ 0-1.5'		0-1.5	18	10/15/23	1350	Dense, damp, bwn, gravelly, SAND
2.5/4	grab @ 2.5-4'		2.5-4	18	3/4/6		Moist, dk bwn, silty, SAND, w/some gravel, wood chip
5/6.5	grab @ 5-6.5'		5-6.5	18	11/11/16		M dense, wet, gry, F-M SAND
7.5/9	grab @ 7.5-9'		7.5-9	18	5/3/11		M dense, sat, gry, F-M SAND
10/11.5	grab @ 10-11.5'		10-11.5	18	1/1/1	1430	as above to 11' 11-11.5' Wet, gry, F sandy, SILT

Bottom of boring @ 11.5'

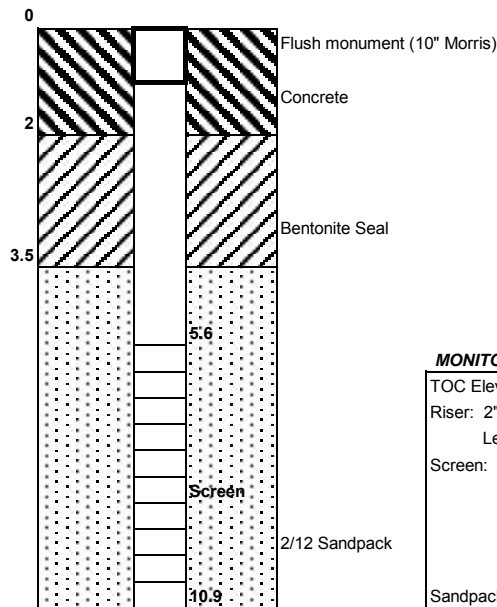
MONITORING WELL DIAGRAM

Depth(ft.)

SUMMARY LOG



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.



MONITORING WELL INFORMATION

TOC Elevation: 15.31
Riser: 2" dia. SCH 40 PVC Length: 5.6'
Screen: 2" dia. SCH 40 PVC Slot size: 0.010" Length: 5' (top/bot) 5.6/10.9 0.3' end cap
Sandpack: 2/12 colorado sand (top/bot) 3.5/11
Seal: Hydrated bentonite chip (top/bot) 2/3.5
Monument: 10" dia. Flush Mount (Morris) -0.4' to top of PVC/TOC

MW-E

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

Field Rep: D. Cooper		Location: N709277 E1176266		Ecology ID# BBL966	
Drilling Co.: Cascade		Ground surface elevation: 16.4			
Driller: Steve Chote		Date Completed: 6/10/2009			
Drill Type: CME 75		Weather: Clear 75F			
Size/Type Casing: 4" I.D. Hollow-Stem Auger		Sampler: 3" SPT			

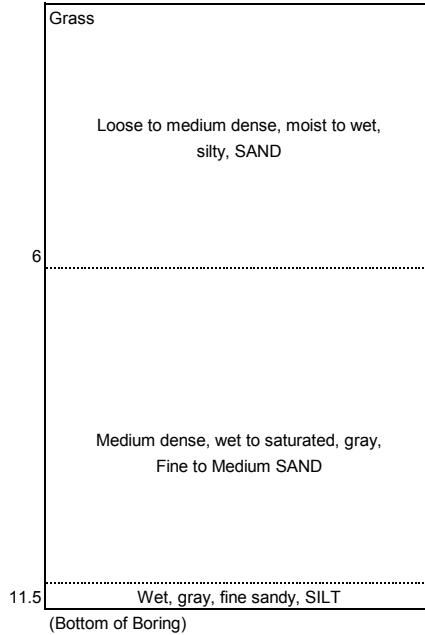
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
0/1.5	grab @ 0-1.5'		0-1.5	18	7/9/13	1220	M dense, silty, SAND, w/ some gravel, scattered wood chip
2.5/4	grab @ 2.5-4'		2.5-4	0.5	15/17/23		Dense, moist, mot bwn, silty, SAND, w/ some gravel
5/6.5	grab @ 5-6.5'		5-6.5	18	5/6/5		M dense, wet, gry, F SAND, grading to silt
7.5/9	grab @ 7.5-9'		7.5-9	18	2/1/2		V soft, wet, mot gry/bwn, organic, SILT
10/11.5	grab @ 10-11.5'		10-11.5	18	2/2/4	1310	Soft, wet, gry, SILT, w/some orgaincs, marsh grass

Bottom of boring @ 11.5'

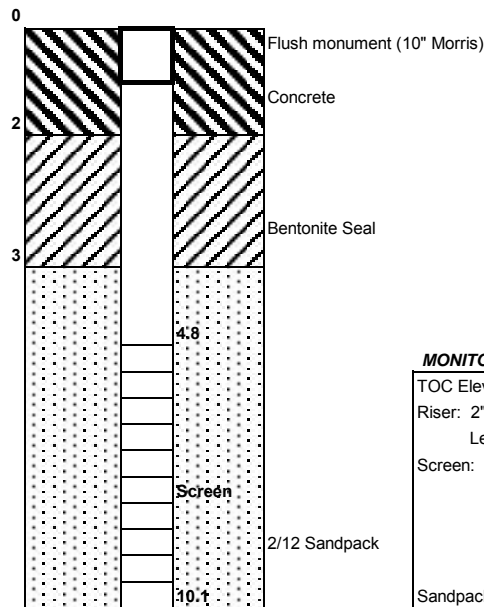
MONITORING WELL DIAGRAM

Depth(ft.)

SUMMARY LOG



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.



MONITORING WELL INFORMATION

TOC Elevation: 15.99
Riser: 2" dia.SCH 40 PVC Length: 4.8'
Screen: 2" dia. SCH 40 PVC Slot size: 0.010" Length: 5' (top/bot) 4.8/10.1 0.3' end cap
Sandpack: 2/12 colorado sand (top/bot) 3/11.5
Seal: Hydrated bentonite chip (top/bot) 2/3
Monument: 10" dia. Flush Mount (Morris) -0.4' to top of PVC/TOC

MW-F

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

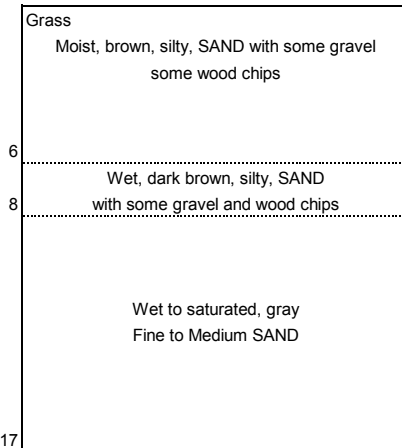
Field Rep: D. Cooper		Location: N710380 E1175980		Ecology ID# BCP828			
Drilling Co.: Cascade		Ground surface elevation: 21.4					
Driller: Frank Scott		Date Completed: 5/11/2010					
Drill Type: Power Probe 9630		Weather: Clear 50F					
Size/Type Casing: 3.5"		Sampler: no samples - direct push to 17'					
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
-	-	smooth	0-5	48	-	0930	0-5 Moist, bwn, silty, SAND, w/some gravel
0.5	grab @ 0.5-1.5'						
3	grab @ 2.5-3.5'						
-	-		5-10	60	-		5-6 As above
6	grab @ 5.5-6'						6-8' Wet, dk bwn, silty, SAND, w/some gravel, woody debris, organics
9	grab @ 8.5-9.5'						8-10' Wet, gry, F-M SAND
-	-		10-15	60	-		10-15 As above
12	grab @ 11.5-12.5'						saturated @ 12'
15	grab @ 14.5-15.5'						
-	-		15-20	60	-		15-17' As above
18	grab @ 17.5-18.5'						17-17.5' Firm, wet, bwn, organic, SILT
							17.5-20' Wet, gry, clayey, SILT, w/thin grass, plastic
-	-		20-25	60	-		20-22 As above
21	grab @ 20.5-21.5'						22-23.5' Wet, bwn, F sandy, SILT, w/some organics
24	grab @ 23.5-24.5'						23.5-25' Sat, gry, F SAND
-	-		25-30	60	-		25-28' Sat, gry, F-M SAND
27	grab @ 26.5-27.5'						28-30 Sat, gry, F SAND, w/some silt
30	grab @ 29-30'					1030	

Note: Log of adjacent boring F2

MONITORING WELL DIAGRAM

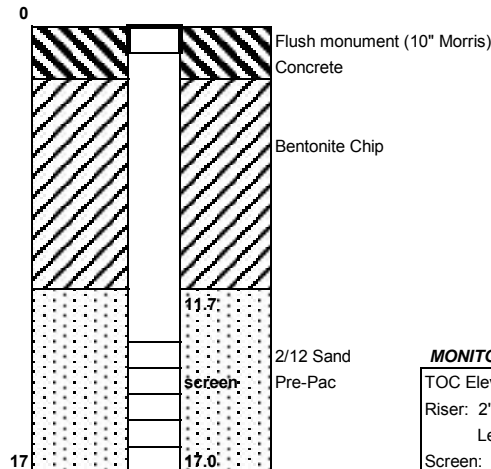
Depth(ft.)

0 SUMMARY LOG



Log excerpt from adjacent boring F2

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.



Well installation completed without sampling based on adjacent log of MW-F2.

MONITORING WELL INFORMATION

TOC Elevation: 21.11
 Riser: 2" dia. SCH 40 PVC
 Length: 11.7'
 Screen: 2" dia. SCH 40 PVC
 Slot size: 0.010"
 Length: 5'
 (top/bot) 11.7/17
 0.3' end cap
 Sandpack: 2/12 sand Pre-Pac
 (top/bot) 10/17
 Seal: Bentonite chip
 (top/bot) 2/10
 Monument: 10" dia. Flush Mount (Morris)
 -0.3' to top of PVC/TOC

MW-F2

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

Field Rep: D. Cooper		Location: N710375 E1175986		Ecology ID# BCP829	
Drilling Co.: Cascade		Ground surface elevation: 21.5			
Driller: Frank Scott		Date Completed: 5/11/2010			
Drill Type: Power Probe 9630		Weather: Clear 50F			
Size/Type Casing: 3.5"		Sampler: 2" macro w/acrylic liner, 5' continuous push			

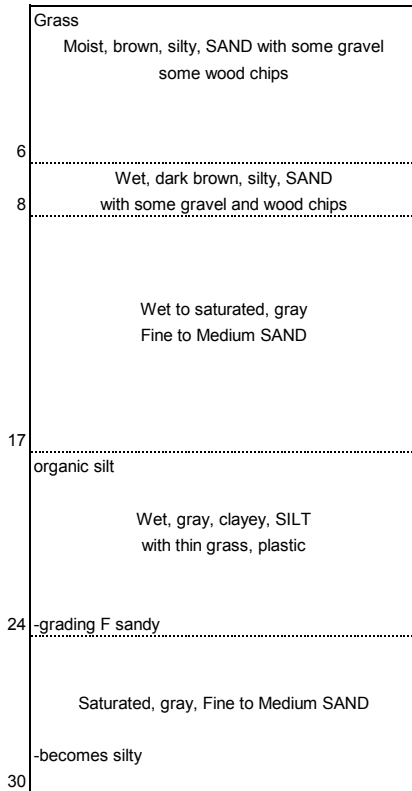
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
-	-	smooth	0-5	48	-	0930	0-5 Moist, bwn, silty, SAND, w/some gravel
0.5	grab @ 0.5-1.5'						
3	grab @ 2.5-3.5'						
-	-		5-10	60	-		5-6 As above
6	grab @ 5.5-6'						6-8' Wet, dk bwn, silty, SAND, w/some gravel, woody debris, organics
9	grab @ 8.5-9.5'						8-10' Wet, gry, F-M SAND
-	-		10-15	60	-		10-15 As above
12	grab @ 11.5-12.5'						saturated @ 12'
15	grab @ 14.5-15.5'						
-	-		15-20	60	-		15-17' As above
18	grab @ 17.5-18.5'						17-17.5' Firm, wet, bwn, organic, SILT
							17.5-20' Wet, gry, clayey, SILT, w/thin grass, plastic
-	-		20-25	60	-		20-22 As above
21	grab @ 20.5-21.5'						22-23.5' Wet, bwn, F sandy, SILT, w/some organics
24	grab @ 23.5-24.5'						23.5-25' Sat, gry, F SAND
-	-		25-30	60	-		25-28' Sat, gry, F-M SAND
27	grab @ 26.5-27.5'						28-30 Sat, gry, F SAND, w/some silt
30	grab @ 29-30'					1030	

Bottom of boring @ 30.0'

MONITORING WELL DIAGRAM

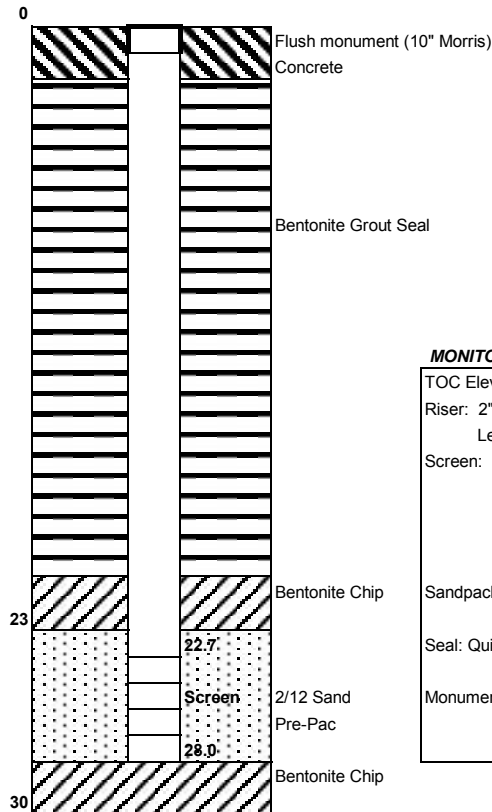
Depth(ft.)

0 SUMMARY LOG



(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.



