Final
Rod Mill Area Closed Landfill
Interim Action Work Plan
Former Kaiser Aluminum Property
3400 Taylor Way
Tacoma, Washington

January 2, 2013

Prepared for

Port of Tacoma
Tacoma, Washington

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ABBREVIATION/ACRONYM LIST

ARAR	Applicable or Relevant and Appropriate Requirement
BGS	Below Ground Surface
City	City of Tacoma
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
CQA	Construction Quality Assurance
Ecology	Washington State Department of Ecology
ft	Foot
HASP	Health and Safety Plan
Kaiser Aluminum	Kaiser Aluminum & Chemical Corporation
MLLW	Mean Lower Low Water
MTCA	Model Toxics Control Act
NPDES	National Pollutant Discharge Elimination System
PCBs	Polychlorinated Biphenyls
Port	Port of Tacoma
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SEPA	State Environmental Policy Act
Site	Former Kaiser Property, not including the Former Wet Scrubber Sludge Pond Area
SPL	Spent Pot Lining
SPL Area	Spent Pot Lining Area
SWPPP	Stormwater Pollution Prevention Plan
yd^3	Cubic Yards
µg/L	Micrograms Per Liter

1.0 INTRODUCTION

The Port of Tacoma (Port) intends to perform an interim action in the Rod Mill Area Closed Landfill at the former Kaiser Aluminum property (Site) located at 3400 Taylor Way in Tacoma, Washington (see Figure 1). The 96-acre property is currently owned by the Port. The proposed interim action is designed to remove waste material and associated contaminated soil from the Rod Mill Area Closed Landfill. The interim action will remove waste material and associated contaminated soil with concentrations of constituents greater than the cleanup levels developed and presented in the Final Remedial Investigation/Feasibility Study (RI/FS) report (Landau Associates 2012).

The interim action will be conducted under Agreed Order No. DE-5698 between the Port and the Washington State Department of Ecology (Ecology). The interim action will be implemented in advance of selection of the final cleanup action for the Site, and as such, must not foreclose reasonable alternatives for the cleanup action [WAC 173-340-430(3)(b)]. The interim action is planned to be implemented at this time to improve the efficacy of the final cleanup in accordance with Article VII.D of the Agreed Order and to support Port development plans in the vicinity of the Rod Mill Area Closed Landfill.

The Interim action will be designed and executed in accordance with WAC 173-340-430. The interim action, once approved by Ecology, will become an integral and enforceable part of the Agreed Order.

1.1 BASIS FOR INTERIM ACTION

An interim cleanup action partially addresses the cleanup of a site and achieves at least one of the following purposes [WAC 173-340-430(1)]:

- Reduces the threat to human health and the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance [WAC 173-340-430(1)(a)].
- Corrects a problem that may become substantially worse or cost substantially more to address if the remedial action is delayed [WAC 173-340-430(1)(b)].
- Completes a site hazard assessment, remedial investigation/feasibility study, or designs a cleanup action [WAC 173-340-430(1)(c)].

The proposed interim action will achieve bullets one and three above. The interim action will remove, through excavation and offsite disposal, the waste material and associated contaminated soil in the Rod Mill Area Closed Landfill, which will effectively prevent direct contact with contaminants in soil with concentrations greater than the soil cleanup levels. It will also remove the source of contamination to groundwater and limit the potential for groundwater with contaminant concentrations greater than the cleanup levels to migrate off site. In addition, it will substantially reduce the cost of the final remedy by

removing the waste material and associated contaminated soil that would likely need to be addressed as part of the final cleanup action.

An interim cleanup action must also meet one of the following general requirements [WAC 173-340-430(2)]:

- Achieve cleanup standards for a portion of the site.
- Provide a partial cleanup (clean up hazardous substances from all or part of the site, but not achieve cleanup standards).
- Provide a partial cleanup and not achieve cleanup standards, but provide information on how to achieve cleanup standards.

The proposed interim action will provide a partial cleanup by:

- Removing (through excavation and offsite disposal) waste material and associated contaminated soil with concentrations of contaminants greater than the cleanup levels established in the final RI/FS.
- Substantially reducing the potential for contaminated groundwater migrating off site through source removal of waste material and associated contaminated soil.

1.2 SITE LOCATION AND HISTORY

The Site encompasses approximately 96 acres of the Blair Hylebos Peninsula in Tacoma, Washington. The Hylebos Waterway is located northeast of the Site and the Blair Waterway is located to the southwest (Figure 1). From 1941 to 1947, the Department of Defense built and operated an aluminum smelter at the Site. In 1947, Kaiser Aluminum & Chemical Corporation (Kaiser Aluminum) purchased the Site and operated the aluminum production facility until 2001. In 2002, Kaiser Aluminum closed the plant and, in 2003, the Port purchased the smelter property from Kaiser Aluminum for redevelopment. Between 2003 and 2010, the Port demolished the smelter complex, shipped thousands of tons of waste to approved disposal or treatment facilities, and placed a 2- to 6-foot (ft)-thick layer of structural fill on approximately 80 of the 96 acres.

Currently, all but two of the Kaiser Aluminum buildings (both used for offices) have been removed from the Site; subsurface structures, such as footings and slabs, are still in place and most areas have been covered with soil and a layer of gravel. Aerial photographs of the Site in 2005 (prior to demolition of the buildings) and in 2010 (following demolition of the buildings) are shown on Figures 2 and 3, respectively. Current uses of the Site include staging of construction materials (primarily soil, crushed concrete, and crushed asphalt pavement materials) and short-term use by contractors for lay down and staging of materials. The Port is planning to redevelop the Site for other maritime uses.

1.3 ROD MILL AREA CLOSED LANDFILL HISTORY

The Rod Mill Area is located within the southeastern portion of the Site, as shown on Figures 2 and 3. A fence is present along the southern and eastern portions of the Rod Mill Area; however, the property line that defines the eastern limit of the Rod Mill Area is approximately 30 to 40 ft east of the fenceline.

The Closed Landfill is located within the southeast corner of the Rod Mill Area, southeast of the former Rod Mill building. In about 1980, this area was used by Kaiser Aluminum as a borrow source of sand; the excavated area was subsequently used for disposal of miscellaneous smelter wastes. Based on a review of aerial photographs, it appears that the landfill was covered and closed by Kaiser Aluminum by the mid-1980s. The waste materials in the Rod Mill Area Closed Landfill reportedly include anode butts, pitch, green cathode, coke, dirty ore, brick, mortar, concrete rubble, rubber and plastic products, gutter dust, and general trash (Kennedy Jenks 2003). According to Kaiser Aluminum (Leber, B., 2005, personal communication), spent pot lining (SPL) is not known to have been placed in the Closed Landfill. The Closed Landfill is unlined and covered with a thin veneer of soil and gravel.

2.0 PHYSICAL AND ENVIRONMENTAL CONDITIONS

A number of environmental and geotechnical investigations have been conducted at or near the Rod Mill Area Closed Landfill, and provide the basis for characterizing Site environmental conditions. Previous environmental investigations within the Closed Landfill area were conducted between 2003 and 2008. These included excavating 29 test pits, drilling a direct-push soil boring, and installing four groundwater monitoring wells in the shallow aquifer and four groundwater monitoring wells in the intermediate aquifer at locations upgradient, downgradient, and within the Closed Landfill area. The previous soil exploration and monitoring well locations are shown on Figure 4; exploration logs are included in Appendix A.

A remedial investigation (RI) was conducted in 2012. Waste, soil, and groundwater results from the RI are discussed in detail in Section 2.2 below. Information obtained during the RI and the previous investigations provide the basis for evaluating the physical and environmental conditions present at the Site. A summary of these conditions is presented below.

2.1 SITE PHYSICAL CONDITIONS

The geology and hydrogeology of the Site is presented in Section 8.1 of the final RI/FS and is summarized below. The lithology of the soil beneath the Site is well documented to a depth of about 100 ft based on data developed from borings, test pits, and soil probes installed since 1947. Geologic units beneath the Site from shallowest to deepest have been defined as follows (Dames & Moore 1985):

- Unit A: Fill materials
- Unit B: Mudflat deposit, sandy to clayey silt
- Unit C: Fine to coarse silty sand
- Unit D: Sandy or clayey silt
- Unit E: Fine to coarse sand with occasional silt.

Descriptions of Unit A, Unit B, Unit C, Unit D, and Unit E are provided below.

2.1.1 GEOLOGIC UNIT A

Fill materials are encountered from the surface to depths ranging from approximately 5 ft to greater than 15 ft. Portions of the Site have been filled with hydraulically dredged sand and silt (Rod Mill Area and along west margins of the Site); wet scrubber sludge (west-central former impoundments); silt, sand, and gravel materials imported from off site locations (original smelter complex and elsewhere); and more recently, Blair Waterway dredged silt and sand placed as structural fill over approximately 80 of the 96 acres.

Groundwater is present in this fill material (Unit A) across most of the Site. The base of Unit A (shallow water-bearing zone) is at, or slightly below, the mean high water level in the Hylebos and Blair Waterways (Landau Associates 1987). An evaluation of groundwater levels in the vicinity of the SPL Area indicates shallow groundwater is influenced by tidal actions in the waterways (Landau Associates 2004). Based on groundwater levels measured during the RI and groundwater levels measured as part of the wet scrubber sludge management area monitoring (Landau Associates 2010), groundwater elevations for shallow groundwater in the SPL, Rod Mill, and Former Log Yard Areas indicate groundwater flow within Unit A in the eastern portion of the Site is to the east/northeast toward the Hylebos Waterway. Recharge to the shallow water-bearing zone is mainly through infiltration of precipitation in unpaved areas (Landau Associates 1987).

2.1.2 GEOLOGIC UNIT B

Geologic Unit B comprises the uppermost layer of native soil and is typically soft mudflat deposits consisting of predominantly sandy to clayey organic silt with minor peat, woody debris, and shell fragments. Unit B is a confining unit separating the shallow aquifer in Unit A and the intermediate aquifer in Unit C (discussed below). The upper surface of this layer varies in elevation, probably because of surface drainages previously located throughout the tideflats (Bortleson et al. 1980).

2.1.3 GEOLOGIC UNIT C

Geologic Unit C comprises the sandy deltaic sediments underlying Unit B and is identified as the intermediate aquifer. The sands are described as fine to coarse and occasionally silty (Dames & Moore 1985). The thickness of this unit ranges from 3.5 to 38 ft (Dames & Moore 1985). Groundwater in this unit is the deepest water-bearing zone that has been impacted by waste materials in the SPL Area. Similar to groundwater in the shallow aquifer, groundwater within Unit C is influenced by tidal actions in the waterways and, based on groundwater levels measured during the 2008 supplemental investigation, the RI, and earlier investigations, groundwater within Unit C below the Rod Mill Area flows east/northeast toward the Hylebos Waterway (Landau Associates 2011).

2.1.4 GEOLOGIC UNIT D

Geologic Unit D comprises the low permeability layer below the intermediate aquifer (Unit C). This low permeability layer consists of sandy silt or clayey silt deltaic sediments (Dames & Moore 1985). The thickness of this unit ranges from 3 to 32 ft (Dames & Moore 1985).

2.1.5 GEOLOGIC UNIT E

Geologic Unit E consists of alternating layers of silts and sands below Unit D that extend to a depth of at least 120 ft below ground surface (BGS) (Dames & Moore 1985). Unit E is identified as the deep aquifer. Groundwater in this aquifer is also tidally influenced and, based on an evaluation of groundwater levels in the vicinity of the SPL Area, the groundwater in this aquifer flows northeasterly toward the Hylebos Waterway (Landau Associates 2004).

2.2 SITE ENVIRONMENTAL CONDITIONS

Environmental conditions at the Rod Mill Area Closed Landfill were generally evaluated by comparing concentrations of constituents detected in Site media of concern to cleanup levels. Cleanup levels were developed in the final RI/FS for constituents detected in groundwater, soil, and waste material. Cleanup standards consist of: 1) cleanup levels defined by regulatory criteria that are adequately protective of human health and the environment, and 2) the point of compliance at which the cleanup levels must be met.

The results of the RI combined with the results from the 2008 supplemental investigation were used to evaluate the nature and extent of waste materials present in the Closed Landfill and to evaluate the nature and extent of impact to soil and groundwater by these waste materials.

2.2.1 CLOSED LANDFILL WASTE MATERIALS

Waste materials consisting of black carbon waste (including anode fragments, petroleum coke, coal, and coal tar pitch), white waste (aluminum ore and synthetic cryolite) and to a lesser extent concrete, refractory brick, wood, and rebar are present mixed with soil in an area approximately 240 ft by 180 ft. The depths of the waste material are illustrated in Rod Mill Area Closed Landfill geologic profiles; the cross section locations are shown on Figure 5 and the profiles are shown on Figures 6, 7, and 8. The approximate limits of the waste material are shown on Figure 9. The depth of the waste material varies, but waste material is typically encountered in soil at depths ranging up to 4.5 to 7.5 ft BGS.