MONITORING WELL INFORMATION

TOC Elevation: 21.21
Riser: 2" dia. SCH 40 PVC
Length: 22.7'
Screen: 2" dia. SCH 40 PVC
Slot size: 0.010"
Length: 5'
(top/bot) 22.7/28
0.3' end cap
Sandpack: 2/12 sand Pre-Pac
(top/bot) 22/28
Seal: Quick Grout bentonite
(top/bot) 2/21
Monument: 10" dia. Flush Mount (Morris)
-0.3' to top of PVC/TOC

MW-G

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

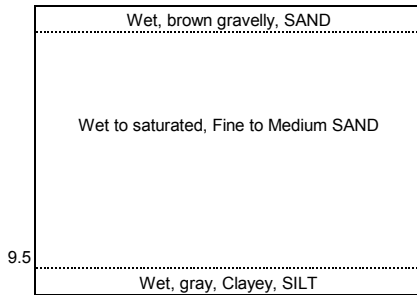
Field Rep: D. Cooper		Location: N710250 E1175801		Ecology ID# BCP831			
Drilling Co.: Cascade		Ground surface elevation: 15.2					
Driller: Frank Scott		Date Completed: 5/14/2010					
Drill Type: Power Probe 9630		Weather: Clear 55F					
Size/Type Casing: 3.5"		Sampler: 2" macro w/acrylic liner, 5' continuous push					
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
-	-	smooth	0-5	36	-	0645	0-1' Wet, bwn, gravelly, SAND, w/trace silt, organics, chip @ base 1-5' Wet-sat, gry, F-M SAND
3	grab @ 0.5-1.5' grab @ 2.5-3.5'						
-	-		5-10	40	-		5-9.5 As above 9.5-10' Wet, gry, clayey, SILT
6	grab @ 5.5-6'						
9	grab @ 8.5-9.5'						
-	-		10-15	60	-		10-11 As above 11-11.5' Wet, bwn, fibrous PEAT 11.5-15' Wet, gry-bwn, organic, clayey, SILT, w/marsh grass
12	grab @ 11.5-12.5'						
15	grab @ 14.5-15.5'						
-	-		15-20	60	-		15-19' Wet, gry, SILT, w/trace sand, grading sandier w/depth 19-20' Sat, gry, F SAND
18	grab @ 17.5-18.5'						
-	-		20-25	60	-		20-25' Sat, gry, silty, F SAND, interbeds of silt/sand
21	grab @ 20.5-21.5'						
24	grab @ 23.5-24.5'					0720	

Log of adjacent boring G2

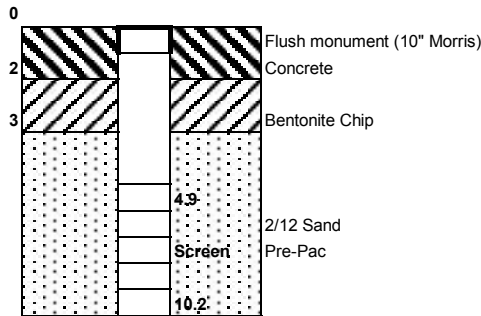
MONITORING WELL DIAGRAM

Depth(ft.)

SUMMARY LOG



Log excerpt from Boring G2



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

Well installation completed without sampling based on adjacent log of MW-G2.

MONITORING WELL INFORMATION

TOC Elevation: 14.88
Riser: 2" dia. SCH 40 PVC Length: 4.9'
Screen: 2" dia. SCH 40 PVC Slot size: 0.010" Length: 5' (top/bot) 4.9/10.2 0.3' end cap
Sandpack: 2/12 sand Pre-Pac (top/bot) 4/10
Seal: Bentonite chip (top/bot) 2/3
Monument: 10" dia. Flush Mount (Morris) -0.3' to top of PVC/TOC

MW-G2

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

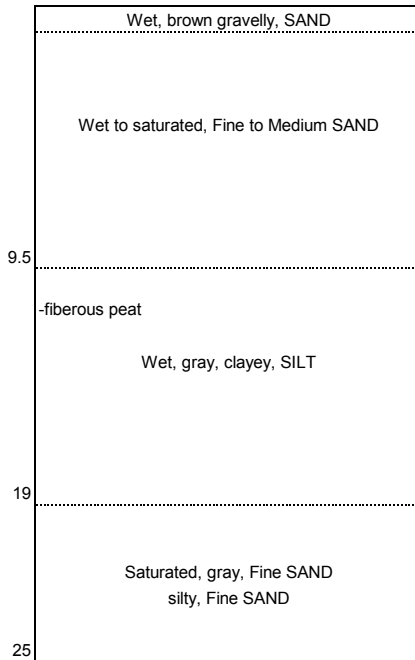
Field Rep: D. Cooper		Location: N710250 E1175801		Ecology ID# BCP830			
Drilling Co.: Cascade		Ground surface elevation: 15.2					
Driller: Frank Scott		Date Completed: 5/14/2010					
Drill Type: Power Probe 9630		Weather: Clear 55F					
Size/Type Casing: 3.5"		Sampler: 2" macro w/acrylic liner, 5' continuous push					
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
-	-	smooth	0-5	36	-	0645	0-1' Wet, bwn, gravelly, SAND, w/trace silt, organics, wood chip @ base
3	grab @ 0.5-1.5' grab @ 2.5-3.5'						1-5' Wet-sat, gry, F-M SAND
-	-		5-10	40	-		5-9.5 As above
6	grab @ 5.5-6'						9.5-10' Wet, gry, clayey, SILT
9	grab @ 8.5-9.5'						
-	-		10-15	60	-		10-11 As above
12	grab @ 11.5-12.5'						11-11.5' Wet, bwn, fibrous PEAT
15	grab @ 14.5-15.5'						11.5-15' Wet, gry-bwn, organic, clayey, SILT, w/marsh grass
-	-		15-20	60	-		15-19' Wet, gry, SILT, w/trace sand, grading sandier w/depth
18	grab @ 17.5-18.5'						19-20' Sat, gry, F SAND
-	-		20-25	60	-		20-25' Sat, gry, silty, F SAND, interbeds of silt/sand
21	grab @ 20.5-21.5'						
24	grab @ 23.5-24.5'					0720	

Bottom of boring @ 25.0'

MONITORING WELL DIAGRAM

Depth(ft.)

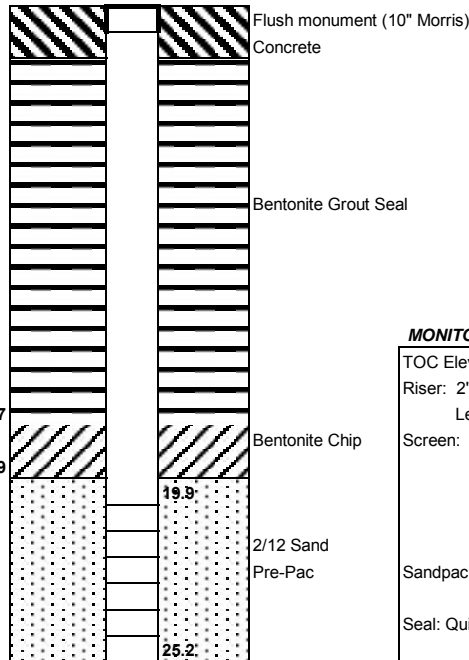
SUMMARY LOG



(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

0



MONITORING WELL INFORMATION

TOC Elevation: 14.89
Riser: 2" dia. SCH 40 PVC
Length: 22.7'
Screen: 2" dia. SCH 40 PVC
Slot size: 0.010"
Length: 5'
(top/bot) 19.9/25.2
0.3' end cap
Sandpack: 2/12 sand Pre-Pac
(top/bot) 19/25
Seal: Quick Grout bentonite
(top/bot) 2/17
Monument: 10" dia. Flush Mount (Morris)
-0.3' to top of PVC/TOC

MW-H

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

Field Rep: D. Cooper		Location: N710536 E1175849		Ecology ID# BCM813	
Drilling Co.: Cascade		Ground surface elevation: 17.2			
Driller: Frank Scott		Date Completed: 12/10/2010			
Drill Type: GeoProbe 7730DT		Weather: Cloudy 50F			
Size/Type Casing: 3.5"		Sampler: 2" macro w/acrylic liner, 5' continuous push			

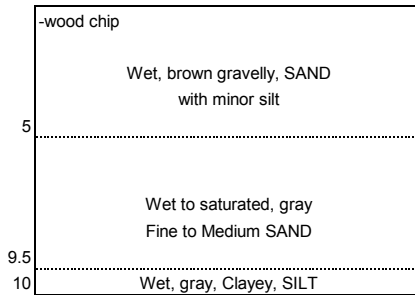
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
-	-	smooth	0-5	40	-		
1	grab @ 0.5-1'					1415	1.5-5' Moist, bwn, gravelly, SAND, w/minor silt
3	grab @ 2-3'					1420	
6	grab @ 5-6'		5-10	60	-	1425	5-9.5' Wet-sat, gry, F-M SAND
9	grab @ 8-9'					1430	9.5-10' Wet, gry, clayey, SILT

Bottom of Boring @ 10.0'

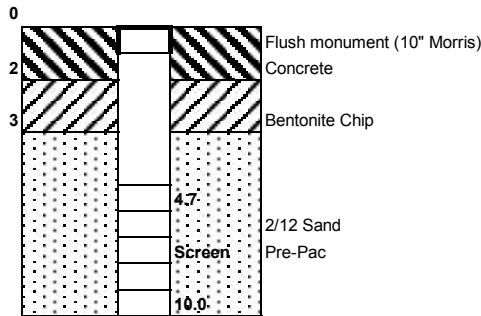
MONITORING WELL DIAGRAM

Depth(ft.)

0 SUMMARY LOG



(Bottom of Boring)



MONITORING WELL INFORMATION

TOC Elevation: 16.86
Riser: 2" dia. SCH 40 PVC
Length: 4.7'
Screen: 2" dia. SCH 40 PVC
Slot size: 0.010"
Length: 5'
(top/bot) 4.7/10.0
0.3' end cap
Sandpack: 2/12 sand Pre-Pac
(top/bot) 3/10
Seal: Bentonite chip
(top/bot) 2/3
Monument: 10" dia. Flush Mount (Morris)
-0.3' to top of PVC/TOC

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

MW-J

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

Field Rep: D. Cooper		Location: N79409 E1175970		Ecology ID# BCM811	
Drilling Co.: Cascade		Ground surface elevation: 16.3			
Driller: Frank Scott		Date Completed: 12/10/2010			
Drill Type: GeoProbe 7730DT		Weather: Cloudy 45F			
Size/Type Casing: 3.5"		Sampler: 2" macro w/acrylic liner, 5' continuous push			

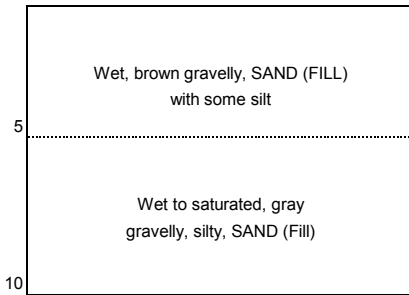
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
-	-	smooth	0-5	48	-		0-1' Wet, bwn, F-M SAND, w/some silt
2	grab @ 1-2'					1005	1-5' Wet, mot bwn, gravelly, SAND, w/some silt
5	grab @ 4-5'					1010	
-	-		5-10	18	-		Poor recovery - Wet to sat, gry, gravelly, silty, SAND
						1045	

Bottom of Boring @ 10.0'

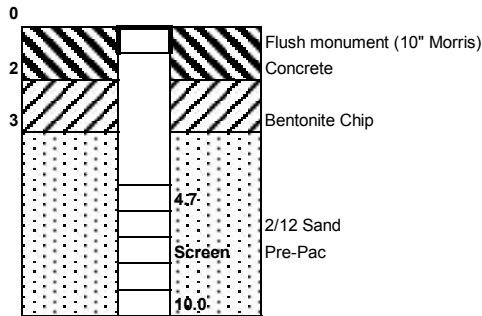
MONITORING WELL DIAGRAM

Depth(ft.)

0 SUMMARY LOG



(Bottom of Boring)



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

MONITORING WELL INFORMATION

TOC Elevation: 15.93
Riser: 2" dia. SCH 40 PVC
Length: 4.7'
Screen: 2" dia. SCH 40 PVC
Slot size: 0.010"
Length: 5'
(top/bot) 4.7/10.0
0.3' end cap
Sandpack: 2/12 sand Pre-Pac
(top/bot) 3/10
Seal: Bentonite chip
(top/bot) 2/3
Monument: 10" dia. Flush Mount (Morris)
-0.3' to top of PVC/TOC

MW-K

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

Field Rep: D. Cooper		Location: N79248 E1176151		Ecology ID# BCM810	
Drilling Co.: Cascade		Ground surface elevation: 15.7			
Driller: Frank Scott		Date Completed: 12/10/2010			
Drill Type: GeoProbe 7730DT		Weather: Cloudy 45F			
Size/Type Casing: 3.5"		Sampler: 2" macro w/acrylic liner, 5' continuous push			

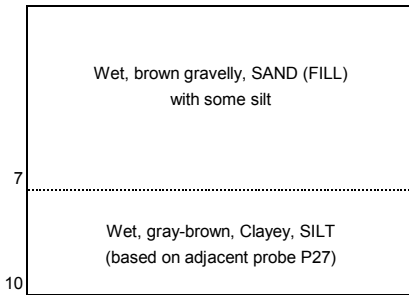
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
- 2	- grab @ 1-2'	smooth	0-5	36	-	0900	0-5' Wet, bwn, gravelly, SAND, w/some silt
-	-		5-10	18	-	0940	Poor recovery - As above w/SILT at base

Bottom of Boring @ 10.0'

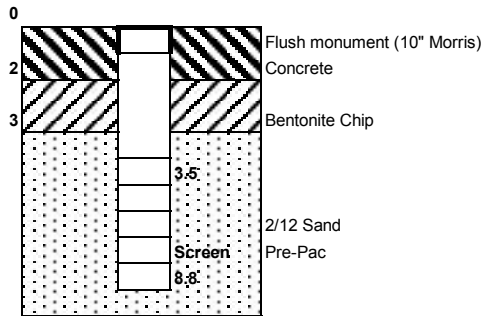
MONITORING WELL DIAGRAM

Depth(ft.)

0 SUMMARY LOG



(Bottom of Boring)



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

MONITORING WELL INFORMATION

TOC Elevation: 15.43
Riser: 2" dia. SCH 40 PVC
Length: 3.5'
Screen: 2" dia. SCH 40 PVC
Slot size: 0.010"
Length: 5'
(top/bot) 3.5/8.8
0.3' end cap
Sandpack: 2/12 sand Pre-Pac
(top/bot) 3/10
Seal: Bentonite chip
(top/bot) 2/3
Monument: 10" dia. Flush Mount (Morris)
-0.3' to top of PVC/TOC

MW-L

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

Field Rep: D. Cooper		Location: N709615 E1176456		Ecology ID# BCM812	
Drilling Co.: Cascade		Ground surface elevation: 16.1			
Driller: Frank Scott		Date Completed: 12/10/2010			
Drill Type: GeoProbe 7730DT		Weather: Cloudy 50F			
Size/Type Casing: 3.5"		Sampler: 2" macro w/acrylic liner, 5' continuous push			

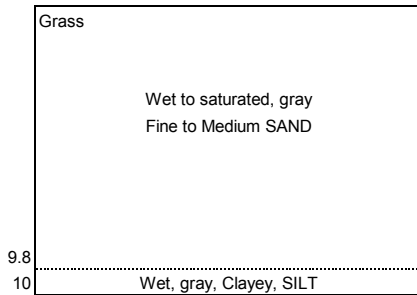
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
-	-	smooth	0-5	48	-		0-0.8' Moist, bwn, silty SAND, w/trace gravel, fine roots
1	grab @ 0.5-1'					1115	0.8-5' Moist-wet, gry, F-M SAND
3	grab @ 2.5-3.5'					1120	
6	grab @ 5.5-6.5'		5-10	60	-	1125	5-9.9' As above, sat
9	grab @ 8.5-9.5'					1130	9.8-10' Wet, gry, clayey, SILT

Bottom of Boring @ 10.0'

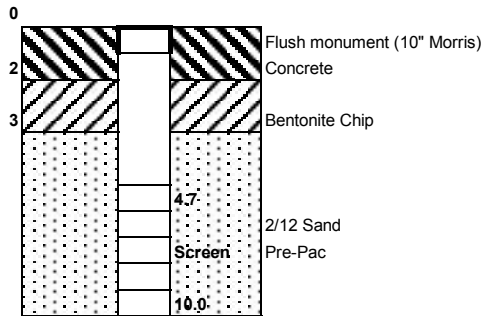
MONITORING WELL DIAGRAM

Depth(ft.)

0 SUMMARY LOG



(Bottom of Boring)



NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

MONITORING WELL INFORMATION

TOC Elevation: 15.80
Riser: 2" dia. SCH 40 PVC
Length: 4.7'
Screen: 2" dia. SCH 40 PVC
Slot size: 0.010"
Length: 5'
(top/bot) 4.7/10.0
0.3' end cap
Sandpack: 2/12 sand Pre-Pac
(top/bot) 3/10
Seal: Bentonite chip
(top/bot) 2/3
Monument: 10" dia. Flush Mount (Morris)
-0.3' to top of PVC/TOC

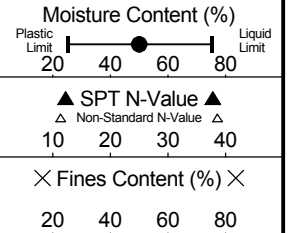
RRI-B-146

LAI Project No: 168005.030

SAMPLE DATA

SOIL PROFILE

WELL DETAIL



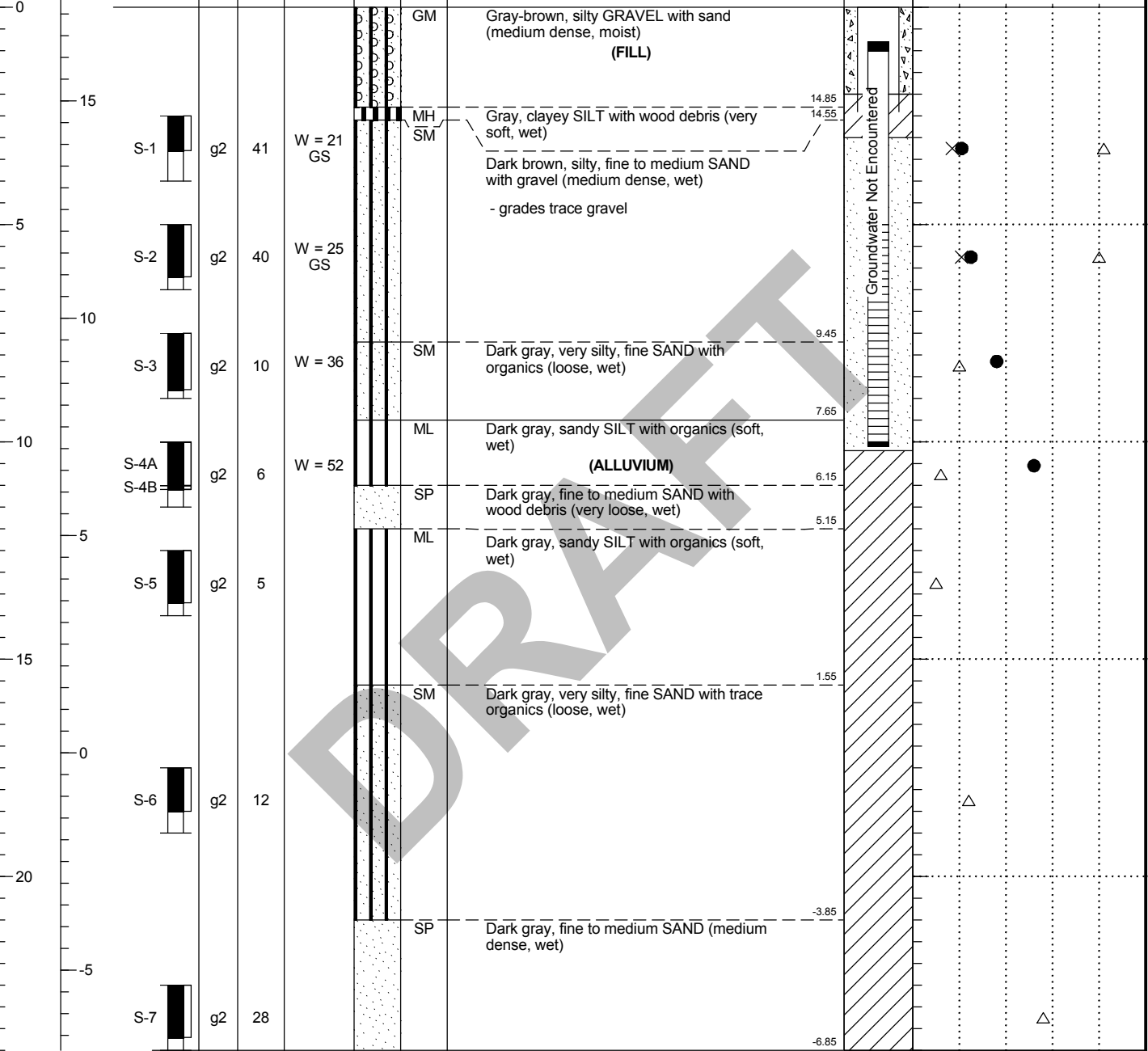
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 17.15

Drilled By: Holocene Drilling

Logged By: RRR Date: 10/17/08

168005.03 5/12/08 C:\DOCUMENTS AND SETTINGS\BBENNETT\SIDESKTOP\168005.010 REVISED B129 B130 B136 B137 B146 THROUGH B151 B162 B173 B174.GPJ SOIL BORING LOG WITH GRAPH



Boring Completed 10/17/08. Total Depth of Boring = 24.0 ft.

Elevation at Top of Soil Boring Casing = 16.83 ft.

- Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
 2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
 3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.



RRI-Blair Hylebos
Peninsula Terminal
Redevelopment Project
Tacoma, Washington

Log of Boring RRI-B-146

Figure
A-

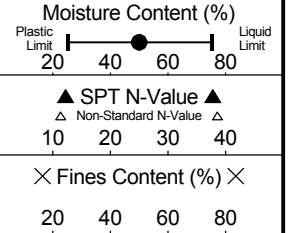
RRI-B-147

LAI Project No: 168005.030

SAMPLE DATA

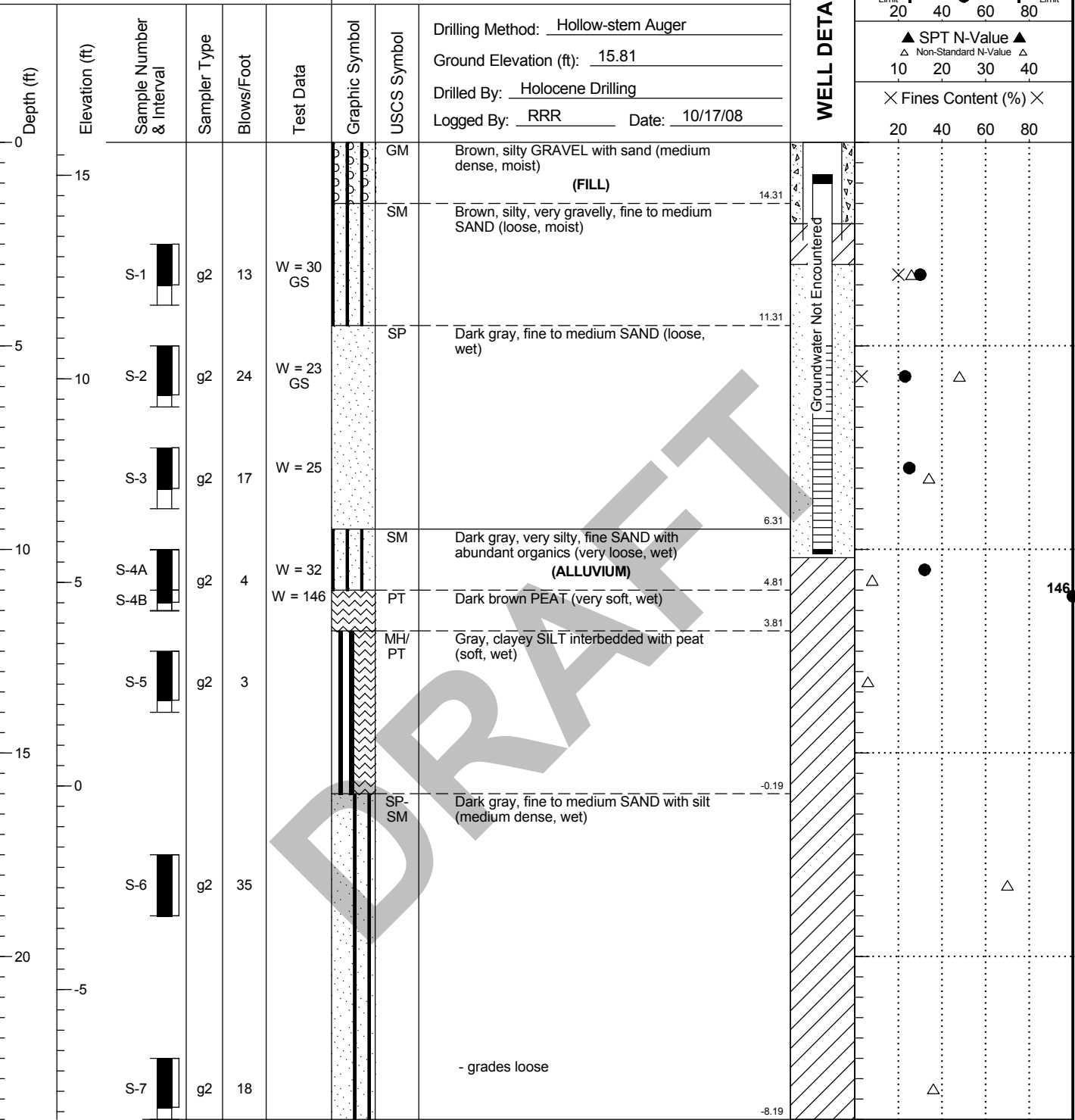
SOIL PROFILE

WELL DETAIL



Drilling Method: Hollow-stem Auger
 Ground Elevation (ft): 15.81
 Drilled By: Holocene Drilling
 Logged By: RRR Date: 10/17/08

168005.03 5/12/08 C:\DOCUMENTS AND SETTINGS\BBENNETT\SIDESKTOP\168005.010 REVISED B129 B130 B136 B137 B146 THROUGH B151 B162 B173 B174.GPJ SOIL BORING LOG WITH GRAPH



Boring Completed 10/17/08. Total Depth of Boring = 24.0 ft.

- Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
 2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
 3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.