The size of the black carbon waste and concrete ranges from gravel-sized fragments to cobble- and boulder-sized rubble. At some locations (LF21, LF22, LF28, and LF29), the pieces of the black carbon waste and/or concrete were too large to remove with the excavator, indicating that anode butts and demolition debris are present. At these locations, the vertical extent of waste material was estimated. For each depth interval in which waste material was observed in the 2008 supplemental investigation or RI exploration, the percent of black carbon waste relative to other fill materials and/or soil was estimated. The estimated percent of black carbon waste ranged from less than 5 percent at test pit LF24 to 75 percent at soil boring MW-6(I). The estimated percentage of black carbon waste and the depth intervals where

black carbon waste were observed are summarized in Table 1. The locations where other types of waste material were observed and the depth intervals of these wastes are also summarized in Table 1.

During the 2012 RI, waste characterization samples were collected from three test pits, RM-LF30, RM-LF31, and RM-LF32. Waste characterization data results compared to typical Subtitle D landfill disposal criteria are presented in Table 2.

2.2.2 SOIL QUALITY

The evaluation of the nature and extent of soil impacted by waste material present in the Closed Landfill is based on the analytical results for the five soil samples collected below the waste material at soil borings MW-6(S) and MW-6(I) during the 2008 supplemental investigation, soil samples collected from the depth intervals where waste material was encountered at two previous investigation test pits located within the Closed Landfill (LF9 and LF10), and from the upper 4 or 5 ft of soil at three previous investigation test pits located just outside the limits of the Closed Landfill (LF1, LF4, and LF7). The evaluation includes comparison of the soil analytical results to the cleanup levels. Based on this comparison, carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and diesel-range petroleum hydrocarbons are present in the fill material below the landfill waste material at concentrations above the cleanup levels. cPAHs are also present in the native material below the landfill at concentrations above the cleanup levels.

2.2.2.1 Fill Material Located Below the Waste Material

Fill material is present directly below the waste material to a depth of approximately 9.5 ft BGS. Concentrations of cPAHs exceed the cleanup levels protective of human direct contact and marine surface water in the soil sample collected from 5.5 ft BGS at soil boring MW-6(S) and in the soil samples collected from 7 and 9 ft BGS at soil boring MW-6(I). Concentrations of diesel-range petroleum hydrocarbons in these three samples also exceed the cleanup levels based on Model Toxics Control Act (MTCA) Method A. Analytical results for samples collected from the fill material below the waste material and a comparison of the analytical results to the cleanup levels is shown in Table 3.

2.2.2.2 Native Soil Underlying the Fill Material

Diesel-range petroleum hydrocarbons at concentrations exceeding the cleanup levels are not present in the native soil underlying the fill material. cPAHs were detected in the native soil but the concentrations are protective of human direct contact based on an industrial land use. The cPAH concentrations do exceed cleanup levels protective of marine surface water; however, based on the concentration of cPAHs in groundwater samples from wells downgradient of the landfill

[MW-3(S), MW-4(S), MW-7(S), and MW-8(S)], cPAHs above the groundwater cleanup levels do not appear to be migrating off the Site. Analytical results for samples collected from the native soil below the fill material and a comparison of the analytical results to the cleanup levels is shown in Table 3.

2.2.2.3 Soil Samples Collected Within the Waste Material Zone

In 2003, soil samples were collected from two test pits (LF9 and LF10) and one soil boring (DPT3) located within the Closed Landfill from depth intervals that contained waste material. Analytical results for the soil samples are provided in Appendix E of the final RI/FS report (Landau Associates 2012). Concentrations of cPAHs exceed the cleanup levels developed for protection of human direct contact and marine surface water. The concentrations of motor oil-range petroleum hydrocarbons detected in the samples collected from test pits LF9 and LF10 and the concentration of diesel-range petroleum hydrocarbons detected in the sample collected from test pit LF9 exceed the cleanup level. Neither total nor WAD cyanide were detected in any of the 2003 soil samples.

2.2.2.4 Soil Samples Located Adjacent to the Closed Landfill

In 2003, soil samples were collected from three test pits (LF1, LF4, and LF7) located outside but adjacent to the Closed Landfill. Analytical results for the soil samples are provided in Appendix E of the final RI/FS report (Landau Associates 2012). No constituents were detected at concentrations above cleanup levels.

2.2.3 GROUNDWATER QUALITY

The evaluation of impacts to groundwater by the waste materials in the Closed Landfill is based on a comparison of 2008 and RI analytical results for groundwater samples collected from monitoring wells located within, upgradient, and downgradient of the Closed Landfill to the groundwater cleanup levels. The comparison, presented in Table 4, shows some exceedances of the cleanup levels but not in groundwater downgradient of the Closed Landfill, as described below. RI groundwater monitoring locations are shown on Figure 10. Groundwater contours for early March 2012 for the shallow and intermediate aquifers are presented on Figures 11 and 12, respectively.

2.2.3.1 Shallow Aquifer Groundwater

The landfill waste material has impacted shallow groundwater directly below the landfill but the impacts are not observed downgradient of the landfill. Diesel-range petroleum hydrocarbons, cPAHs, and other contaminants [vinyl chloride, polychlorinated biphenyls (PCBs), arsenic, copper, lead, mercury, and zinc] were detected in 2008 at concentrations exceeding the cleanup levels in shallow groundwater within

the Closed Landfill. During the RI, fewer constituents (cPAHs, PCBs, and arsenic) were detected in shallow groundwater directly below the Closed Landfill at concentrations exceeding the cleanup levels. cPAHs and PCBs were not detected at concentrations above the cleanup levels in shallow groundwater downgradient of the landfill during the 2008 supplemental investigation or during the RI. Although arsenic and copper were detected in the shallow groundwater at concentrations above the cleanup levels in groundwater downgradient of the landfill during previous investigations, they were not during the RI. Based on these results, groundwater contaminants from the Closed Landfill do not appear to be migrating off the Site. A comparison of the 2008 supplemental investigation analytical results to the RI analytical results indicates that the concentrations of constituents detected in the shallow aquifer groundwater below the landfill decreased over a 4-year period.

2.2.3.2 Intermediate Aquifer Groundwater

The waste material in the landfill has only slightly impacted groundwater in the intermediate water-bearing zone directly below the Closed Landfill. cPAHs, PCBs, and arsenic were detected at concentrations above the cleanup levels in the intermediate aquifer below the Closed Landfill during the 2008 supplemental investigation but only total and dissolved arsenic were detected at concentrations above the cleanup levels during the RI. Except for total arsenic at well MW-4(I), these constituents have not been detected at concentrations above the cleanup levels in the intermediate aquifer at locations downgradient of the landfill. The concentration of total arsenic [8.6 micrograms per liter (µg/L)] in the groundwater sample collected at downgradient well MW-4(I) during the RI slightly exceeded the cleanup level of 8.0 µg/L. The dissolved arsenic concentration (7.3 µg/L) for this sample was below the cleanup level, indicating that filtering the samples prior to analysis may remove particulates entrained in the sample and that the total arsenic result may be elevated due to particulate matter. The total chromium concentration reported during the 2008 supplemental investigation was initially compared to a conservative cleanup level for chromium based on hexavalent chromium. During the RI, all of the intermediate groundwater monitoring well samples were analyzed for hexavalent chromium and it was not detected in any sample, therefore the cleanup level for total chromium is based on chromium III.

3.0 INTERIM ACTION

This section presents a summary of the interim action design and construction activities proposed for the Rod Mill Area Closed Landfill.

3.1 PURPOSE OF THE INTERIM ACTION

The purpose of the interim action is to permanently remove (through excavation and offsite disposal) waste material and associated contaminated soil within the Closed Landfill with concentrations greater than the cleanup levels established in the final RI/FS. The removal of waste material and associated contaminated soil will also improve groundwater conditions within the Closed Landfill and reduce the potential for contaminated groundwater to migrate off site. The interim action also includes post-source removal groundwater monitoring (see Section 3.4.3.1).

3.2 DESCRIPTION OF INTERIM ACTION

The interim action excavation activities will be conducted within the footprint of the waste material, as shown on Figure 13, which covers approximately 0.9 acres. The waste material forms an irregular shape within the Closed Landfill (see cross section locations and profiles on Figures 5 through 8). Because the waste material is found relatively close to the surface in the Closed Landfill, it is assumed for conceptual design purposes that soil above the waste material will be excavated and will likely be disposed off site along with the underlying waste material. However, if there are areas identified where relatively thick zones of clean overlying soil can be feasibly identified and separated from the underlying waste material, such overlying soil may be excavated and stockpiled for reuse as excavation backfill material.

The estimated excavation volume for the Closed Landfill, including the soil above and a 1-ft-thick zone of soil beneath the waste material, is approximately 12,300 cubic yards (yd^3) (see Table 5). The estimated volume of waste material to be excavated was calculated by taking an average surface area from the lengths of waste in Profiles A-A' and B-B' (39,000 ft^2) and multiplying by the total depth of the waste material plus the 1-ft-thick zone of underlying soil (8.5 ft).

The interim action will consist of the following elements:

- Decommissioning of groundwater monitoring wells in or near the Closed Landfill
- Excavation of waste material and associated contaminated soil from the ground surface to approximately 1 ft below the bottom of the waste material
- Localized excavation of deeper soil in the vicinity of MW-6 where contaminants were detected at concentrations greater than the cleanup levels in the underlying fill and native soil materials

- Handling, size reduction (as needed), and disposal of excavated waste material and soil
- Handling and disposal of construction water (if any)
- Surveying of the final excavation extent and depth
- Backfilling the excavation area to final grade with clean, compacted structural fill, sloping the surface as needed to promote drainage of stormwater
- Site grading and restoration
- Post-excavation groundwater monitoring.

The elements of the interim action cleanup in the Closed Landfill are further described in the following sections.

3.2.1 MATERIAL EXCAVATION PROCEDURES

As described above, the landfill waste material and adjacent soil to be removed includes material from the ground surface down to the bottom of the waste material and underlying soil up to 1 ft below the bottom of the waste material. Because the landfill waste material and adjacent soil is not a dangerous waste, the excavated material will be transported to a permitted Subtitle D solid waste landfill for disposal. Soil and waste material will be excavated down to approximately Elevation 11.5 ft Mean Lower Low Water (MLLW) (approximately 8.5 ft BGS), and will involve excavation within the saturated zone (i.e., beneath the groundwater level estimated to be at approximately Elevation 13 ft). Localized deeper soil excavation [in the vicinity of MW-6(S) and (I)] will be conducted in the saturated zone to approximately 11.5 ft BGS where soil with concentrations greater than the cleanup levels was identified to a depth of 10.5 BGS.

As discussed further in Section 3.2.2 below, excavations that extend beneath groundwater level will not be conducted "in the dry"; however, saturated materials will be allowed to drain back into the excavation to remove free liquids, and may be mixed with drier excavated materials prior to being loaded for transport to the landfill.

The base of the excavations that extend beneath groundwater level will be backfilled with quarry spalls (or other suitable coarse materials) up to groundwater level, and the excavation will then be backfilled to final grade with clean material suitable for placement as structural fill. The clean fill material will be placed in 6- to 8-inch compacted lifts, backfilled to either match the pre-existing grade or a somewhat lower grade consistent with the Port's plans for future redevelopment in the area, and sloped to promote stormwater drainage. Excavation and backfill surfaces will be further evaluated during project design and presented on the interim action construction drawings.

Waste material and associated contaminated soil will be removed by contracted personnel using a combination of excavation equipment and, if necessary, hand tools. Excavated materials will be allowed

to drain to remove free liquids, size-reduced as required for disposal, transferred into trucks or roll-off containers, and transported under appropriate bill of lading for disposal at LRI Landfill and Recycling in Graham, Washington (or another equivalent Subtitle D solid waste landfill).

Confirmation soil samples will be collected from the base and/or sidewalls of the excavation at approximately 50 ft intervals based on the anticipated grid sampling locations shown on Figure 13 (also refer to the performance monitoring sampling discussion in Section 3.4.2). Samples will be analyzed for cPAHs and diesel-range petroleum hydrocarbons. If confirmation sampling indicates soil within a grid contains concentrations of constituents of concern greater than the cleanup levels, additional soil excavation within that grid will be conducted, if practicable. However, if it is determined that it is impracticable to remove any zone of residual contaminated soil, appropriate measures needed to protect human health and the environment and prevent exposure to residual contaminants will be evaluated and implemented in consultation with Ecology.

3.2.2 GROUNDWATER MANAGEMENT

Interim action construction activities are planned to be conducted during late summer/early fall when the groundwater level is at or near its seasonal low. While a significant portion of the planned excavations will likely extend below groundwater level, such excavations will not be dewatered to allow excavation to be conducted "in the dry".

It is currently anticipated that any construction stormwater would be managed by infiltration, and that saturated materials would be excavated and placed in temporary soil stockpiles within the excavation area where excess water would be allowed to drain back into the excavation prior to the material being loaded for transport to the landfill.

3.3 APPLICABLE, RELEVANT, AND APPROPRIATE REGULATORY REQUIREMENTS

This interim action will be conducted under Agreed Order No. DE-5698 between the Port and Ecology. The Agreed Order requires identification of the permits or specific federal, state, or local requirements that the agency has determined are applicable to Site activities. In accordance with MTCA, all cleanup actions conducted under MTCA must comply with applicable state and federal laws [WAC 173-340-710(1)]. MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements that are relevant and appropriate. Collectively, these requirements are referred to as applicable or relevant and appropriate requirements (ARARs).