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 Redevelopment Project
 Tacoma, Washington

Log of Boring RRI-B-147

Figure
A-

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

MW-147-2

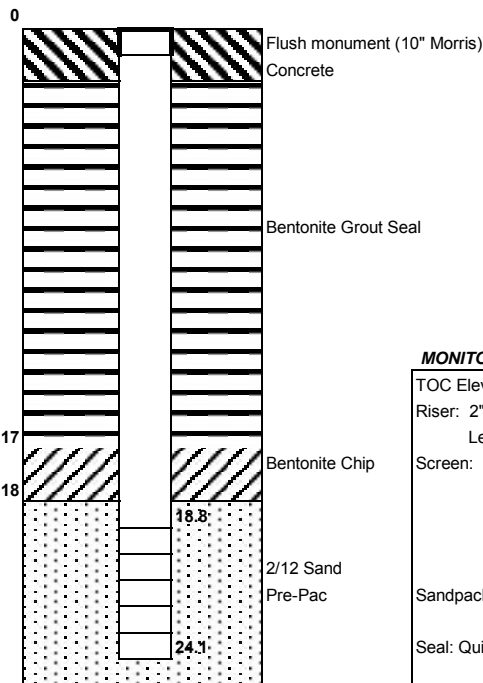
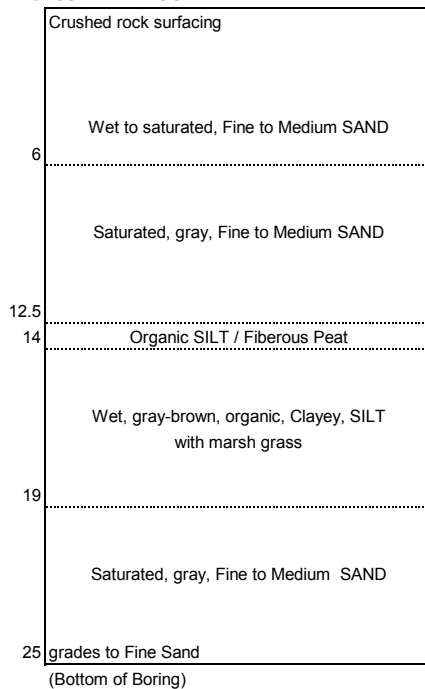
Field Rep: D. Cooper		Location: N709950 E1175863		Ecology ID# BCP833			
Drilling Co.: Cascade		Ground surface elevation: 17.5					
Driller: Frank Scott		Date Completed: 5/13/2010					
Drill Type: Power Probe 9630		Weather: Clear 65F					
Size/Type Casing: 3.5"		Sampler: 2" macro w/acrylic liner, 5' continuous push					
Spl. No.	Type Sample Saved	Drill Action	Spl Depth (Ft.) From - To	Spl length (inches)	Blows/ 6 inches	Time	Sample Description
-	-	smooth	0-5	40	-	1635	0-1.5' Wet, mot gry, gravelly, SAND, w/some silt
1	grab @ 0.5-1.5'						1.5-5' Wet, mot bwn, silty, SAND, w/some organics, minor silt
3	grab @ 2.5-3.5'						Wood @ 3'
-	-		5-10	60	-		5-6' As above
6	grab @ 5.5-6'						6-10' Sat, gry, F-M SAND
9	grab @ 8.5-9.5'						
-	-		10-15	60	-		10-12.5 As above
12	grab @ 11.5-12.5'						12.5-13.5' Sat, dk gry, organic, SILT / Fiberous PEAT
15	grab @ 14.5-15.5'						13.5-15' Wet, gry-bwn, organic, clayey, SILT, W/ marsh grass
-	-		15-20	60	-		15-18' As above
18	grab @ 17.5-18.5'						18-20' Sat, gry, F-M SAND
-	-		20-25	60	-		20-25' As above, grading finer
21	grab @ 20.5-21.5'						
24	grab @ 23.5-24.5'					1710	

Bottom of boring @ 25.0'

MONITORING WELL DIAGRAM

Depth(ft.)

SUMMARY LOG



MONITORING WELL INFORMATION

TOC Elevation: 17.18
Riser: 2" dia. SCH 40 PVC Length: 18.8'
Screen: 2" dia. SCH 40 PVC Slot size: 0.010" Length: 5' (top/bot) 18.8/24.1 0.3' end cap
Sandpack: 2/12 sand Pre-Pac (top/bot) 18/25
Seal: Quick Grout bentonite (top/bot) 2/18
Monument: 10" dia. Flush Mount (Morris) -0.3' to top of PVC/TOC

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

SHORELINE BANK LOGS
SB1 to SB7
FORMER ARKEMA MOUND SITE

SHORELINE BANK SAMPLING - DESCRIPTION OF SAMPLES AND TESTS

SB1

Field Ref: DG Cooper		Location: N710411 E1175787	
Excavato Hand excavated		Elevation : Top of bank -16.4' Toe of bank - 13.8' MLLW	
		Date Completed: 11/16/10	
		Weather: clear 40F	
Depth (Ft.) From - To	DESCRIPTION		
Top of Slope	Grass		
0-2	Loose., wet, mottled brown, silty, SAND, with many roots		
2-3	Medium dense, wet, gray, Fine to Medium SAND, with silt interbeds		
	Flowing surface water stream at toe of slope (East Channel ditch)		
	Samples: AKW-S-SB1-A-111610 grab @ 0-2' AKW-S-SB1-B-111610 grab @ 2-3'		

SHORELINE BANK SAMPLING - DESCRIPTION OF SAMPLES AND TESTS

SB2

Field Ref: DG Cooper		Location: N710501 E1175789	
Excavato Hand excavated		Elevation : Top of bank -14.8' Toe of bank - 10.8' MLLW	
		Date Completed: 11/15/10	
		Weather: clear 40F	
Depth (Ft.) From - To	DESCRIPTION		
Top of Slope	Grass		
0-0.5	Organic Duff		
0.5-2	Loose, wet, brown, dilty, SAND, with organics, roots		
2-4	Medium dense, wet, gray, Fine to Medium SAND, with silt interbeds. Oxidation cementing @ 3.5'. SILT at base		
	Seepage at 4' or 10.8' MLLW (pH 6.8) Flowing surface water stream at toe of slope (East Channel ditch) Samples: AKW-S-SB2-A-111510 grab @ 0.5-2' AKW-S-SB2-B-111510 grab @ 2-4'		

SHORELINE BANK SAMPLING - DESCRIPTION OF SAMPLES AND TESTS

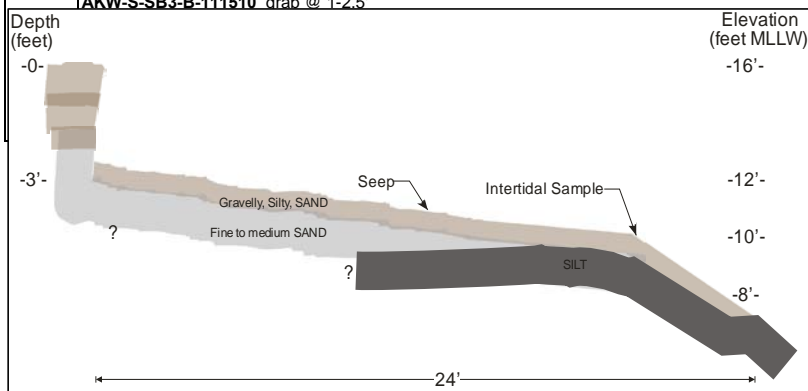
SB3

Field Ref: DG Cooper Excavato Hand excavated	Location: N710544 E1175860 Elevation : Top of bank -16.5' Toe of bank - 12.5' MLLW Date Completed: 11/15/10 Weather: clear 40F
---	---

Depth (Ft) From - To	DESCRIPTION
Top of Slope	Grass
0-1	Loose, wet, mottled brown, SAND, with some silt, scattered gravel, many fine roots
1-2.5	Medium dense, moist, brown, gravelly, SAND, with minor silt
2.5-3	Loose, wet, dark brown, organi;c, Fine to Medium, SAND, with woody debris
3-4	Medum dense, wet, gray, Fine to Medium SAND
10.0 MLLW	Grab sample of intertidal surface sediment (top 10 cm). Brown, gravelly, SAND

Seepage @ elev. 10.8 from intertidal slope

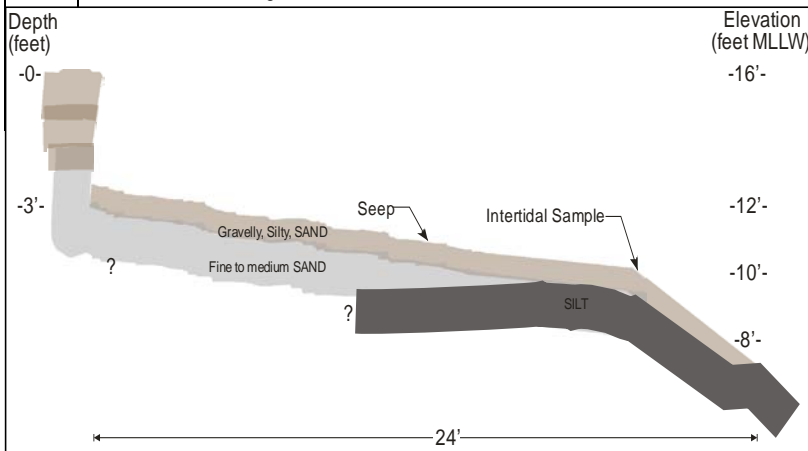
Samples:
AKW-S-SB3-A-111510 grab @ 0-1'
AKW-S-SB3-B-111510 grab @ 1-2.5'



SHORELINE BANK SAMPLING - DESCRIPTION OF SAMPLES AND TESTS

SB4

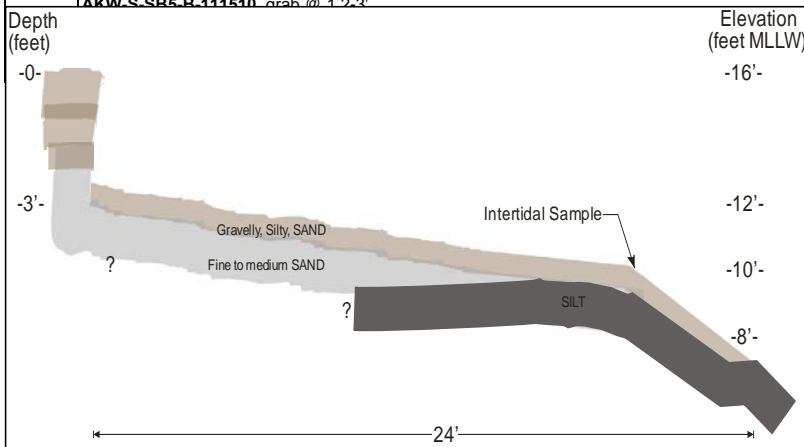
Field Ref: DG Cooper Excavato Hand excavated		Location: N710449 E1175955 Elevation : Top of bank -17.3' Toe of bank - 13.3' MLLW Date Completed: 11/15/10 Weather: clear 40F	
Depth (Ft.) From - To	DESCRIPTION		
Top of Slope	Grass		
0-1	Loose, wet, mottled brown, SAND, with some gravel, minor silt, organics, many fine roots		
1-1.6	Medium dense, moist, brown, gravelly, SAND, with some silt		
1.6-3	Loose, wet, dark brown,woody debris, with some sand		
3-4	Medum dense, wet, gray, Fine to Medium SAND		
10.0 MLLW	Grab sample of intertidal surface sediment (top 10 cm). Brown gravelly, SAND		
Seepage @ elev. 10.5 from intertidal slope			
Samples: AKW-S-SB4-A-111510 grab @ 0-1' AKW-S-SB4-B-111510 grab @ 1-1.6'			



SHORELINE BANK SAMPLING - DESCRIPTION OF SAMPLES AND TESTS

SB5

Field Ref: DG Cooper		Location: N710357 E1176064	
Excavator: Hand excavated		Elevation: Top of bank -16.0' Toe of bank - 13.0' MLLW	
		Date Completed: 11/15/10	
		Weather: clear 40F	
Depth (ft.) From - To	DESCRIPTION		
Top of Slope	Grass		
0-1.2	Loose, wet, brown, silty, SAND, with some gravel, many fine roots		
1.2-3	Loose, moist, gray, Fine to Medium SAND		
10.0 MLLW	Grab sample of intertidal surface sediment (top 10 cm). Brown gravelly, SAND		
	No Seepage observed from intertidal slope at this station		
	Samples: AKW-S-SB5-A-111510 grab @ 0-1.2' AKW-S-SB5-B-111510 grab @ 1.2-3'		



SHORELINE BANK SAMPLING - DESCRIPTION OF SAMPLES AND TESTS

SB6

Field Ref: DG Cooper		Location: N709253 E1176198 (Kaiser Ditch)	
Excavato Hand excavated		Elevation : Top of bank -15.0' Toe of bank - 9.1' MLLW	
		Date Completed: 11/15/10	
		Weather: clear 40F	
Slope Distance(Ft)	DESCRIPTION		
Top of Slope	Grassy 1.5 on 1 slope - excavated 1' trench. No distinct stratigraphy - colluvium.		
2	Loose, moist, gray, Fine to Medium SAND		
6	Loose, wet, mottled brown, silty, SAND		
12	Loose, wet, mottled gray-brown, Fine to Medium, SAND. Topographic bench consisting of SILT at base of slope.		
	No seepage observed from bank or intertidal slope		
	Samples: AKW-S-SB6-A-111610 grab @ 2' AKW-S-SB6-B-111610 grab @ 6' AKW-S-SB6-C-111610 grab @ 12'		

SHORELINE BANK SAMPLING - DESCRIPTION OF SAMPLES AND TESTS

SB7

Field Ref: DG Cooper		Location: N709248 E1176263 (Kaiser Ditch)	
Excavato Hand excavated		Elevation : Top of bank -15.0' Toe of bank - 9.3' MLLW	
		Date Completed: 11/15/10	
		Weather: clear 40F	
Slope Distance(Ft)	DESCRIPTION		
Top of Slope	Grassy 1.5 on 1 slope - excavated 1' trench. No distinct stratigraphy - colluvium.		
1	Loose, wet, mottled brown, silty, SAND, with many roots, wood chip		
5	Loose, wet, gray, Fine to Medium SAND		
10	Loose, wet, gray, Fine to Medium SAND. Topographic bench consisting of SILT at base of slope.		
	No seepage observed from bank or intertidal slope		
	Samples: AKW-S-SB7-A-111610 grab @ 1' AKW-S-SB7-B-111610 grab @ 5' AKW-S-SB7-C-111610 grab @ 10'		

**SEEP SAMPLER
CONSTRUCTION LOG
FORMER ARKEMA MOUND SITE**

DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION - MONITORING WELL NO.

Seep Sampler SS-1

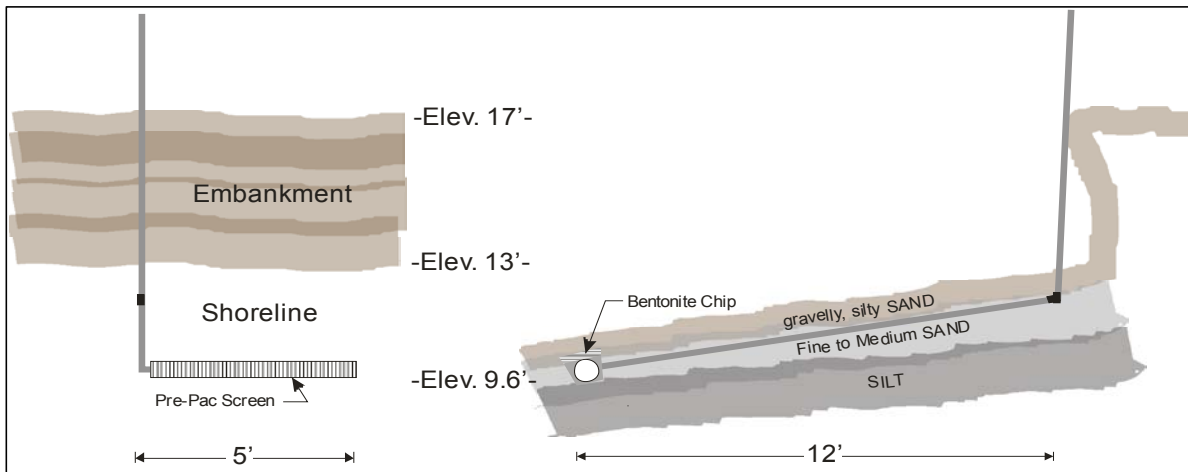
Field Rep: D. Cooper	Location: N710543 E1175859 (Riser location) / N710543 E1175850 (Screen Location)
Drilling Co.: Cascade	Ground surface elevation: 9.6 MLLW
Driller: Frank Scott	Date Completed: 12/10/2010
Drill Type: Hand Excavated	Weather: Cloudy 45F
Size/Type Casing: N/A	Sampler: N/A



Looking South



Looking East



SEEP SAMPLER INFORMATION

Riser: 2" dia. SCH 40 PVC
 Length: 20'
 Screen: 2" dia. SCH 40 PVC Pre-Pac
 Slot size: 0.010"
 Length: 5'
 Horizontal @ Elev. 9.6' MLLW
 0.3' end cap
 Sandpack: 2/12 Colorado sand
 Seal: Hydrated bentonite chip

APPENDIX B
ARSENIC CONCENTRATION TRENDS IN
GROUNDWATER
ARKEMA MOUND RI
May 2015

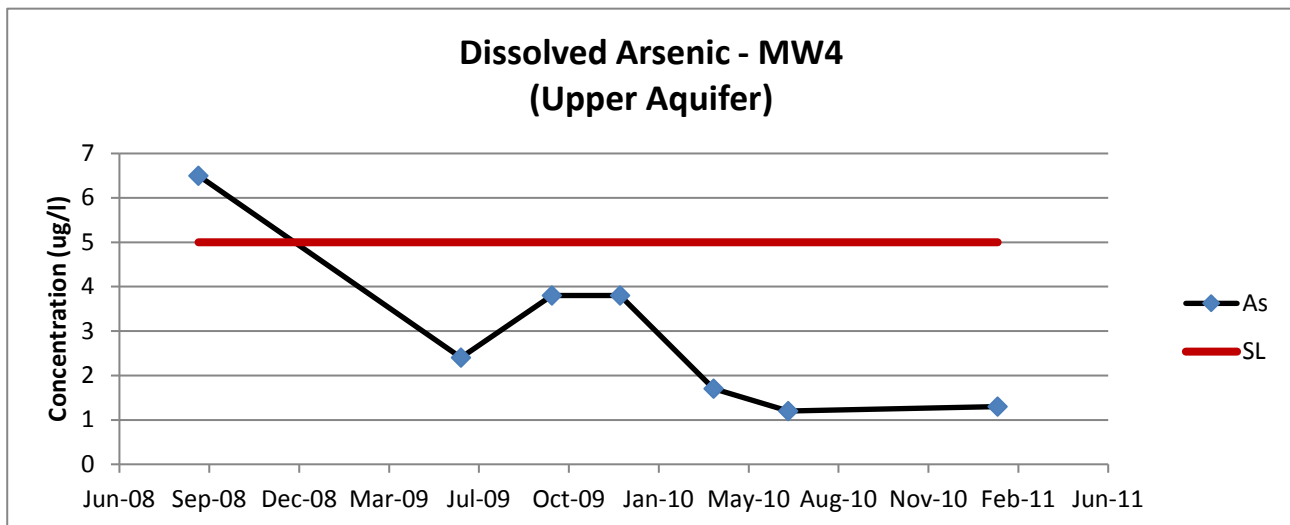
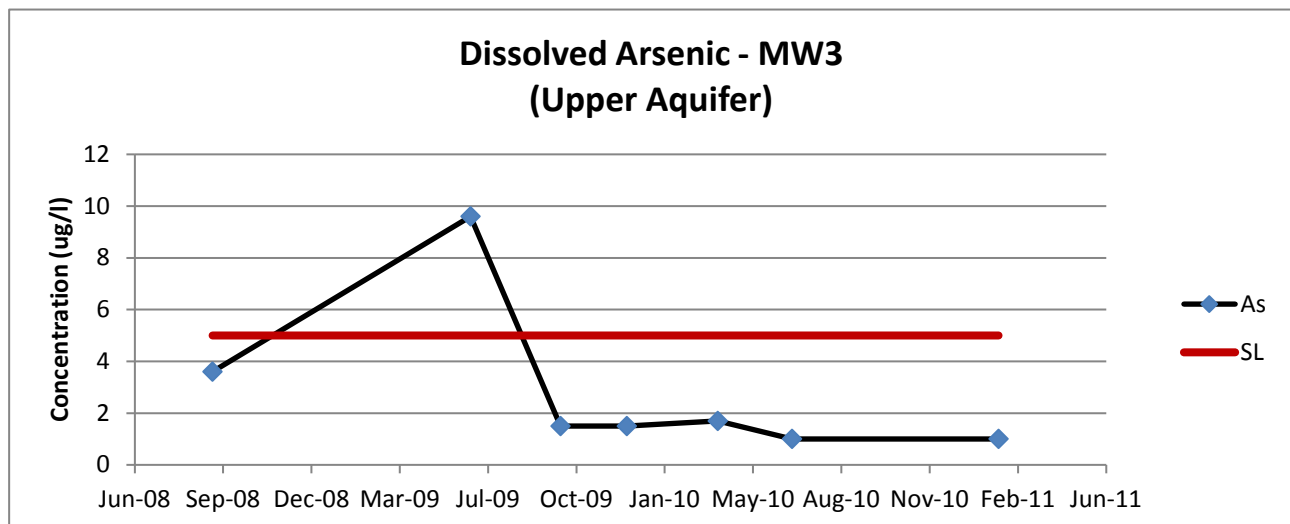
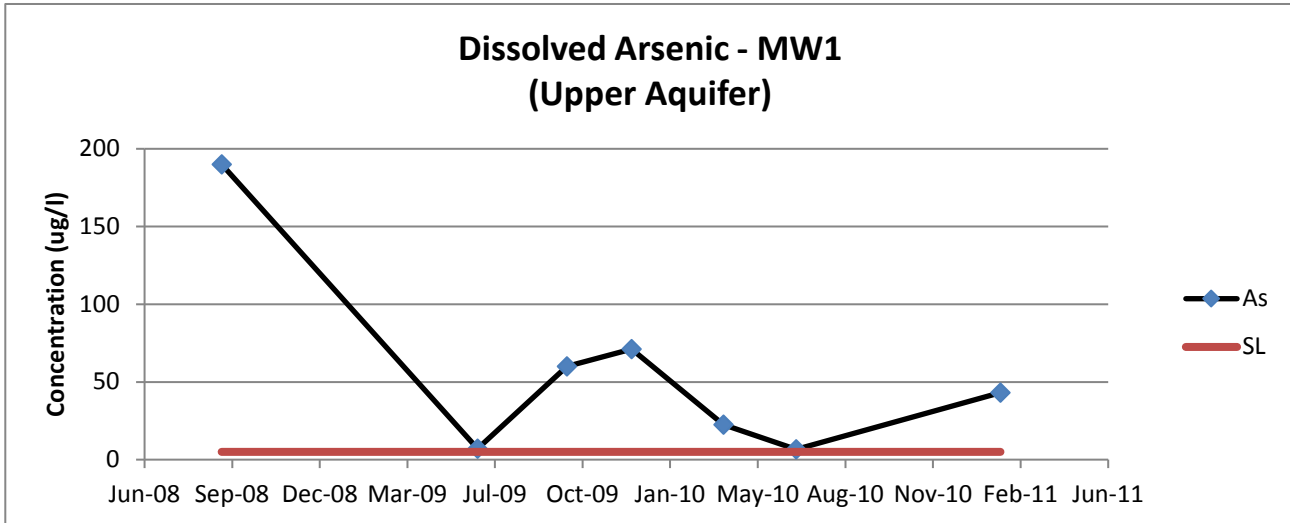


FIGURE B1

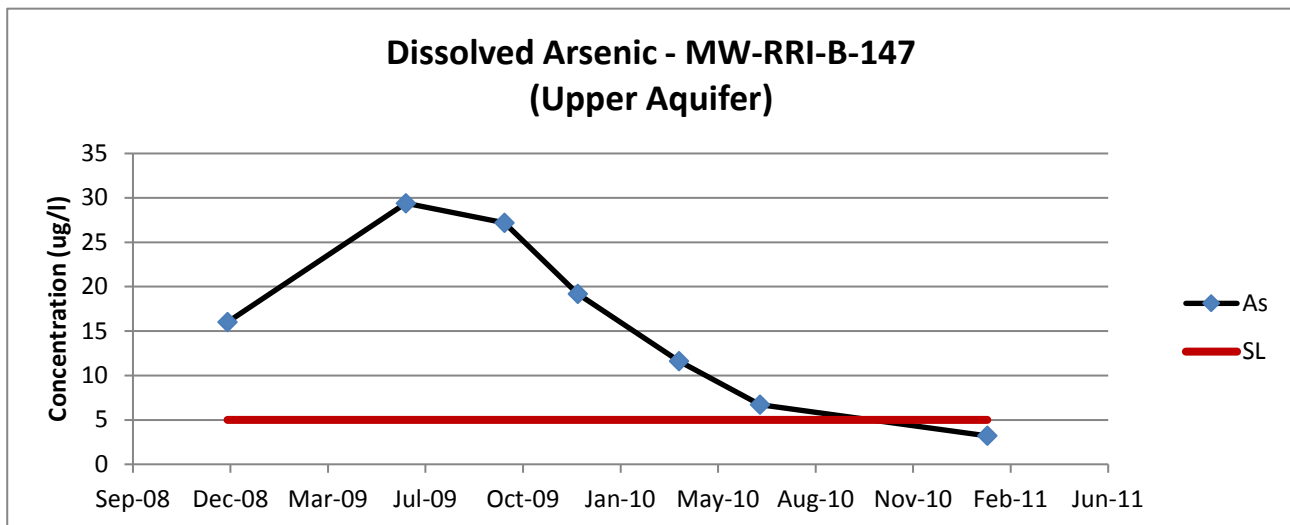
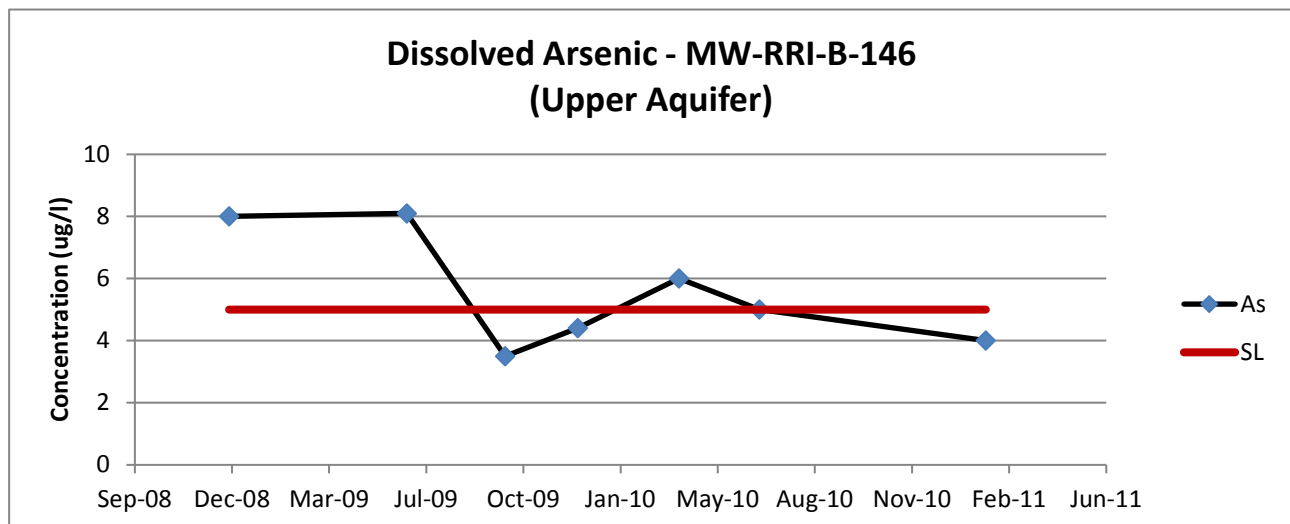
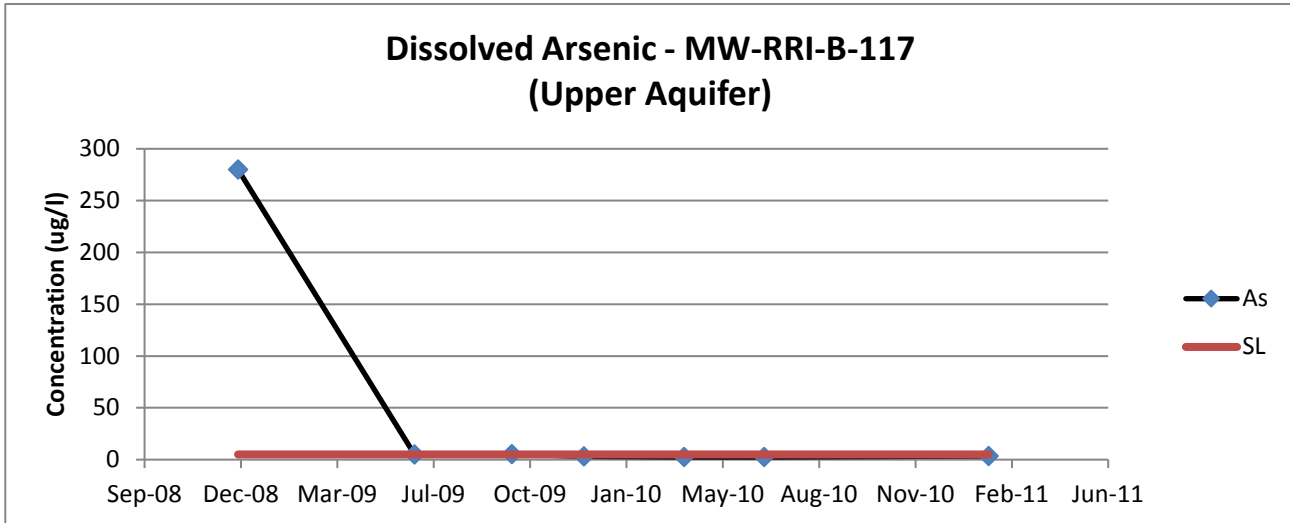