The primary ARAR is the MTCA cleanup regulation (Chapter 173-340 WAC), especially with respect to the development of cleanup standards and procedures for development and implementation of a cleanup under MTCA.

The interim action is exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW and of any laws requiring or authorizing local government permits or approvals, but must still comply with the substantive requirements of such permits or approvals. The Agreed Order also requires the exempt permits or approvals and the applicable substantive requirements of those permits or approvals be identified.

3.3.1 PERMITS AND OTHER REQUIREMENTS

Permits or specific federal, state, or local requirements that are applicable to this interim action and that are known at this time are identified as follows:

3.3.1.1 Tacoma-Pierce County Health Department Waste Disposal Authorization

A waste disposal authorization application and supporting documentation will be prepared and submitted to the Tacoma-Pierce County Health Department Waste Management Program to obtain a Waste Disposal Authorization for soil and waste material disposal at the LRI Landfill and Recycling facility (or an equivalent Subtitle D solid waste landfill under the jurisdiction of the Tacoma-Pierce County Health Department).

3.3.1.2 NPDES Construction Stormwater General Permit

It is anticipated that a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit will be required for this interim action. Ecology administers the federal NPDES regulations in Washington State. Construction projects that disturb more than 1 acre during construction are typically required to obtain a NPDES construction stormwater permit. The NPDES permit program is delegated to Washington State by the federal Environmental Protection Agency under the federal Clean Water Act, § 1251 et seq. Pursuant to RCW 70.105D.090(2), the agency has determined that MTCA cleanup actions are not exempt from the procedural requirements of the NPDES permit. The Port will acquire and comply with the requirements of an NPDES construction stormwater permit issued separately by Ecology. Monitoring requirements will be determined as a component of the stormwater permit, and will likely include turbidity monitoring which can often serve as a surrogate for other water quality constituents of concern because the major transport mechanism for stormwater contaminants is associated with erosion of soil particles.

A substantive requirement will be to prepare a construction stormwater pollution prevention plan (SWPPP) prior to the interim action earthwork activities. The SWPPP would document planned procedures designed to prevent stormwater pollution by controlling erosion of exposed soil and by containing soil stockpiles and other materials that could contribute pollutants to stormwater.

3.4.1.2 State Environmental Policy Act (SEPA)

Compliance with SEPA, Chapter 43.21C RCW, will be achieved by conducting a SEPA review in accordance with applicable regulatory requirements, including WAC 197-11-268, and Ecology guidance as presented in Ecology Policy 130A (Ecology 2004). SEPA review will be conducted concurrent with public review of the interim action. Ecology will act as the SEPA lead agency and will coordinate SEPA review.

No other federal permits will be required for the interim action. No historic or cultural resources are anticipated to be present within the interim action area that would be subject to protection under local, state, or federal laws. There are no structures remaining within the work area, so potential historic resources are not present.

3.3.2 PERMIT EXEMPTIONS AND APPLICABLE SUBSTANTIVE REQUIREMENTS

The following state and local requirements have been identified as applicable but procedurally exempt for this interim action:

- Grading Permit; City of Tacoma (City) Clearing and Grading Code.
- City of Tacoma Stormwater Management Requirements.

The manner in which the interim action will meet the substantive requirements for these laws and regulations is addressed in the following sections.

3.3.2.1 Clearing and Grading Permit

Pursuant to the City of Tacoma Clearing and Grading Code (TMC 2.02.370), a clearing and grading permit is required from the City for grading projects that involve more than 500 cubic yards of grading. The City code identifies a number of standards and requirements for obtaining a clearing and grading permit. The City standards and requirements will be integrated into the construction plans and specification for the interim action so that the interim action complies with the substantive requirements of the City clearing and grading code. Those substantive requirements include, but are not limited to, erosion and drainage control, work hours and methods compatible with weather conditions and surrounding property uses, and maintaining a safe and stable work site. The City provides an application and plan submittal checklist for excavation, grading, clearing and paving activities.

3.3.2.2 Stormwater Management Requirements

The interim action must comply with the applicable surface water drainage practices and methods presented in the City of Tacoma Stormwater Management Manual pursuant to TMC 2.02.370. The substantive requirements include, but are not limited to, preparation of a stormwater drainage site plan, preparation of a construction SWPPP, erosion and temporary surface water drainage control, onsite stormwater management, and monitoring/inspection provisions.

3.3.3 OTHER LAWS AND REGULATIONS

Other laws and regulation include:

- Washington Hazardous Waste Management Act (Chapter 70.105 RCW) and its implementing regulations: Dangerous Waste Regulations (Chapter 173-303 WAC). These regulations establish a comprehensive statewide framework for the planning, regulation, control, and management of dangerous waste. The regulations designate those solid wastes that are dangerous or extremely hazardous to human health and the environment. The management of excavated contaminated materials from the Closed Landfill would be conducted in accordance with these regulations to the extent that any dangerous wastes are discovered or generated during the cleanup action.
- Washington Solid Waste Management Act (Chapter 70.95 RCW) and its implementing regulation: Criteria for Municipal Solid Waste Landfills (Chapter 173-351 WAC). These regulations establish a comprehensive statewide program for solid waste management including proper handling and disposal. The management of excavated contaminated soil from the Closed Landfill would be conducted in accordance with these regulations because the landfill waste material and associated soil can be managed as solid waste.
- Hazardous Waste Operations (Chapter 296-843 WAC). Establishes safety requirements for workers conducting investigation and cleanup operations at sites containing hazardous materials. These requirements would be applicable to onsite cleanup activities and would be addressed in a site health and safety plan prepared specifically for these activities.
- Washington Water Pollution Control Act and the following implementing regulation: Water Quality Standards for Surface Waters (Chapter 173-201A WAC). These regulations establish water quality standards for surface waters of the State of Washington consistent with public health and the propagation and protection of fish, shellfish, and wildlife. These standards are used in the development of groundwater cleanup levels for the Site.

The earthwork activities to be performed as part of the proposed interim action are not regulated under the Washington Clean Air Act (Chapter 70.94 RCW and WAC 173-400-100), and the interim action is not expected to create conditions that would significantly affect the ambient air quality or to cause any exceedance of applicable air quality standards.

3.4 COMPLIANCE MONITORING

MTCA requires compliance monitoring for all cleanup actions, including interim actions, as described in WAC 173-340-410. Compliance monitoring is conducted for the following three purposes, which are discussed further in the following sections:

- **Protection monitoring** to confirm that human health and the environment are adequately protected during construction, operation, and maintenance associated with the cleanup action.
- **Performance monitoring** to confirm that the cleanup action has attained cleanup standards and any other performance standards.
- **Confirmational monitoring** to confirm the long-term effectiveness of the cleanup action once the cleanup standards and other performance standards have been attained.

3.4.1 PROTECTION MONITORING

Protection monitoring will address worker health and safety for activities related to interim action construction and excavation activities, as well as protection of the general public. Worker health and safety will be addressed through a project-specific health and safety plan (HASP). The requirements for preparation of a project-specific HASP by the selected contractor will be included in the project construction documents, along with the requirement that it be no less stringent than the HASP included in Appendix B. The HASP will address potential physical and chemical hazards associated with Site activities consistent with the requirements of WAC 173-340-810, and field monitoring to confirm that potential exposure to chemical hazards do not exceed health-based limits. Anticipated potential physical hazards include working in proximity to heavy equipment, heat stress or cold stress, fall hazards, and vehicular traffic. Anticipated potential chemical hazards include exposure to site contaminants through various exposure pathways (i.e., direct contact, inhalation, and ingestion). Dust suppression measures will be implemented during excavation activities to mitigate potential chemical exposure through inhalation of dust. Dust monitoring will be conducted if visible levels of dust are created during construction and excavation activities. It is anticipated that the health and safety measures implemented to protect worker safety will also adequately protect the general public.

3.4.2 PERFORMANCE MONITORING

Performance monitoring will consist of testing samples of affected media (soil) to determine that the interim action has achieved cleanup standards, and construction quality assurance (CQA) monitoring to confirm that the interim action is conducted in conformance with the project construction drawings and specifications.

As described in Section 3.2.1, performance monitoring samples (also referred to as confirmation soil samples) will be collected throughout the interim action excavation area at approximately 50 ft

intervals per the anticipated grid-sampling array shown on Figure 13. This will result in approximately 16 performance monitoring sample locations; however, the exact location and number of performance monitoring samples to be collected along the base and sidewalls of the excavation area will be determined in the field during construction. Representative soil samples will be collected from approximately 4 to 6 locations along the base and/or side walls of the excavation within each grid, and composited into one sample to be analyzed for cPAHs and diesel-range petroleum hydrocarbons. Performance monitoring sample results will be compared directly to the cleanup levels or may be evaluated using a statistical approach consistent with WAC 173-340-740(7)(d).

CQA monitoring will include physical testing and construction observations to confirm that the interim action is constructed consistent with the intent of this Interim Action Work Plan and the project construction drawings and specifications. Remedial construction activities will be observed and documented by representatives of the Port engineering team. Physical testing will include a limited amount of grain size and compaction testing of the clean structural backfill material placed in the excavation area.

3.4.3 CONFIRMATION MONITORING

Confirmation monitoring will be conducted to confirm the effectiveness of the interim action. Confirmation monitoring will consist of groundwater monitoring at shallow downgradient wells as described below.

3.4.3.1 Post-Excavation Groundwater Monitoring

The groundwater compliance monitoring program will include post-construction groundwater monitoring of three existing or new downgradient groundwater monitoring wells. Existing monitoring wells to potentially be used for compliance monitoring include MW-3, MW-7, and MW-8; the locations of these wells are shown on Figure 13. If any of these existing downgradient groundwater monitoring wells is damaged during interim action construction activities, the damaged monitoring well will be decommissioned and replaced with a similarly constructed groundwater monitoring well. Groundwater samples will be analyzed for cPAHs, PCBs, and arsenic.

Four quarters of groundwater monitoring will be conducted following interim action activities to confirm that groundwater samples continue to meet the cleanup levels at the shallow downgradient groundwater monitoring wells. If contaminants in groundwater samples do not meet the cleanup levels following four quarters of sampling, additional remedial actions including additional groundwater monitoring will be evaluated and conducted as approved by Ecology.

3.5 REPORTING

An Interim Action Construction Completion Report will be prepared and submitted to Ecology during fall/winter 2013/2014 within approximately 1 to 3 months after completion of excavation backfilling/site restoration activities and receipt of as-built record drawings and information from the remediation contractor. The Interim Action Construction Completion Report will document the implementation of the interim action summarized in this Work Plan. Reporting will meet the applicable construction documentation requirements for MTCA listed in WAC 13-340-400(6)(b). The report will include the date and time the interim action was completed, a description of the excavation locations, as-built survey drawings and data documenting the extent and depth of the interim action excavations (in Port format), the weights and estimated volumes of soil and wastes removed for offsite disposal, post-excavation verification sampling data (performance monitoring data) including the sampling methodology and analytical techniques used, and any deviations from this Work Plan. The report will also include laboratory data reports (to supplement the EIM submittal), summary tables of validated performance monitoring data, and figures showing final excavation areas and depths.

3.6 SCHEDULE CONSIDERATIONS

The Port currently anticipates that interim action construction activities will be implemented during summer/early fall of 2013, and the regulatory review and approval process will be conducted consistent with that schedule.

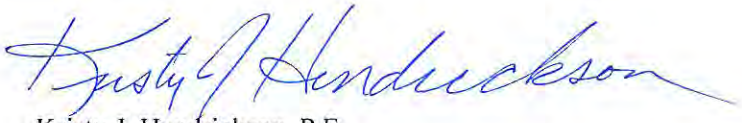
The Port anticipates that this draft Interim Action Work Plan and SEPA documents will be made available to the public by Ecology along with the final RI/FS report. Ecology will consider public input and incorporate those concerns with their comments on these draft documents. Following finalization and Ecology approval of this Work Plan during the winter of 2012/2013, the Port will design the interim actions during the winter of 2012/2013, bid the Interim Action Cleanup Project during the spring of 2013, and require that the selected contractor implement the interim action construction activities during summer/early fall of 2013 when the groundwater level is at or near its seasonal low. The Interim Action Construction Completion Report documenting implementation of the remedial construction activities will be prepared and submitted for Ecology approval during fall/winter of 2013/2014 within approximately 1 to 3 months after completion of excavation backfilling/site restoration activities and receipt of as-built record drawings and information from the selected contractor.

4.0 USE OF THIS REPORT

This Rod Mill Area Closed Landfill Interim Action Work Plan has been prepared for the exclusive use of the Port of Tacoma and applicable regulatory agencies for specific application to the former Kaiser Aluminum Site located in Tacoma, Washington. None of the information, conclusions, and recommendations included in this document can be used for any other project without the express written consent of Landau Associates. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

This report has been prepared under the supervision and direction of the undersigned. If you have any questions or comments regarding this report, please contact us at (425) 778-0907.

LANDAU ASSOCIATES, INC.



Kristy J. Hendrickson, P.E.
Principal

David A. Pischer, P.E.
Principal

Colette M. Griffith
Project Engineer

KJH/DAP/CMG/kes

5.0 REFERENCES

Bortleson, G.C. et al. 1980. *Historical Changes of Shoreline and Wetland at Puyallup River and Commencement Bay, Washington.* Hydraulic Investigations, Atlas HA-617 (Sheet 8).

Dames & Moore. 1985. *Report of Ground-Water Quality Related to Potlining Management for the Kaiser Aluminum and Chemical Corporation, Tacoma, Washington.* April 16.

Ecology. 2004. *Toxics Cleanup Program Policy, Policy 130A.* Available at: http://www.ecy.wa.gov/programs/tcp/policies/Final-policy%20130a.pdf. Washington State Department of Ecology. July 28.

Kennedy Jenks. 2003. *Preliminary Due Diligence Evaluation Kaiser Aluminum Facility.* Prepared for Port of Tacoma. March.

Landau Associates. 2012. *Final Remedial Investigation/Feasibility Study, Former Kaiser Aluminum Property, 3400 Taylor Way, Tacoma, Washington.* Prepared for the Port of Tacoma. August 23.

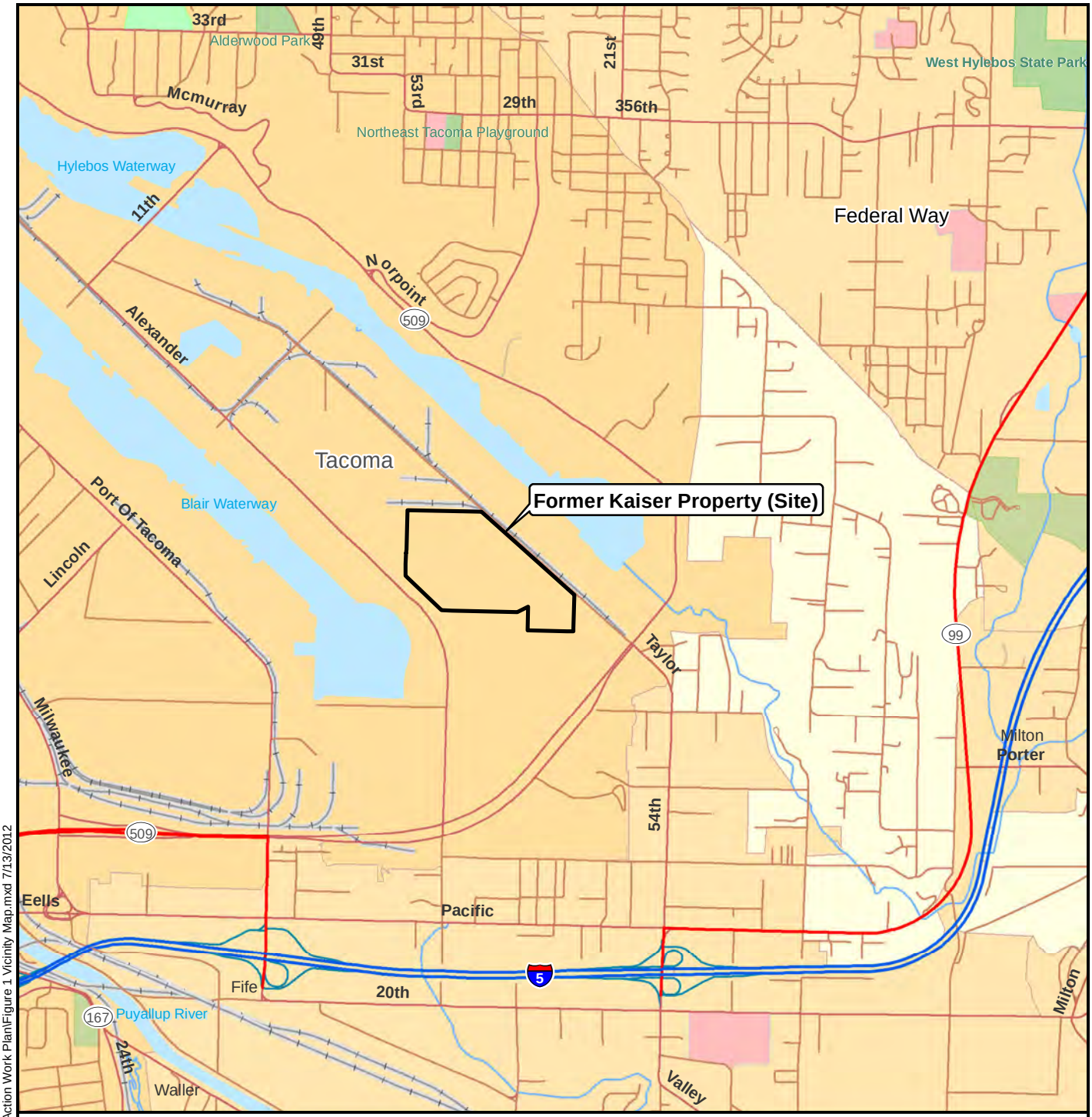
Landau Associates. 2011. *Compilation Report, Former Kaiser Aluminum Property, 3400 Taylor Way, Tacoma, Washington.* Prepared for Port of Tacoma. November 30.

Landau Associates. 2010. Letter Report: *Annual Groundwater Monitoring Report, June 2010, Former Kaiser Aluminum &Chemical Corporation – Tacoma Facility, Wet Scrubber Sludge Management Area*. Prepared for Port of Tacoma. November 1.

Landau Associates. 2004. Letter Report: *Groundwater Monitoring Report, June and July 2004, Former Kaiser Aluminum & Chemical Corporation, Former Spent Potlining Management Area.* Prepared for the Port of Tacoma. November 19.

Landau Associates. 1987. *Final Ground Water Monitoring Report, Kaiser Wet Scrubber Sludge, Management Area, Kaiser Tacoma Works, Tacoma, Washington.* July.

Leber, B. 2005. Personal communication (conversation with Bill Evans, Port of Tacoma). Bud Leber, Kaiser Aluminum. Re: *Rod Mill Area Closed Landfill.*



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Miles

Data Source: ESRI 2006

Y:\Projects\118032\020.005\MapDocs\Rod Mill Interim Action Work Plan\Figure 1 Vicinity Map.mxd 7/13/2012

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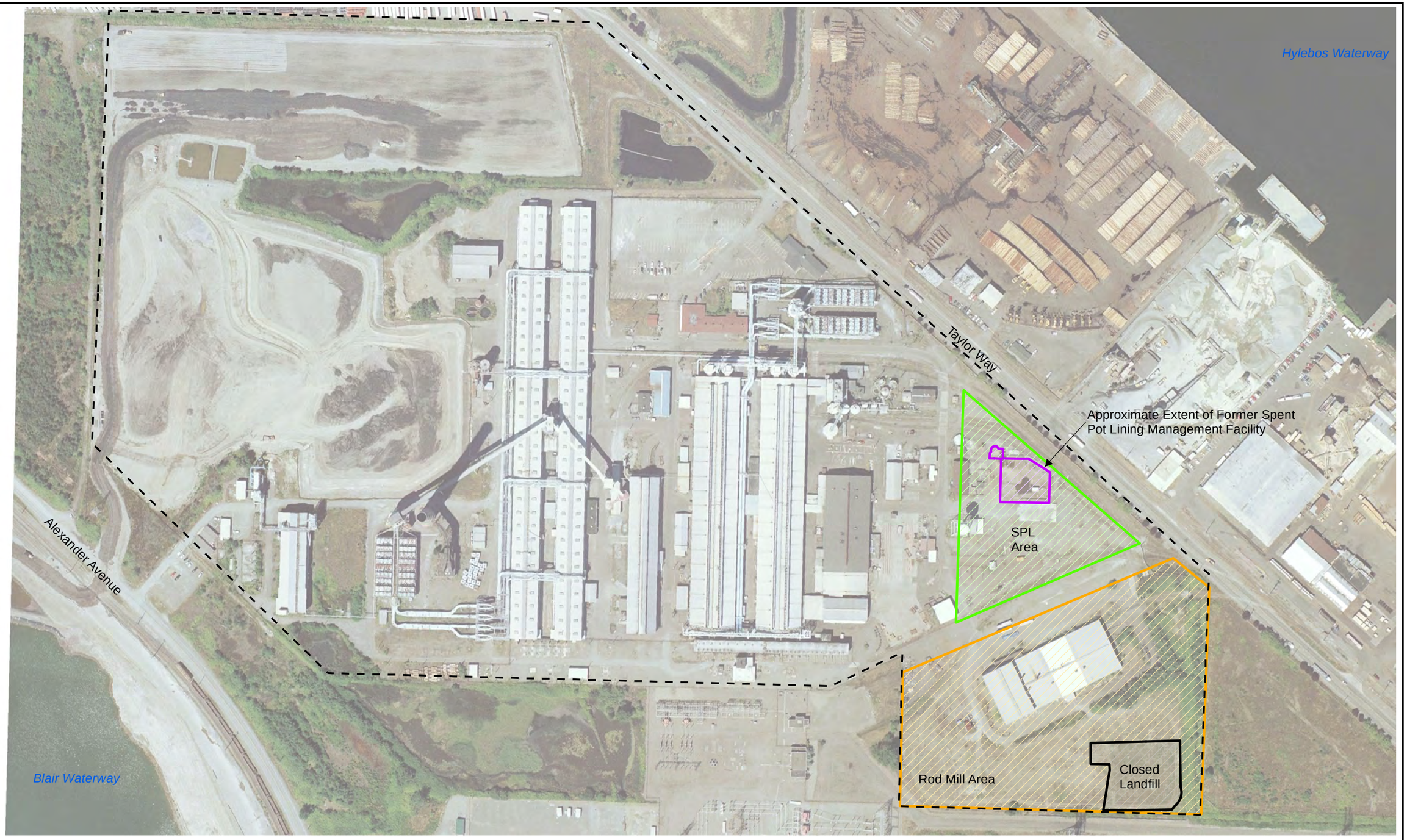
Rod Mill Area Closed Landfill Interim Action Work Plan Tacoma, Washington	**Vicinity Map**	Figure 1



Y:\Projects\118032\020.005\MapDocs\Rod Mill Interim Action Work Plan\Figure 2 Kaiser Facility 2005.mxd 10/31/2012 NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

Site Boundary

0 250 500

Scale in Feet

Data Source: Bing Aerials 2005; Pierce County Assesor

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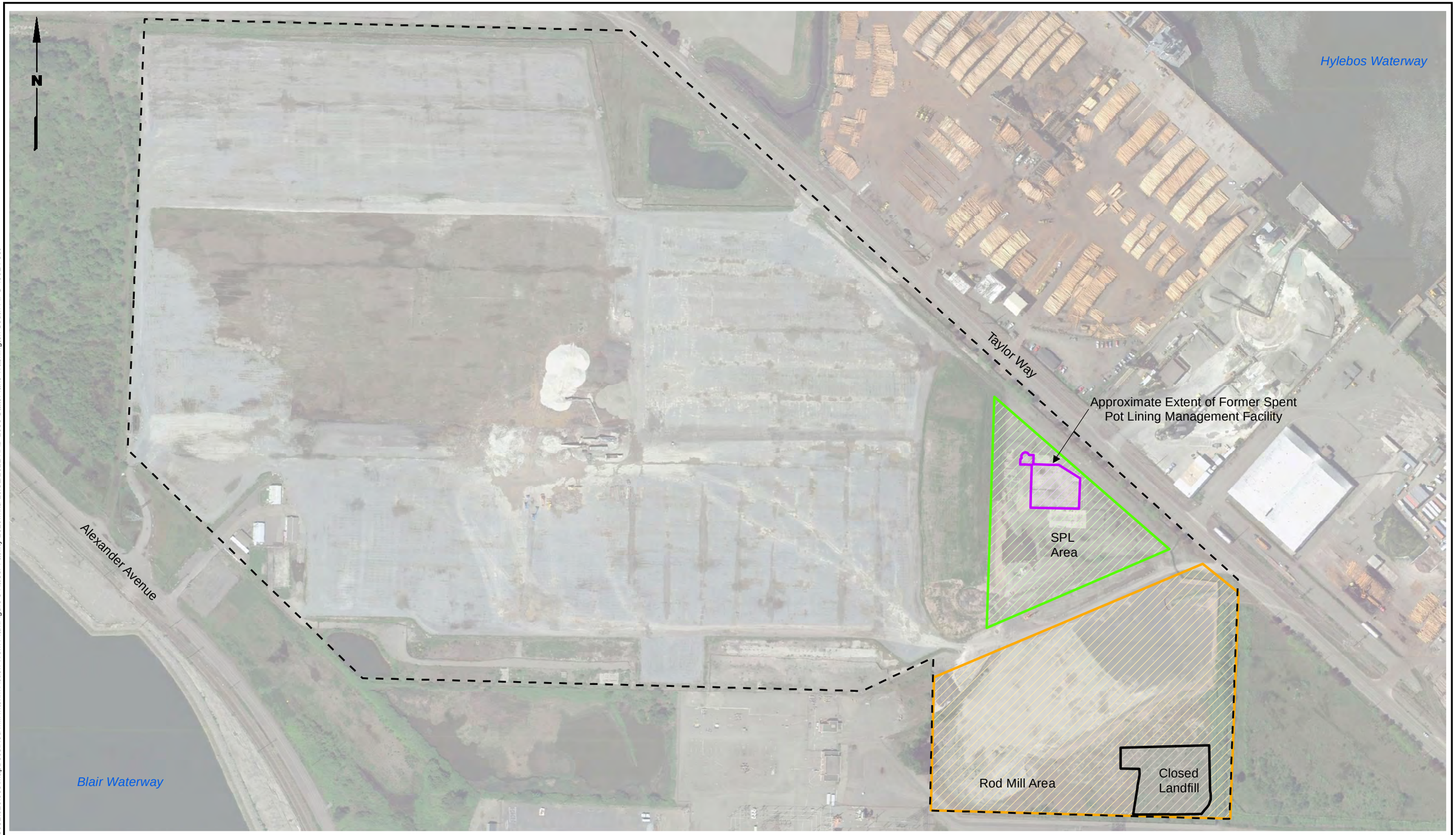
Rod Mill Area Closed Landfill
Interim Action Work Plan
Tacoma, Washington