FIGURE B2

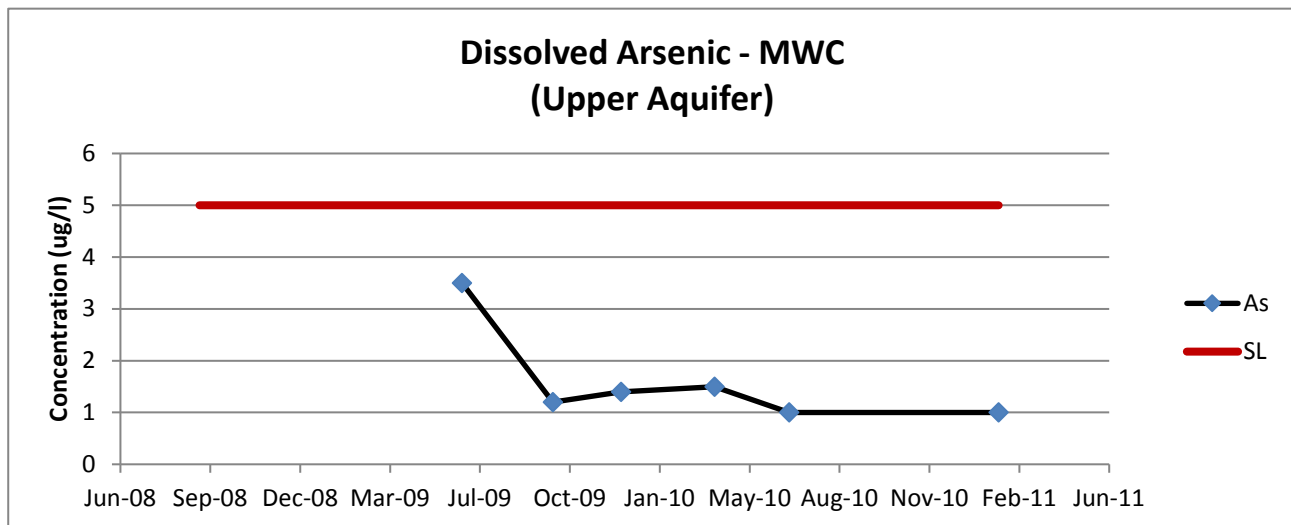
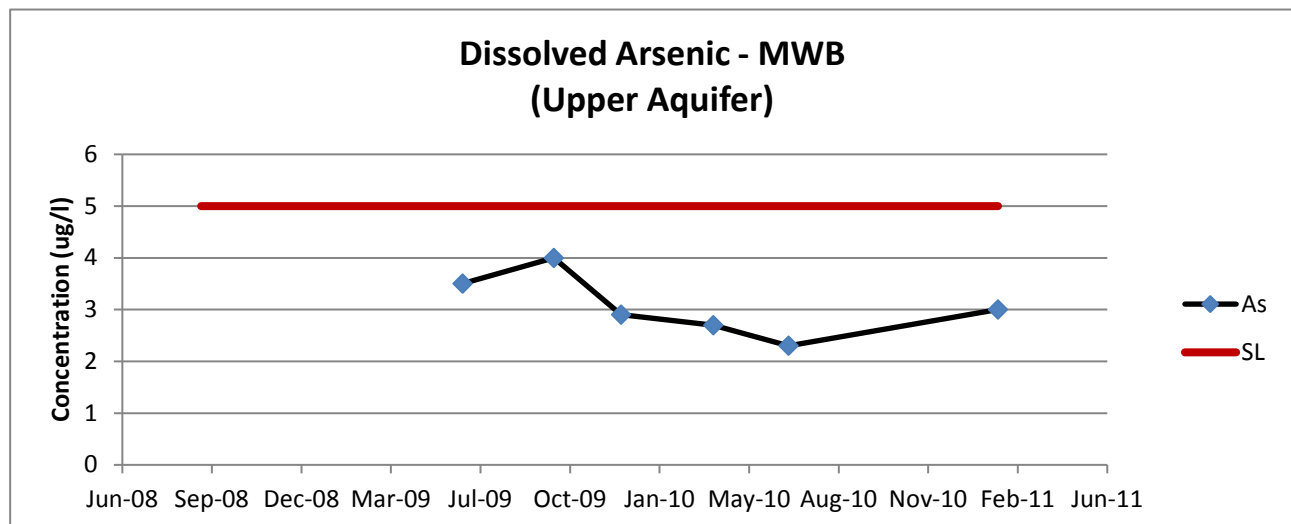
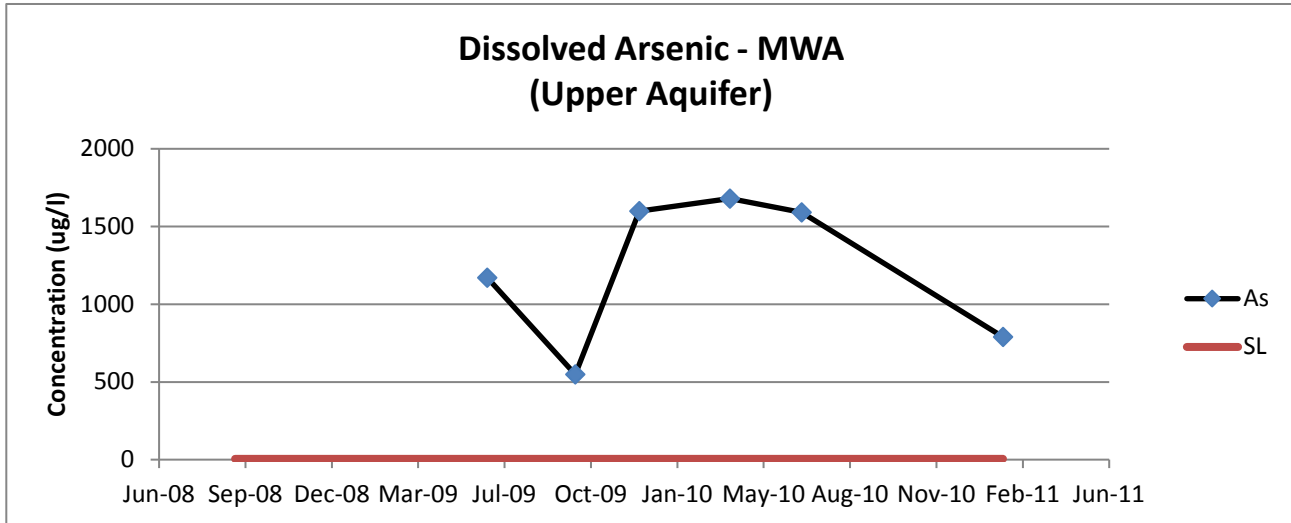


FIGURE B3

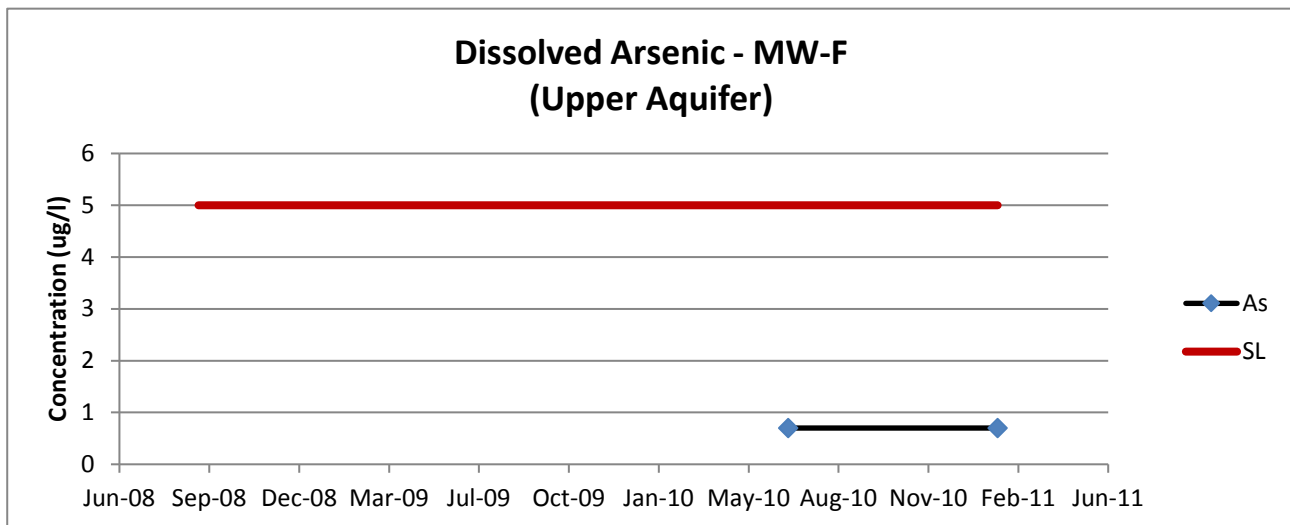
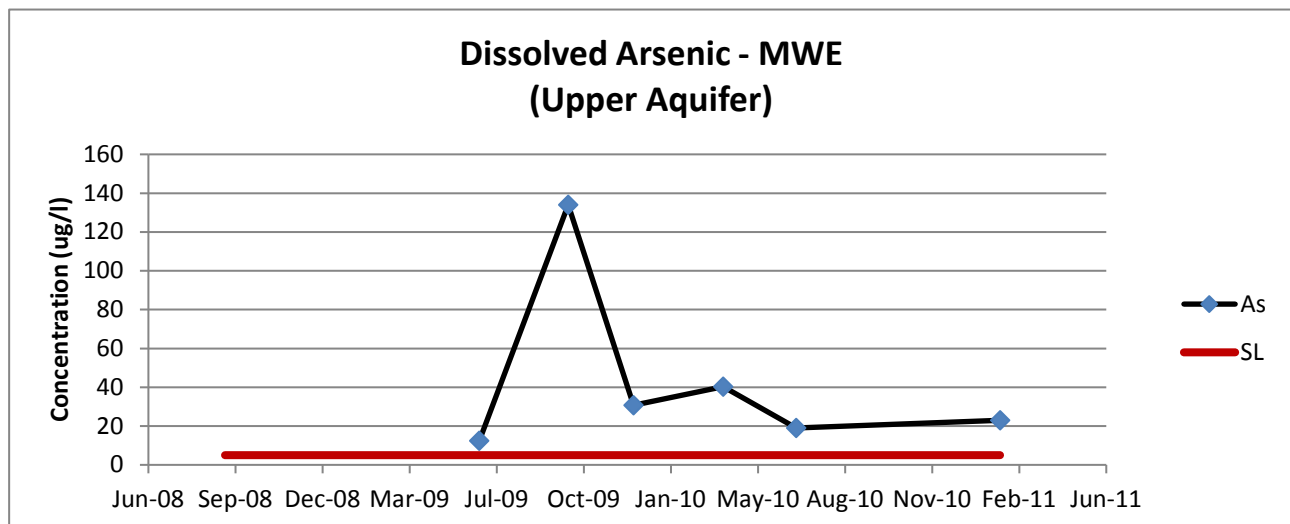
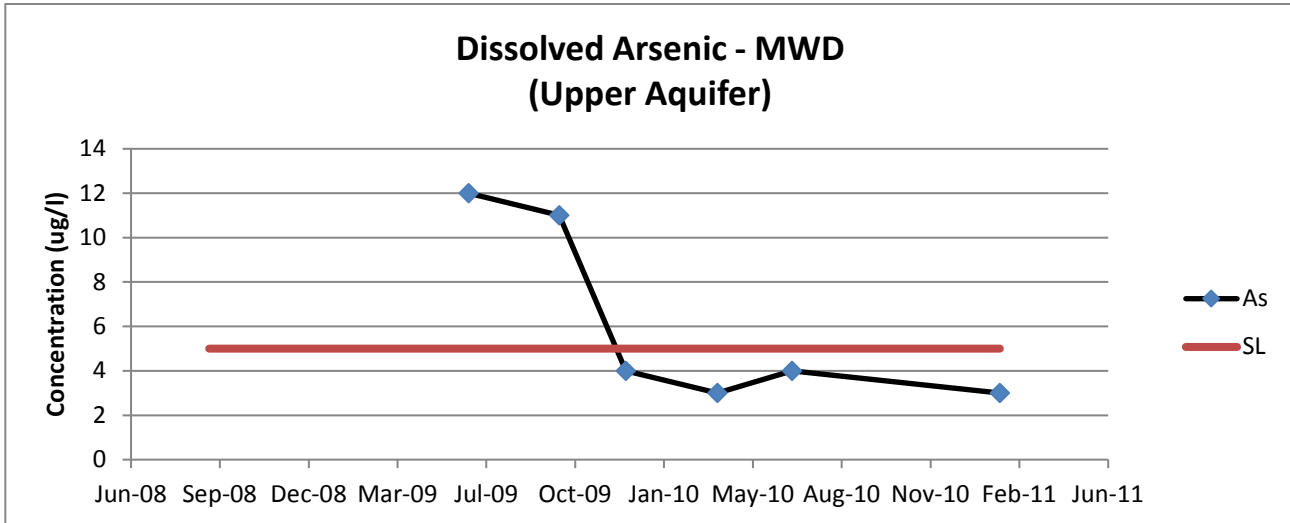