Site Plan with Historical Site Features

Figure 2



Y:\Projects\118032\020.005\MapDocs\Rod Mill Interim Action Work Plan\Figure 3 Kaiser Facility 2010.mxd 10/31/2012 NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

Site Boundary

0 250 500

Scale in Feet

Data Source: Jacobs Engineering; Pierce County Assesor; Google Earth Pro 2010

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Rod Mill Area Closed Landfill
Interim Action Work Plan
Tacoma, Washington

Current Site Plan

Figure
3

N

Former Rod Mill Building

Closed Landfill

DPT5
DPT4
WCDA8
MW-3(S)
MW-3(I)
WCDA9
LF14
LF15
LF16
LF17
LF7
WCDA18
MW-1(I)
WCDA17
DPT2
MW 2(I)
WCDA10
DPT3
LF18
LF26
WCDA11
MW-6(S)
LF12
MW-6(I)
LF8
LF6
DPT1
WCDA1
WCDA12
LF13
LF27
RRI-B-23
LF28
MW-4(S)
MW-4(I)
WCDA19
WCDA13
LF24
LF19
LF29
LF25
WCDA14
WCDA16
LF11
LF10
LF9
LF23
LF5
WCDA15
MW-5(S)
MW-5(I)
LF22
LF21
LF20
LF1
LF2
LF3
LF4

Legend

- 2008 Test Pit
- 2008 Test Pit (Observed Waste)
- 2003 Direct-Push Boring (Observed Waste)
- 2003/2004 Test Pit (Observed Waste)
- 2007 RRI Soil Boring
- 2003/2004 Test Pit
- 2003/2004 Direct-Push Boring
- Catch Basin
- Intermediate Aquifer Monitoring Well
- Shallow Aquifer Monitoring Well
- Rod Mill Area
- Site Boundary

0 80 160

Scale in Feet

Data Source: Google Earth Pro 2010; Pierce County Assesor

Y:\Projects\118032\020.005\MapDocs\Rod Mill Interim Action Work Plan\Figure 4 Rod Mill Area Closed Landfill Previous Exploration.mxd 10/31/2012 NAD 1983 StatePlane Washington South FIPS 4602 Feet

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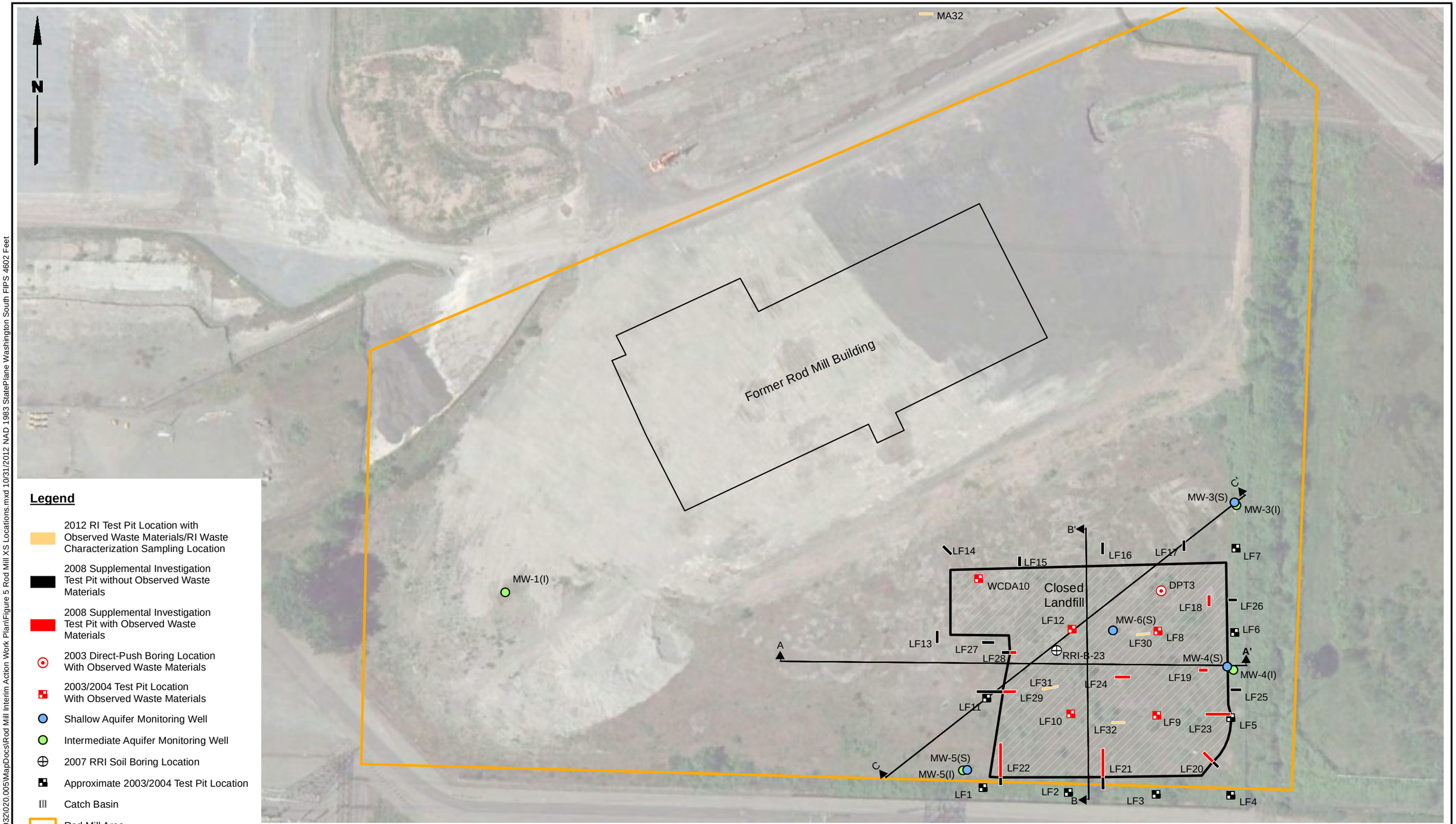
Rod Mill Area Closed Landfill Interim Action Work Plan Tacoma, Washington	**Rod Mill Area Closed Landfill Previous Exploration & Monitoring Well Locations**	Figure 4



Legend

- 2012 RI Test Pit Location with Observed Waste Materials/RI Waste Characterization Sampling Location
- 2008 Supplemental Investigation Test Pit without Observed Waste Materials
- 2008 Supplemental Investigation Test Pit with Observed Waste Materials
- 2003 Direct-Push Boring Location With Observed Waste Materials
- 2003/2004 Test Pit Location With Observed Waste Materials
- Shallow Aquifer Monitoring Well
- Intermediate Aquifer Monitoring Well
- 2007 RRI Soil Boring Location
- Approximate 2003/2004 Test Pit Location
- Catch Basin
- Rod Mill Area
- Site Boundary
- Cross-Secton Location

0 80 160

Scale in Feet

Data Source: Google Earth Pro 2010; Pierce County Assesor

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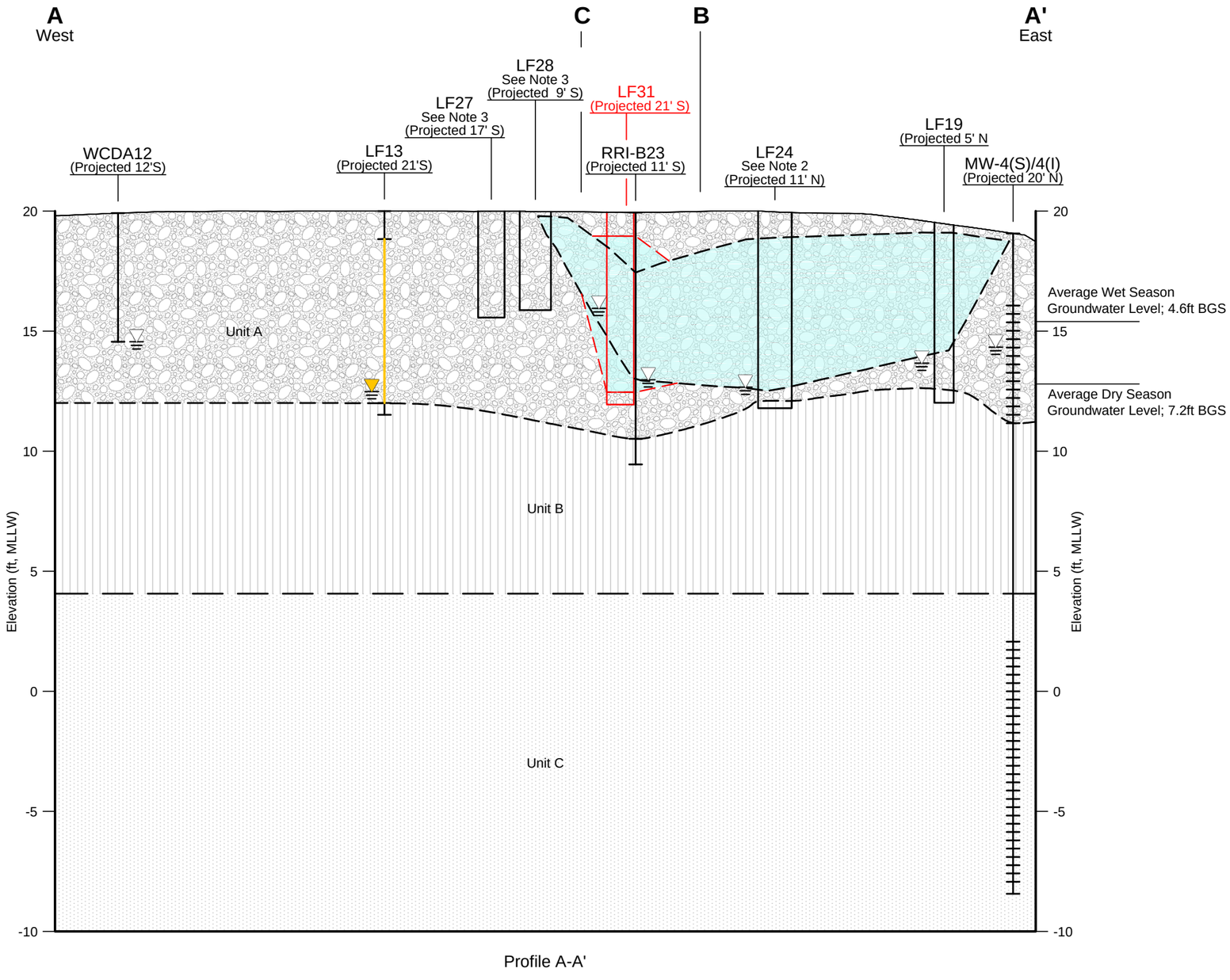
Rod Mill Area Closed Landfill
Interim Action Work Plan
Tacoma, Washington

Rod Mill Area Closed Landfill Cross-Section Locations

Figure 5

Y:\Projects\118032\020.005\MapDocs\Rod Mill Interim Action Work Plan\Figure 5 Rod Mill XS Locations.mxd 10/31/2012 NAD 1983 StatePlane Washington South FIPS 4602 Feet



Legend

LF24 (Offset 16' W) — Project Exploration Designation; Offset Distance in Feet and Direction

- Top of Exploration
- Groundwater Level (at time of drilling)
- Inferred Geologic Contact
- Well Screen Interval
- Petroleum Colored Staining Observed
- Sheen Observed On Water
- Bottom of Exploration

Sand with Varying Amounts of Black Carbon Waste Materials, Concrete, Refactory Brick, Wood Debris, and Miscellaneous Debris

Unit A: Sand, Silt, and Gravel Fill

Unit B: Sandy to Clayey Organic Silt with minor peat, woody debris, and shell fragments; native mudflat deposits.

Unit C: Fine to Medium Sand with Occasional Silt

Notes

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
2. White-gray chalk-like to clay-like mixture of cryolite and bauxite ore encountered at test pit LF24.
3. Test pits excavated during the RI are shown in red.
4. Groundwater not encountered at LF27 and LF28.
5. See report text for descriptions of geologic units.
6. For cross-section profile location, see Figure 5.