FIGURE B4

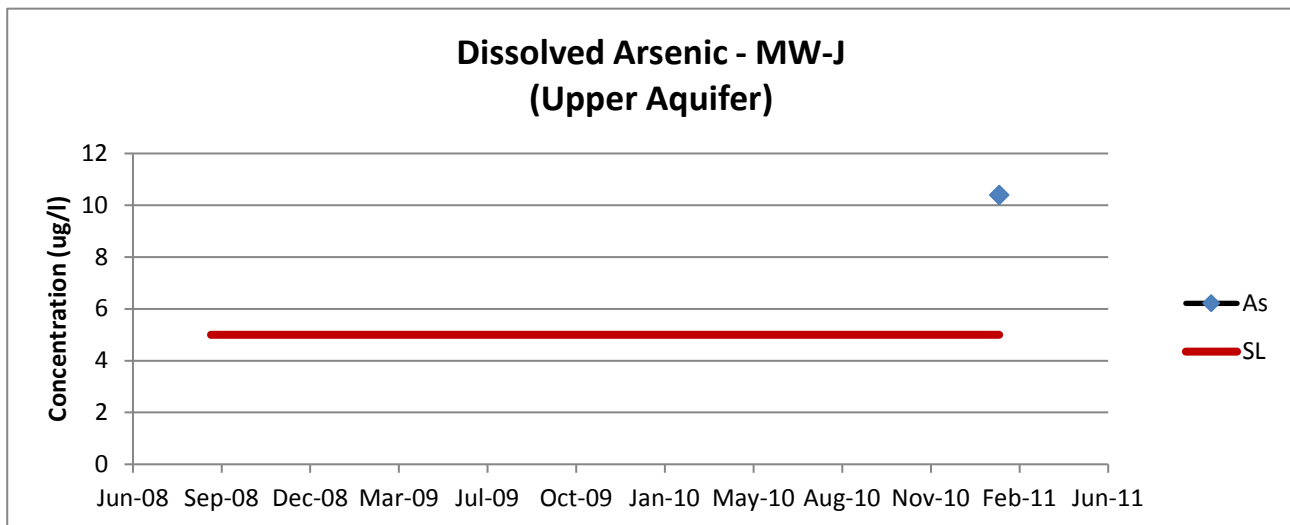
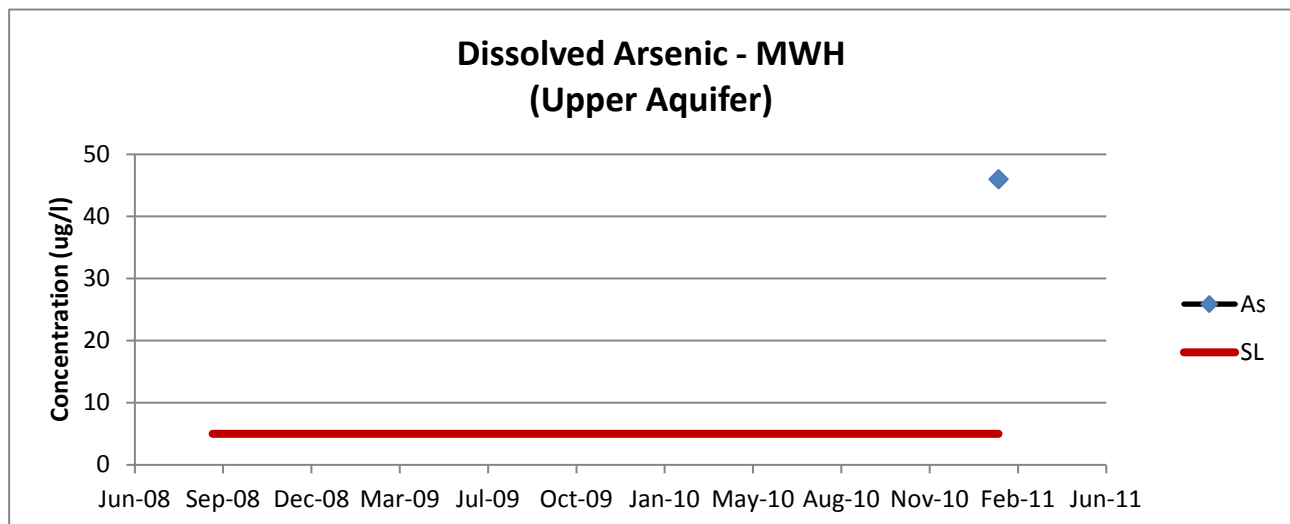
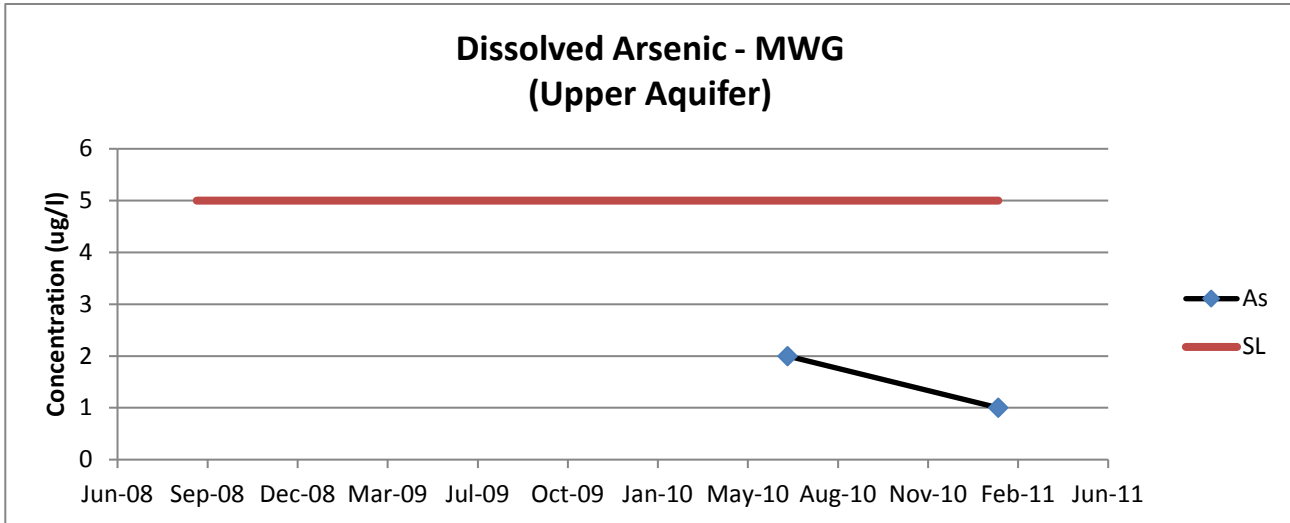


FIGURE B5

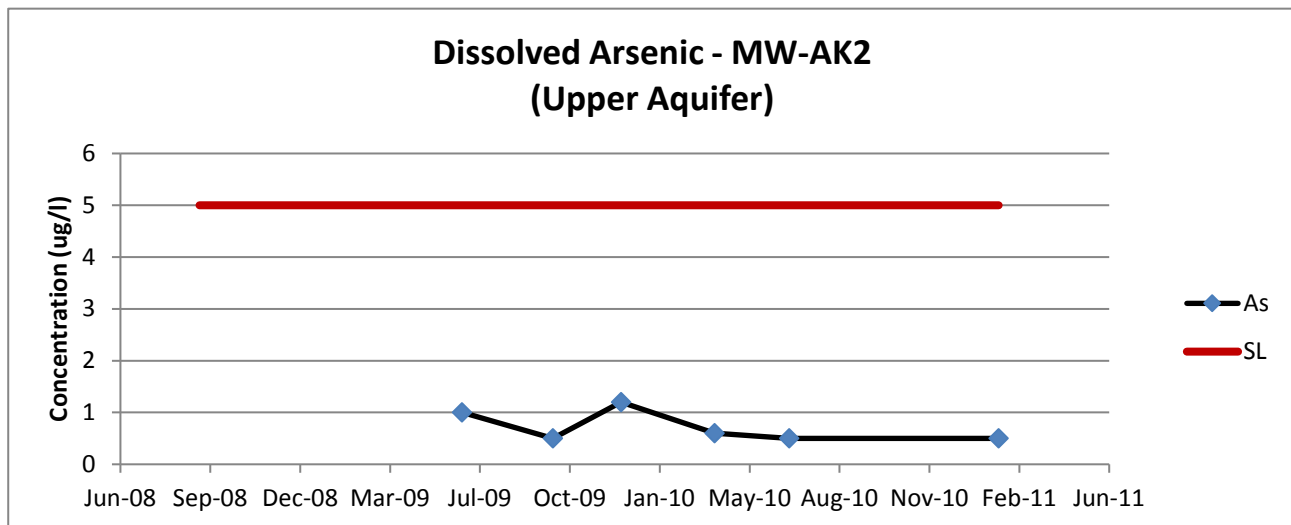
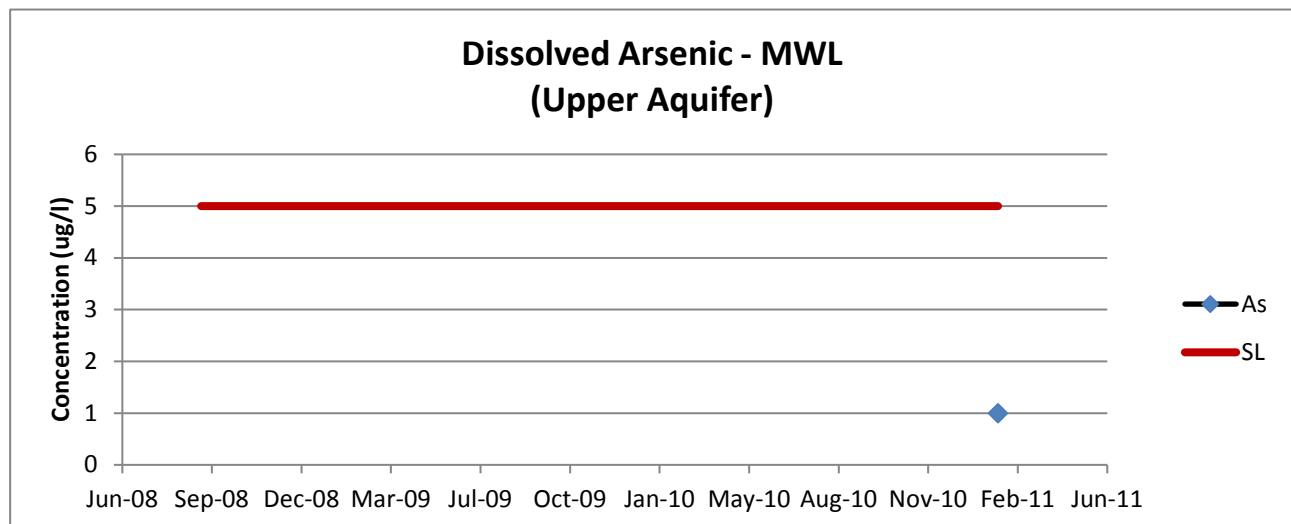
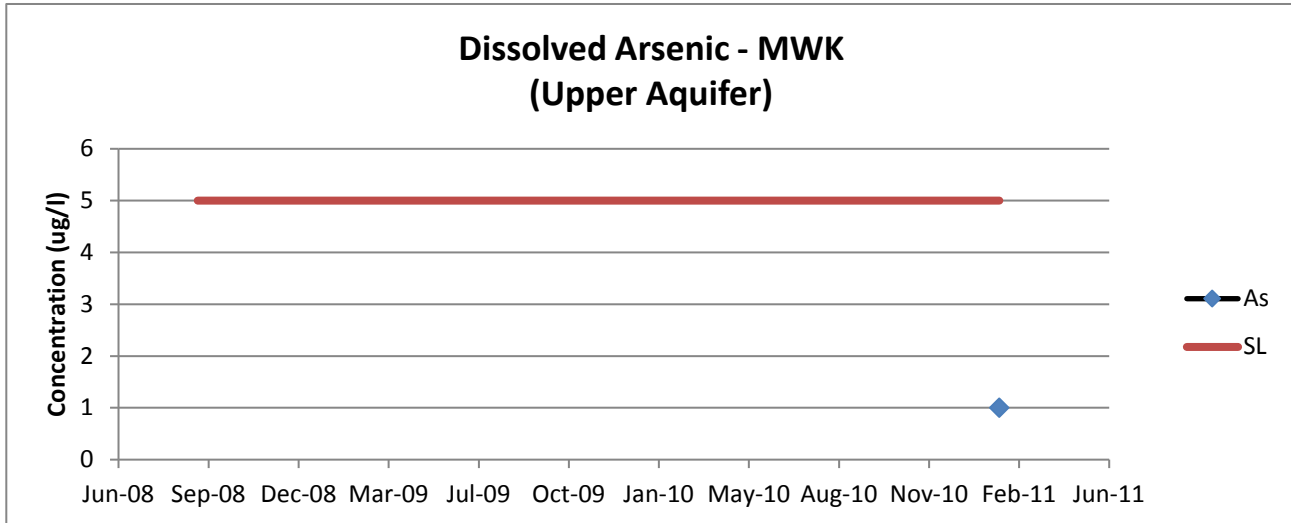