0 50 100

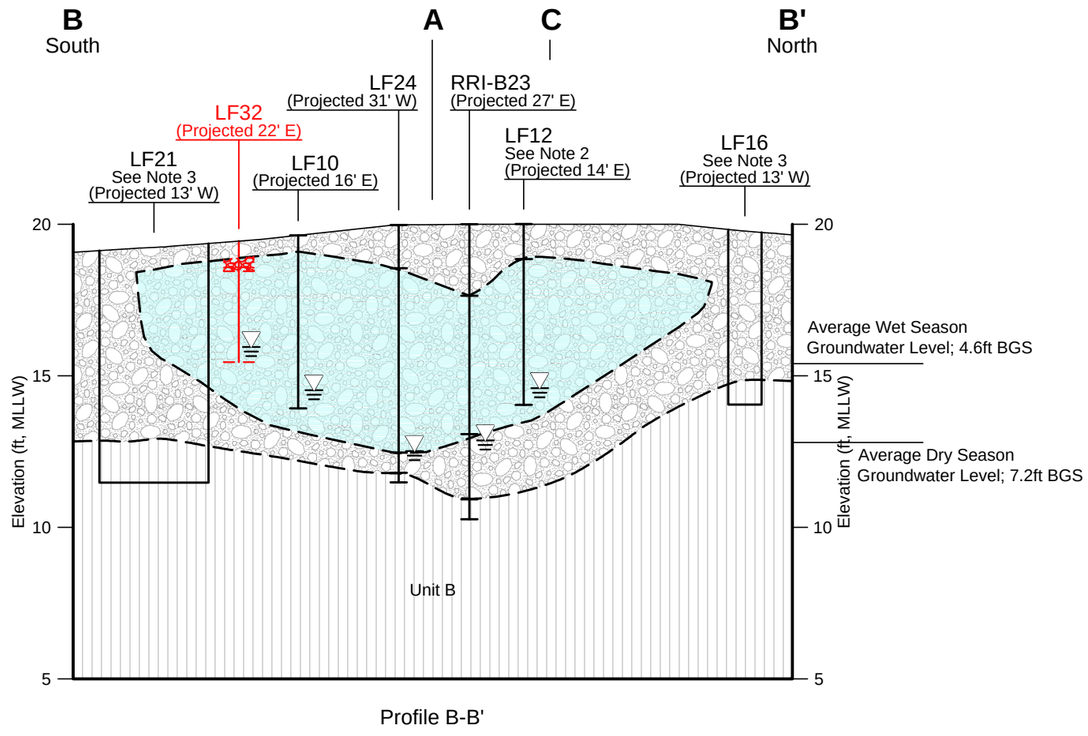
Horizontal Scale 1" = 50'
Vertical Scale 1" = 5'

Rod Mill Area Closed Landfill
Interim Action Work Plan
Tacoma, Washington

Rod Mill Area Closed Landfill
Geologic Profile A-A'

Figure 6

LANDAU ASSOCIATES



Profile B-B'

Legend

LF24 — Project Exploration Designation
(Offset 16' W) — Offset Distance in Feet and Direction

- Top of Exploration
- Groundwater Level (at time of drilling)
- Inferred Geologic Contact
- Bottom of Exploration

Sand with Varying Amounts of Black Carbon Waste Materials, Concrete, Refactory Brick, Wood Debris, and Miscellaneous Debris

Unit A: Sand, Silt, and Gravel Fill

Unit B: Sandy to Clayey Organic Silt with minor peat, woody debris, and shell fragments; native mudflat deposits.

Notes

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3. Test pits excavated during the RI are shown in red.
4. Groundwater not encountered at LF27 and LF28.
5. See report text for descriptions of geologic units.
6. For cross-section profile location, see Figure 5.

0 50 100
Horizontal Scale 1" = 50'
Vertical Scale 1" = 5'

Rod Mill Area Closed Landfill
Interim Action Work Plan
Tacoma, Washington

Rod Mill Area Closed Landfill
Geologic Profile B-B'

Figure 7

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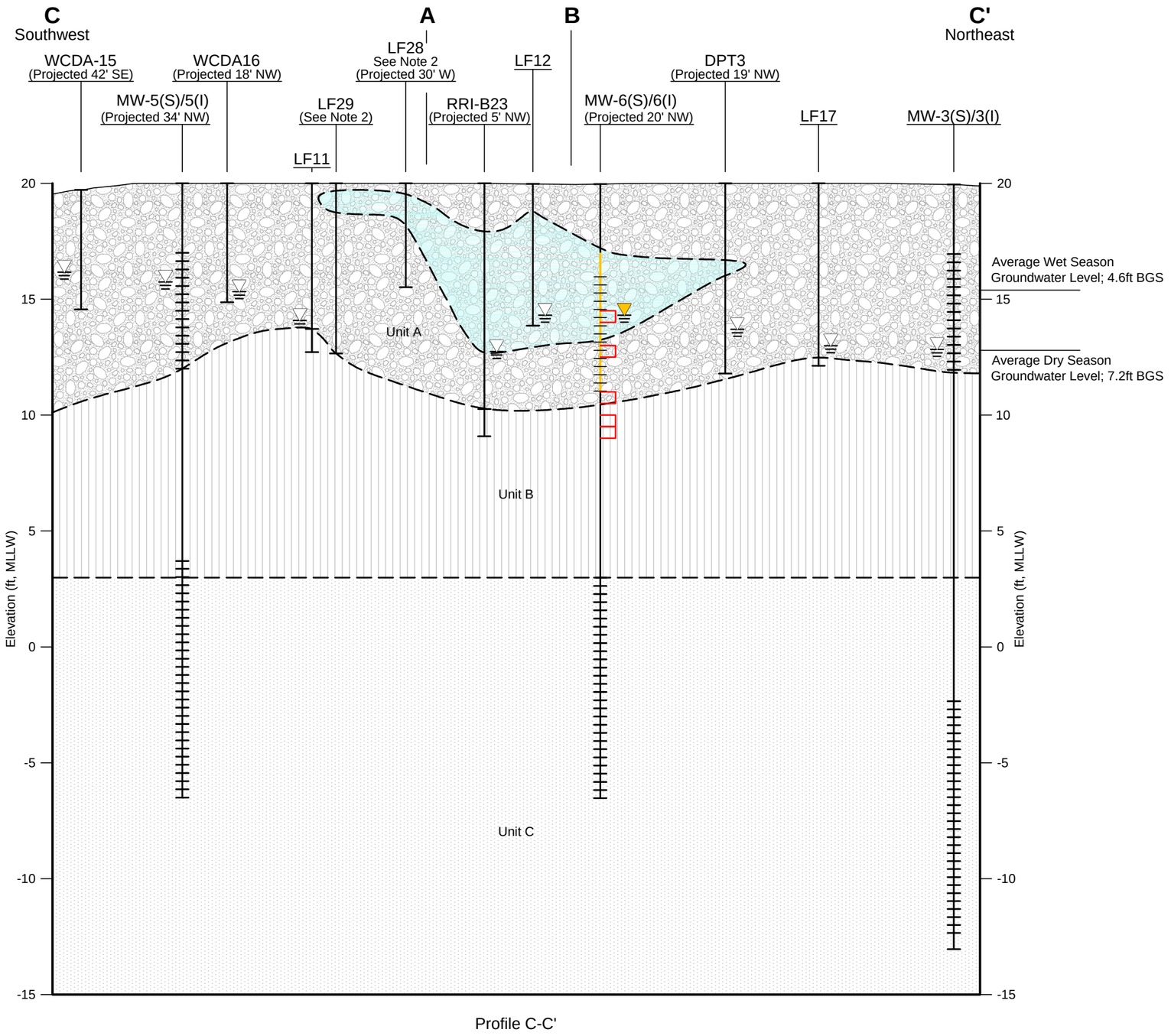

Profile C-C'

0 50 100

Horizontal Scale 1" = 50'
Vertical Scale 1" = 5'

Legend

LF24 — Project Exploration Designation
(Offset 16' W) — Offset Distance in Feet and Direction

- Top of Exploration
- Groundwater Level (at time of drilling)
- Inferred Geologic Contact
- Well Screen Interval
- Soil Sample Interval
- Petroleum Colored Staining Observed
- Sheen Observed On Water
- Bottom of Exploration

Sand with Varying Amounts of Black Carbon Waste Materials, Concrete, Refactory Brick, Wood Debris, and Miscellaneous Debris

Unit A: Sand, Silt, and Gravel Fill

Unit B: Sandy to Clayey Organic Silt with minor peat, woody debris, and shell fragments; native mudflat deposits.

Unit C: Fine to Medium Sand with Occasional Silt

Notes

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
2. Groundwater not encountered at LF28.
3. See report text for descriptions of geologic units.
4. For cross-section profile location, see Figure 5.

Kaiser Aluminum | V:\1181032\020.005\Figure 6_7_8.dwg (A) "Figure 8" 11/7/2012

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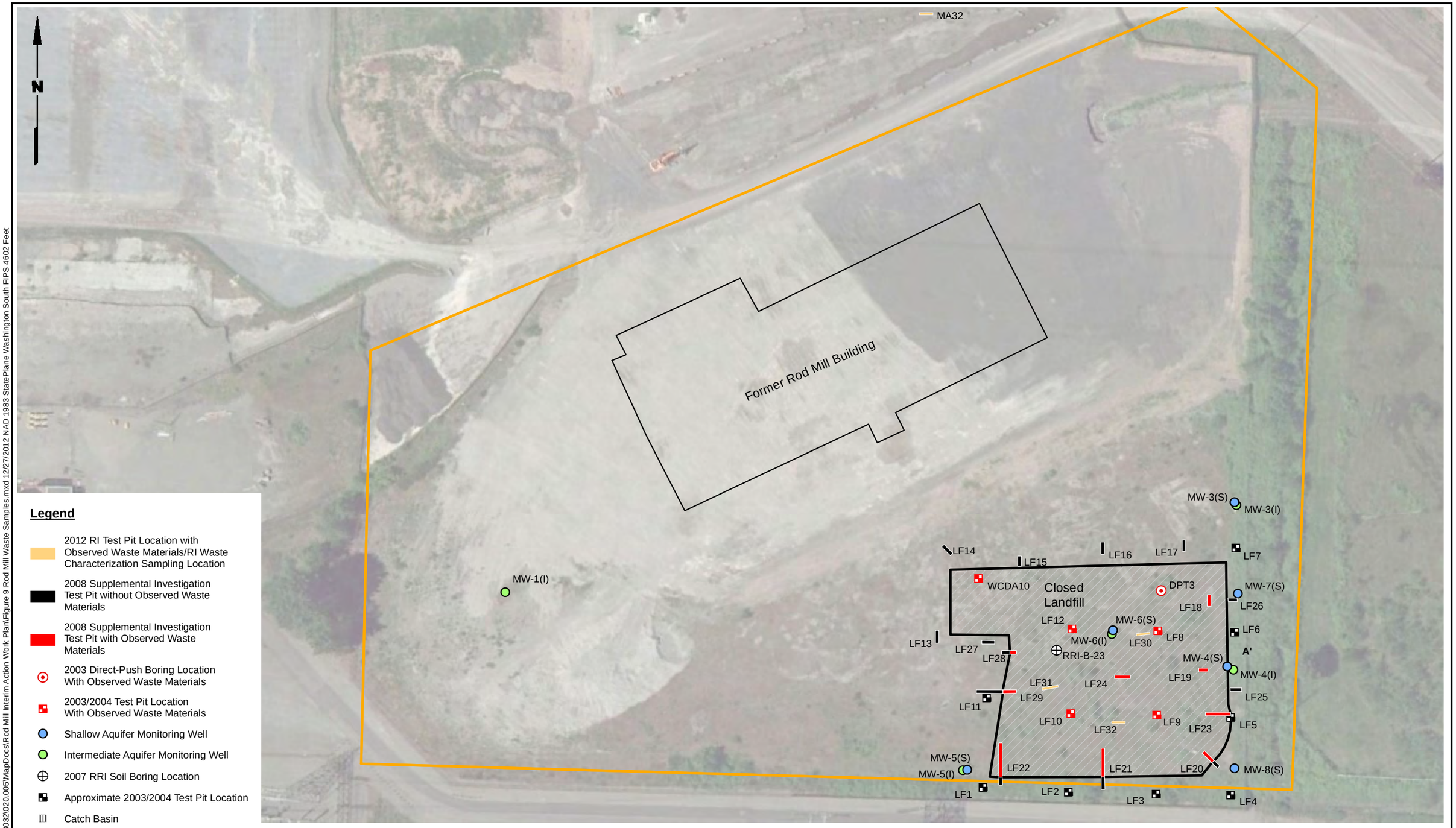
Rod Mill Area Closed Landfill
Interim Action Work Plan
Tacoma, Washington

Rod Mill Area Closed Landfill
Geologic Profile C-C'

Figure
8



Legend

- 2012 RI Test Pit Location with Observed Waste Materials/RI Waste Characterization Sampling Location
- 2008 Supplemental Investigation Test Pit without Observed Waste Materials
- 2008 Supplemental Investigation Test Pit with Observed Waste Materials
- 2003 Direct-Push Boring Location With Observed Waste Materials
- 2003/2004 Test Pit Location With Observed Waste Materials
- Shallow Aquifer Monitoring Well
- Intermediate Aquifer Monitoring Well
- 2007 RRI Soil Boring Location
- Approximate 2003/2004 Test Pit Location
- Catch Basin
- Rod Mill Area
- Site Boundary

0 80 160

Scale in Feet

Data Source: Google Earth Pro 2010; Pierce County Assesor

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Rod Mill Area Closed Landfill
Interim Action Work Plan
Tacoma, Washington

Lateral Extent of Rod Mill Area Closed Landfill Waste Material

Figure 9

Y:\Projects\118032\020.005\MapDocs\Rod Mill Interim Action Work Plan\Figure 9 Rod Mill Waste Samples.mxd 12/27/2012 NAD 1983 StatePlane Washington South FIPS 4602 Feet

Y:\Projects\118032\020.005\MapDocs\Rod Mill Interim Action Work Plan\Figure 10 Rod Mill GW Sampling.mxd 10/31/2012 NAD 1983 StatePlane Washington South FIPS 4602 Feet

N

Former Rod Mill Building

Closed Landfill

MW-1(I)
MW 2(I)
MW-3(S)
MW-3(I)
MW-4(S)
MW-4(I)
MW-5(S)
MW-5(I)
MW-6(S)
MW-6(I)
MW-7(S)
MW-8(S)

Legend

- Shallow Aquifer Monitoring Well/ RI Groundwater Sampling Location
- Intermediate Aquifer Monitoring Well/ RI Groundwater Sampling Location
- Intermediate Aquifer Monitoring Well (Not Sampled During RI)
- Rod Mill Area
- Site Boundary

Note
1. Waste Characterization samples were taken from Test Pits LF30, LF31, and LF32.

0 80 160
Scale in Feet

Data Source: Google Earth Pro 2010; Pierce County Assesor

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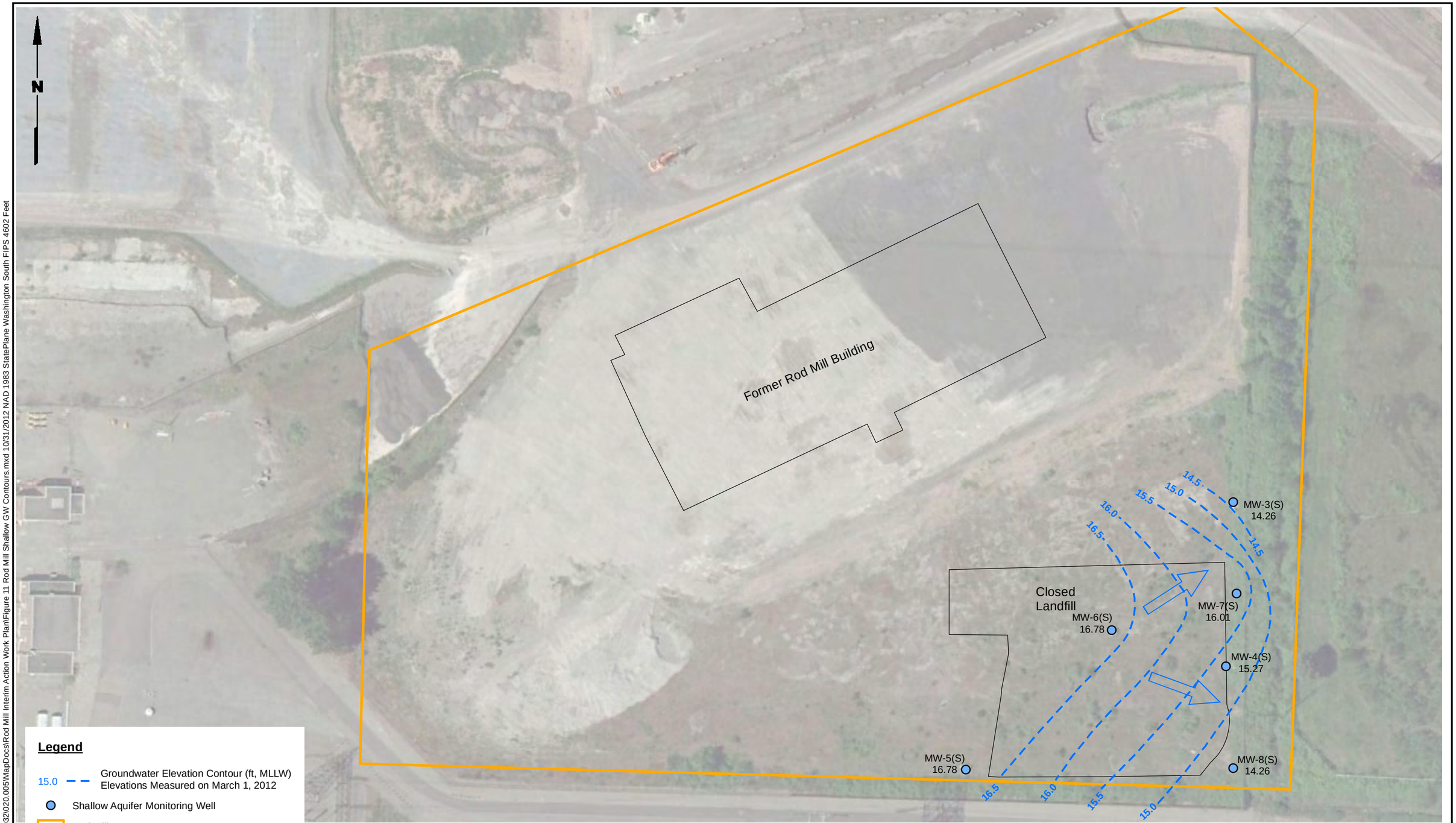
Rod Mill Area Closed Landfill
Interim Action Work Plan
Tacoma, Washington

Rod Mill Area Closed Landfill
RI Groundwater Monitoring Locations

Figure
10



Note
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 80 160
Scale in Feet

Data Source: Google Earth Pro 2010; Pierce County Assesor

LANDAU ASSOCIATES

Rod Mill Area Closed Landfill
Interim Action Work Plan
Tacoma, Washington

Rod Mill Area Closed Landfill
Shallow Aquifer
Groundwater Elevation Contours
March 1, 2012

Figure
11

Y:\Projects\118032\020.005\MapDocs\Rod Mill Interim Action Work Plan\Figure 11 Rod Mill Shallow GW Contours.mxd 10/31/2012 NAD 1983 StatePlane Washington South FIPS 4602 Feet

Y:\Projects\118032\020.005\MapDocs\Rod Mill Interim Action Work Plan\Figure 12 Rod Mill Intermediate GW.mxd 10/31/2012 NAD 1983 StatePlane Washington South FIPS 4602 Feet

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Note
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

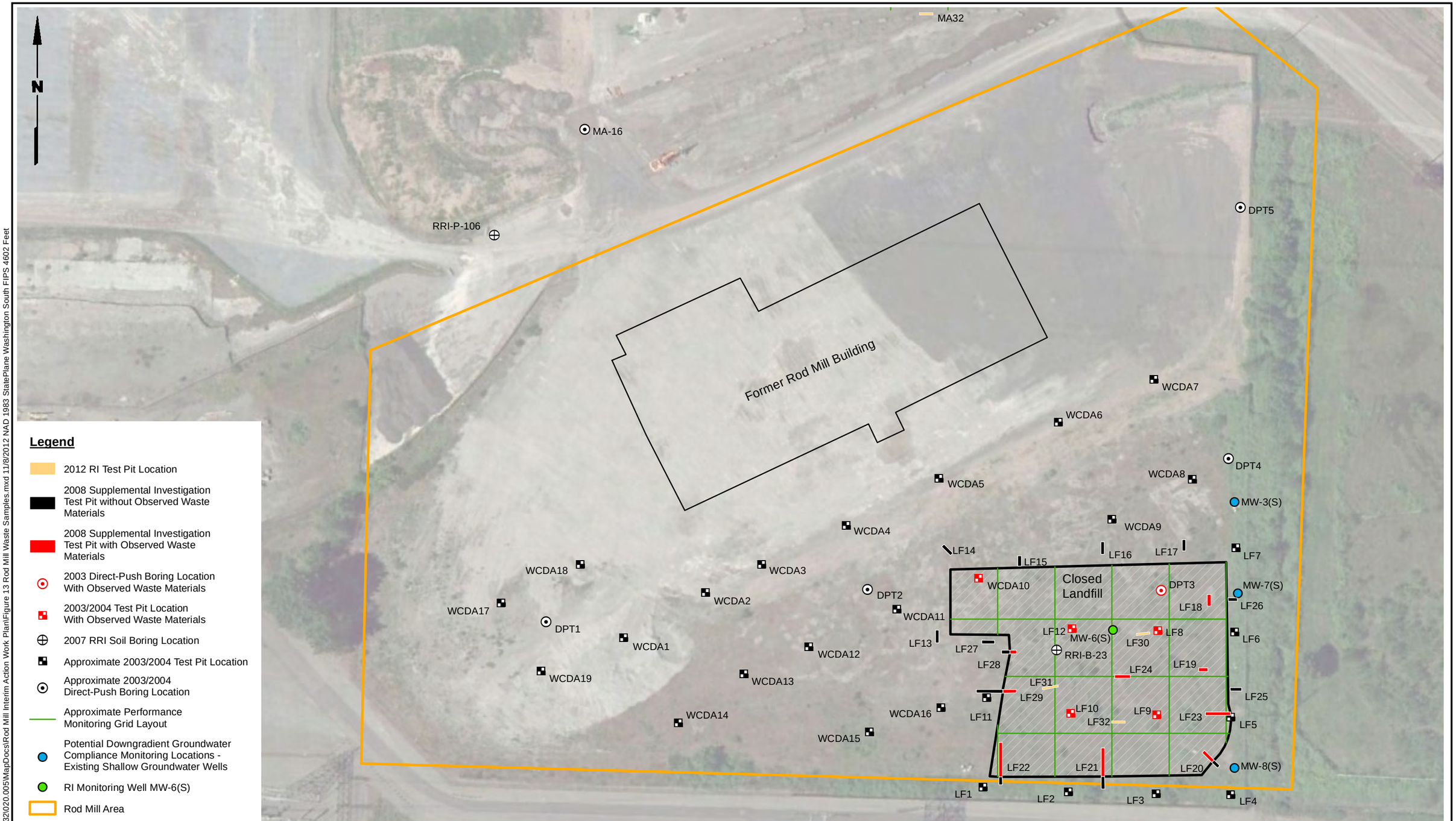
0 80 160
Scale in Feet

Data Source: Google Earth Pro 2010; Pierce County Assesor

Rod Mill Area Closed Landfill
Interim Action Work Plan
Tacoma, Washington

Rod Mill Area Closed Landfill
Intermediate Aquifer
Groundwater Elevation Contours
March 1, 2012

Figure
12



Legend

- 2012 RI Test Pit Location
- 2008 Supplemental Investigation Test Pit without Observed Waste Materials
- 2008 Supplemental Investigation Test Pit with Observed Waste Materials
- 2003 Direct-Push Boring Location With Observed Waste Materials
- 2003/2004 Test Pit Location With Observed Waste Materials
- 2007 RRI Soil Boring Location
- Approximate 2003/2004 Test Pit Location
- Approximate 2003/2004 Direct-Push Boring Location
- Approximate Performance Monitoring Grid Layout
- Potential Downgradient Groundwater Compliance Monitoring Locations - Existing Shallow Groundwater Wells
- RI Monitoring Well MW-6(S)
- Rod Mill Area
- Closed Landfill Interim Action/ Planned Excavation Area to Approximately 8.5 ft BGS (See Note 1)

Notes
1. Localized excavation to approximately 11.5 ft BGS in vincinity of MW-6.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 80 160
Scale in Feet

Data Source: Google Earth Pro 2010; Pierce County Assesor

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Rod Mill Area Closed Landfill Interim Action Work Plan Tacoma, Washington	**Rod Mill Area Closed Landfill Interim Action Area and Performance Monitoring Grid Locations**	Figure 13

Y:\Projects\118032\020.005\MapDocs\Rod Mill Interim Action Work Plan\Figure 13 Rod Mill Waste Samples.mxd 11/8/2012 11/8/2012 NAD 1983 StatePlane Washington South FIPS 4602 Feet

TABLE 1
SUMMARY OF WASTE MATERIAL OBSERVED IN ROD MILL AREA CLOSED LANDFILL EXPLORATIONS
2008 SUPPLEMENTAL AND 2012 RI INVESTIGATIONS
FORMER KAISER SITE
TACOMA, WASHINGTON