FIGURE B6

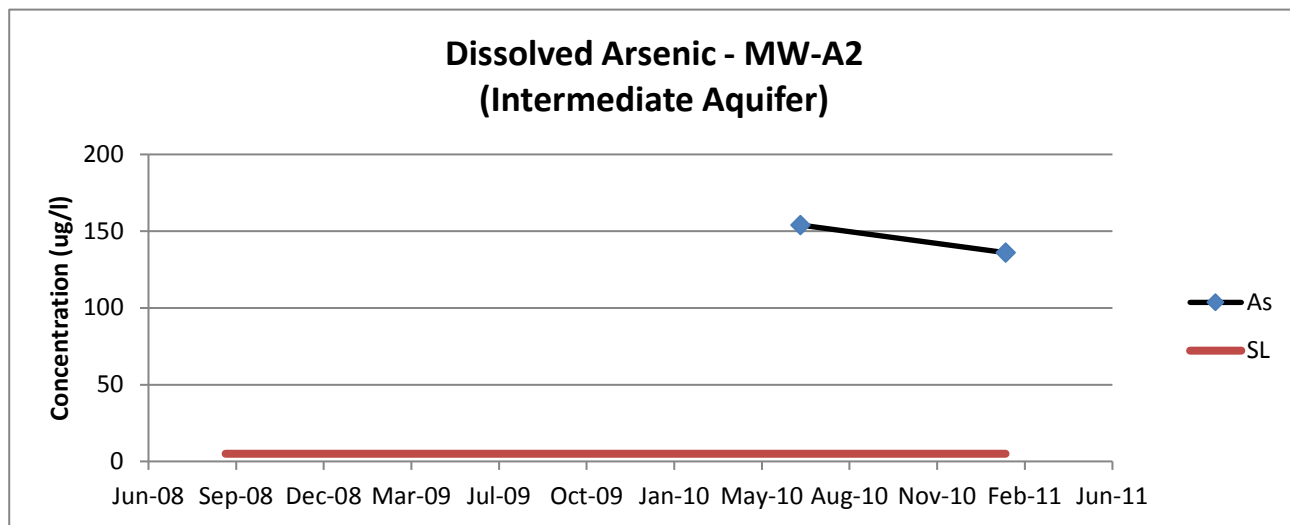
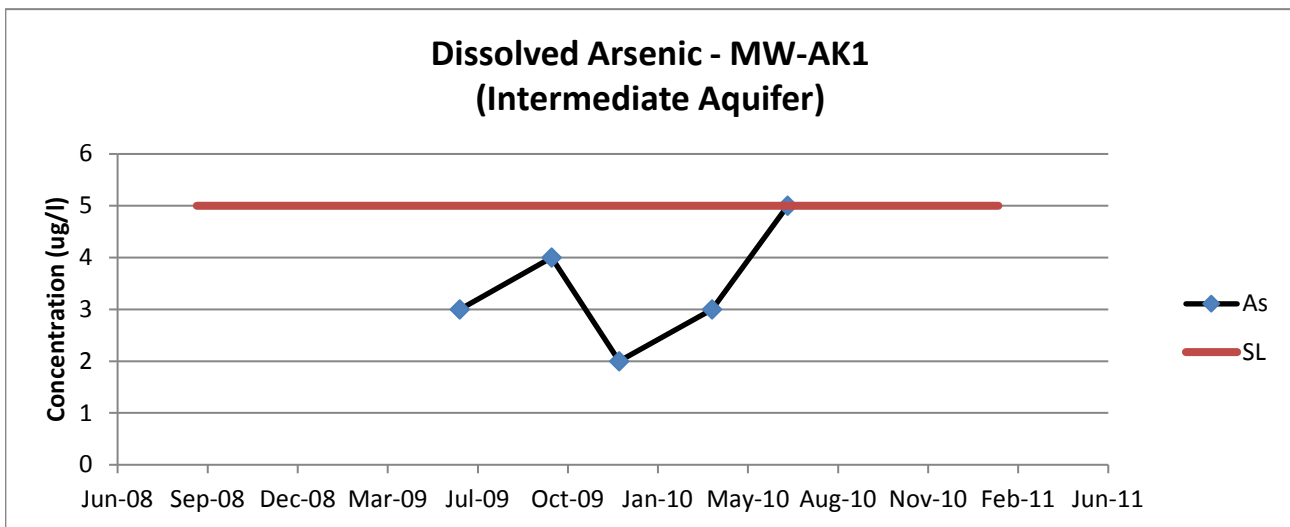
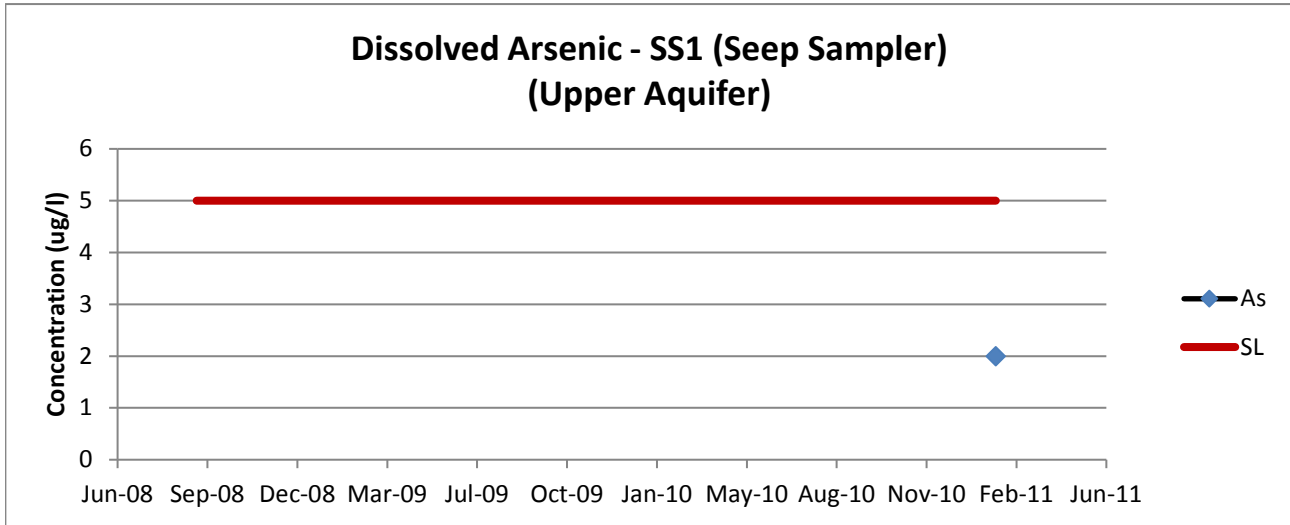


FIGURE B7

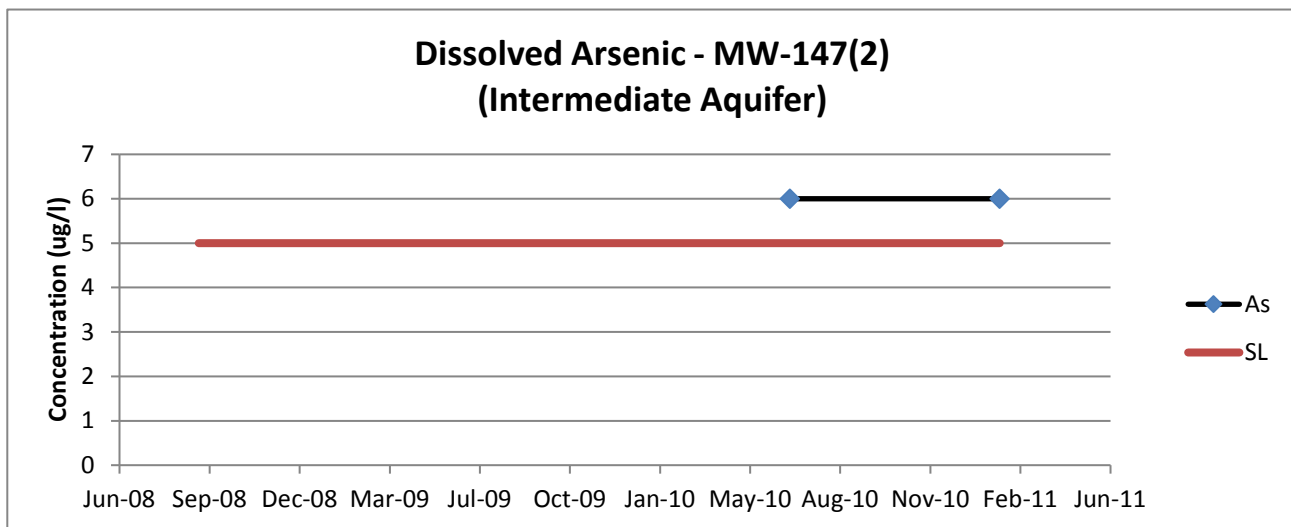
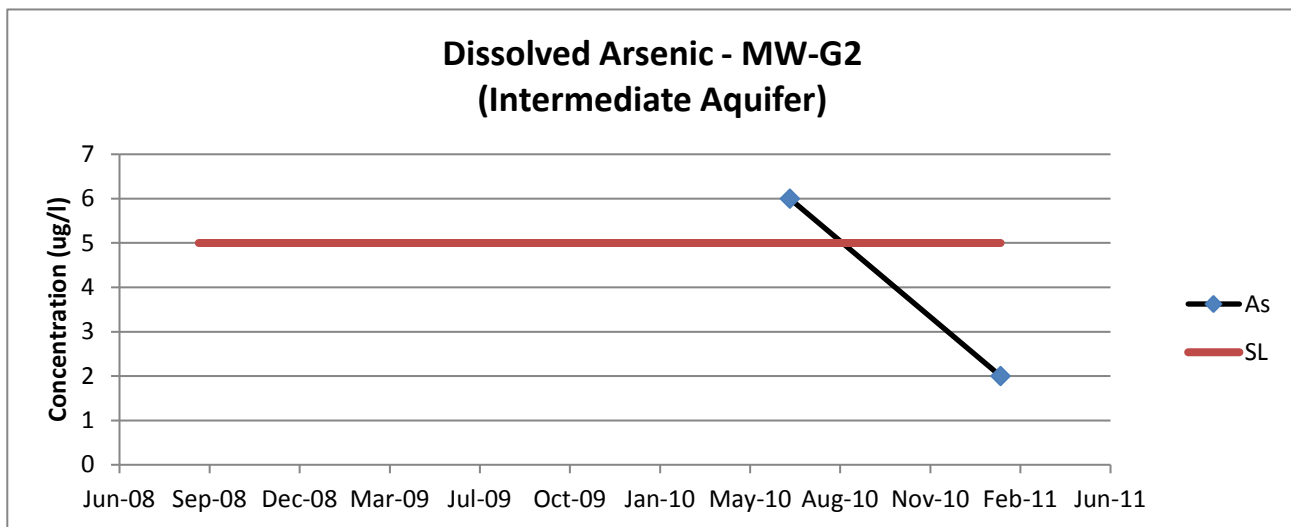
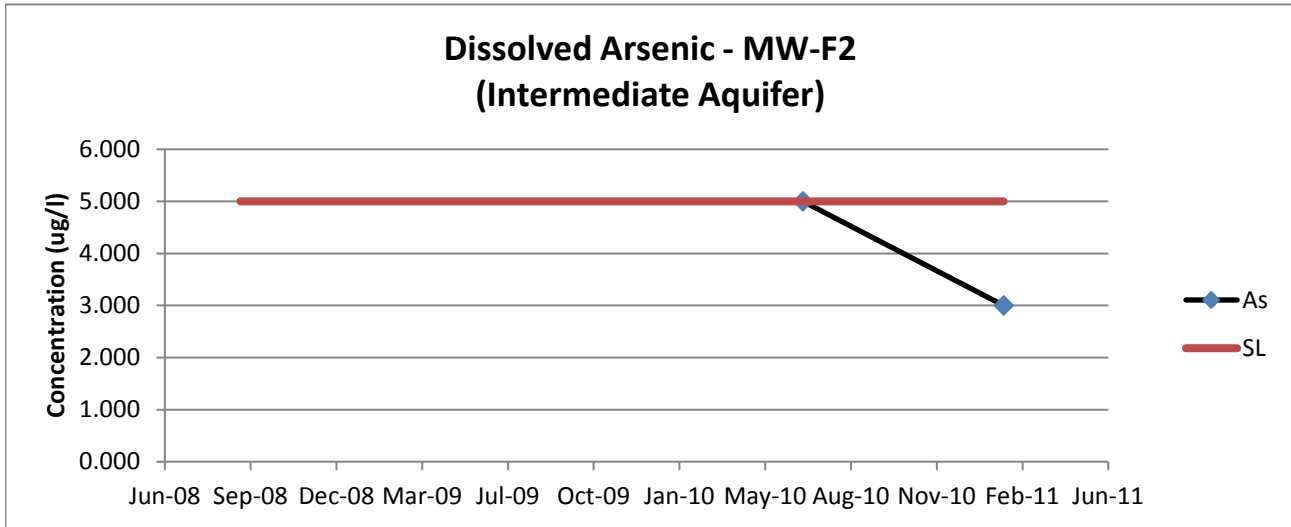


FIGURE B8