			Estimated Percent Total Volume									
				Waste								
Exploration with Observed Waste Materials (a)	Length of Test Pit	Depth Waste Materials Were Observed (ft BGS)	Soil	Carbon Materials	Concrete	Refractory Brick	Coal	Bauxite Ore/Synthetic Cryolite	Wood Debris	Gray-Green Material	Other	Comments
2008 Supplemental Investigation												
RM-LF-13	11	1 - 8	100	--	--	--	--	--	--		--	No waste encountered. Strong petroleum hydrocarbon odor/staining
RM-LF18	10	1 - 4.5	30	40	--	10	--	<5	--		15	Cobble to boulder-sized chunks of carbon waste materials.
	9	4.5-9.5	70	--	--	--	--	--	--		30	Mixed waste.
RM-LF19	8	1-6	83	<5	--	<5	--	--	--		7	Cobble to boulder-sized chunks of carbon waste materials. Mixed waste includes rebar, cloth, metal debris (pipe elbows).
RM-LF20	19	3 - 6.5	70	--	25	<5	--	--	--		--	Cobble to boulder sized chunks of concrete. Waste not encountered in southeastern quarter of test pit.
RM-LF21	36	1 - 4.5	40	10	25	15	--	--	10		--	Cobble to boulder-sized chunks of black carbon waste materials and chunks of concrete. No waste materials encountered in southern quarter of test pit. Refusal encountered at varying depths. Depth of waste materials is an estimate.
RM-LF22	37	1 - 5	50	--	30	15	--	--	--		5	Cobble and boulder-sized chunks of concrete. Other waste is described as red brick or red chunks of concrete
		>5	(b)	(b)	--	--	--	--	--		--	Waste materials encountered to a depth of 3 ft in northern half of test pit. Waste materials extended deeper in southern half of test pit; refusal encountered at 5 ft BGS due to large chunks of waste materials.
RM-LF23	22	0.5 - 1.75	70	--	30	--	--	--	--		--	Cobble to gravel-sized chunks of concrete.
		1.75 - 7	60	--	40	--	--	--	--		--	Cobble to gravel-sized chunks of concrete.
RM-LF24	14	1 - 2.25	>95	<5	--	--	--	--	--		--	Cobble-sized fragments of black carbon waste materials.
		2.25 - 7.5	50 - 80	8-20	5-10	--	--	--	--		7-20	Cobble to boulder-sized chunks of black, light, and porous carbon. Other waste is 5-15% mixture of carbon and coal tar pitch with a vitreous texture and 2 - 5% white to gray chalk-like to clay-like mixture of cryolite and bauxite ore.
RM-LF28	13	>0.5	(b)	(b)	--	--	--	--	--		--	Refusal encountered at 0.5' BGS in eastern half of test pit due to large chunks of black carbon materials. No waste materials encountered in western half of test pit.
RM-LF29	35	>0.5	(b)	(b)	(b)	--	--	--	--		--	Refusal encountered at 0.5' BGS in eastern half of test pit due to large chunks of black carbon materials and concrete. No waste materials encountered in western half of test pit.
RM-MW-6(S)	NA	2.75 - 3.25	50	50	--	--	--	--	--		--	Black carbon materials.
	NA	3.25 - 3.75	0	--	--	--	--	--	100		--	Wood cuttings with slight hydrocarbon odor and staining.
		3.75 - 5.25	60	40	--	--	--	--	--		--	Black carbon materials. Moderate petroleum odor and staining.
		5.25 - 9.5	100	--	--	--	--	--	--		--	No waste encountered. Strong petroleum hydrocarbon odor/ staining
RM-MW-6(I)	NA	3 - 3.5	25	75	--	--	--	--	--		--	Black carbon waste materials with fragments of petroleum coke and coal tar pitch.
		3.5 - 4	30	--	--	--	--	--	--		70	Other waste described as gray silt/ash.
		6.75 - 9.5	100	--	--	--	--	--	--		--	No waste encountered. Strong petroleum hydrocarbon odor/ staining

TABLE 1
SUMMARY OF WASTE MATERIAL OBSERVED IN ROD MILL AREA CLOSED LANDFILL EXPLORATIONS
2008 SUPPLEMENTAL AND 2012 RI INVESTIGATIONS
FORMER KAISER SITE
TACOMA, WASHINGTON

			Estimated Percent Total Volume Waste									
Exploration with Observed Waste Materials (a)	Length of Test Pit	Depth Waste Materials Were Observed (ft BGS)	Soil	Carbon Materials	Concrete	Refractory Brick	Coal	Bauxite Ore/Synthetic Cryolite	Wood Debris	Gray-Green Material	Other	Comments
Previous Investigations												
RM-LF8	NS	1-7	(b)	--	--	(b)	--	--	--		(b)	Other waste is described as white waste, blocky waste, and possible pieces of asbestos.
RM-LF9	NS	1-1.5	(b)	--	--	--	--	--	--		(b)	Yellowish (possible iron oxide stained) waste/fill.
		1.5 -2.5	(b)	--	--	(b)	--	--	(b)		(b)	Other waste described as black, gray, and white sand-size waste and metal
		2.5 - 8.5	(b)	--	--	--	--	--	--		(b)	Cemented black medium sand size waste.
RM-LF10	NS	1 - 6	(b)	--	--	--	--	--	(b)		(b)	Gray and white sand-sized waste, metal, cloth, and large blocks of angular waste up to 1.5 ft size, gray and white layered sand-sized waste toward bottom of hole.
RM-LF12	NS	1 - 5.5	(b)	--	--	--	(b)	--	--		(b)	Dark gray to black sandy waste with various sizes of shiny, black coal.
		5.5 - 6	(b)	--	--	--	--	--			(b)	Sand and silt-sized, white-gray, black waste.
RM-DPT3	NA	3.5 - 3.75	(b)	--	--	--	--	--			(b)	Gray and white, fine sand-sized waste.
2012 RI												
RM-LF30	10	1-3.5	20	10	5	--	--	10	--	50	<1	Gray-green fine grained waste material with interspersed white granular material (composed of boaxite ore and synthetic cryolite), cobble sized carbon waste material, and trace amounts of concrete and rebar.
		3.5-4	--	--	--	--	100	--		--	--	Black boulder-sized to fine grained coal waste material
RM-LF31	12	1-7.5	--	15	1	5	1	5	--	75	<1	Gray-green fine grained waster material with boulder sized fragments of black carbon waste and trace amounts of white waste, refractory brick, concrete, coal and metal.
RM-LF32	10	1-4	--	15	3	2	15	15	--	50	<1	Gray-green fine grained waste material with boulder-sized blocks of carbon waste material and coal with trace amounts of white waste material (composed of bauxite ore and synthetic cryolite), concrete, refractory brick, metal, and plastic.

-- Indicates waste type not encountered.
NA Indicates not applicable.
NS Indicates information on length of test pit not available.

(a) Explorations where no waste materials were observed include RM-LF1 through RM-LF7, RM-LF11, RM-LF14, RM-LF15, RM-LF16, RM-LF17, RM-LF25, RM-LF26, and RM-LF2
(b) Percent total volume not estimated.

TABLE 2
2012 REMEDIAL INVESTIGATION WASTE CHARACTERIZATION SAMPLE ANALYTICAL RESULTS
ROD MILL AREA CLOSED LANDFILL
FORMER KAISER SITE
TACOMA, WASHINGTON

Sample Identification: Laboratory Identification: Sample Collection Date:	Municipal Solid Waste Landfill Disposal Screening Levels (a)	RM-LF30-2012-WC(1-4) UI39E 02/14/2012	RM-LF31-2012-WC(1-4) UI39F 02/14/2012	RM-LF32-2012-WC(1-4) UI39G 02/15/2012
TOTAL PETROLEUM HYDROCARBONS (mg/kg)				
NWTPH-Dx				
Diesel Range Organics	--	1200	1500	3800
Motor Oil	--	760	1000	2900
VOLATILES (mg/kg)				
Method SW8260				
Vinyl Chloride	--	0.0007 U	0.0006 U	0.0007 U
cPAHs (mg/kg)				
Method SW8270D				
Benzo(a)anthracene	--	900	610	260
Chrysene	--	950	630	290
Benzo(a)pyrene	--	760	560	220
Indeno(1,2,3-cd)pyrene	--	340	280	110
Dibenz(a,h)anthracene	--	110	77	34
Total Benzofluoranthenes	--	1,200	970	370
Total cPAHs	10,000 (b)	4,260	3,127	1,284
PCBs (mg/kg)				
Method SW8082	--			
Aroclor 1016	--	0.032 U	0.031 U	0.031 U
Aroclor 1242	--	0.032 U	0.031 U	0.031 U
Aroclor 1248	--	0.80 U	0.58	0.12 U
Aroclor 1254	--	0.24	0.38	0.34
Aroclor 1260	--	0.10	0.059	0.15
Aroclor 1221	--	0.032 U	0.031 U	0.031 U
Aroclor 1232	--	0.032 U	0.031 U	0.031 U
Total PCBs	100 (c)	0.34	1.019	0.49
TOTAL METALS (mg/kg)				
Method SW6010B/7471A				
Arsenic	100 (d)	50 U	50 U	50 U
Chromium	100 (d)	10	18	30
Copper	--	80	153	133
Lead	100 (d)	40	60	50
Mercury	4 (d)	0.02 U	0.02	0.02 U
Zinc	--	90	290	90

U = The analyte was not detected in the sample at the given reporting limit.

(a) Values shown are screening levels and subject to approval by the appropriate regulatory agency and/or landfill.
(b) Washington State dangerous waste criteria for solid waste; WAC 173-303-100 (6).
(c) Criterion for disposal in a municipal solid waste landfill may be up to 100 mg/kg if approved by Ecology and EPA.
(d) Level shown is based on a factor of 20 times the Toxicity Characteristic Leaching Procedure concentration.

TABLE 3
SOIL ANALYTICAL RESULTS
2008 SUPPLEMENTAL INVESTIGATION
ROD MILL AREA CLOSED LANDFILL
FORMER KAISER SITE
TACOMA, WASHINGTON

Sample Identification:		RM-MW-6(I)			RM-MW-6(S)	
Sample Depth (ft):		RM-MW-6(I) (7)	RM-MW-6(I) (9)	RM-MW-6(I) (10.5)	RM-MW-6(S) (5.5)	RM-MW-6(S) (10)
Laboratory Identification:		7	9	10.5	5.5	10
Sample Collection Date:	Cleanup Levels (a)	ND16G 6/26/2008	ND16H 6/26/2008	ND16I 6/26/2008	ND16J 6/26/2008	ND16K 6/26/2008
cPAHs (µg/kg)						
SW8270-SIM						
Benzo(a)anthracene	130	**54,000**	**17,000**	**460**	**26,000**	**4,000**
Chrysene	140	**100,000**	**24,000**	**640**	**31,000**	**4,600**
Benzo(b)fluoranthene	440	**52,000**	**15,000**	340	**18,000**	**3,100**
Benzo(k)fluoranthene	440	**42,000**	**12,000**	340	**19,000**	**3,000**
Benzo(a)pyrene	350	**34,000**	**13,000**	320	**19,000**	**3,200**
Indeno(1,2,3-cd)pyrene	1,200	**19,000**	**7,000**	170	**9,300**	**1,600**
Dibenz(a,h)anthracene	640	**5,900**	**2,400**	63	**3,200**	430
Total cPAHs TEQ	2,000	**52,290**	**18,580**	464	**26,860**	**4,459**
PETROLEUM HYDROCARBONS (mg/kg)						
NWTPH-DxSG						
Diesel-Range	2,000	**6,900**	**3,400**	67	**7,300**	100
Motor Oil-Range	2,000	1,500	900	22	1,400	43
Total Solids (%)						
EPA160.3						
Total Solids		79.7	81.3	61.7	86.4	59.3
CONVENTIONALS (mg/kg)						
Cyanide (EPA 335.4)	3,200	0.124	0.127	0.071 U	0.209	0.149

Bold value indicates concentration exceeds the cleanup level.
U = The analyte was not detected in the sample at the given reporting limit

(a) Development of cleanup levels for soil is presented in Table 2 of the RI/FS.

TABLE 4
2012 REMEDIAL INVESTIGATION AND 2008 SUPPLEMENTAL INVESTIGATION
GROUNDWATER ANALYTICAL RESULTS
ROD MILL AREA CLOSED LANDFILL
FORMER KAISER SITE
TACOMA, WASHINGTON

		Shallow Wells											
		Upgradient Well		Closed Landfill				Downgradient Wells					
					Dup of RM-MW-6(S)		Dup of RM-MW-6(s)						
Sample Identification:		RM-MW-5(S)	RM-MW-5(s)	RM-MW-6(S)	RM-MW-6(D)	RM-MW-6(s)	RM-MW-99(s)	RM-MW-3(S)	RM-MW-3(s)	RM-MW-4(S)	RM-MW-4(s)	RM-MW-7(s)	RM-MW-8(s)
Laboratory Identification:	Cleanup	ND59C (RE)	UK03E/UK03K	ND59D (RE)	ND59E (RE)	UK16A/UK16G	UK16B/UK16H	ND59A (RE)	UK03D/UK03J	ND59B (RE)	UK03B/UK03H	UK03C/UK03I	UK03A/UK03G
Sample Collection Date:	Levels (a)	7/1/2008	02/28/2012	7/1/2008	7/1/2008	02/29/2012	02/29/2012	7/1/2008	02/28/2012	7/1/2008	02/28/2012	02/28/2012	02/28/2012
TOTAL PETROLEUM HYDROCARBONS (mg/L)													
NWTPH-Dx													
Diesel Range- Organics	0.5	0.25 U	0.10 U	**7.4** J	**15** J	0.50	0.49	0.25 U	0.10 U	0.25 U	0.10 U	0.10 U	0.10 U
Motor Oil -Range Organics	0.5	0.50 U	0.20 U	2.5 UJ	2.5 UJ	0.20 U	0.20 U	0.50 U	0.20 U	0.50 U	0.20 U	0.20 U	0.20 U
VOLATILES (µg/L)													
Method SW8260-SIM													
Vinyl Chloride	2.4	0.02 UJ	0.020 U	**5.5**	**4**	0.020 U	0.020 U	0.02 UJ	0.020 U	1.2	0.020 U	0.020 U	0.020 U
cPAHs (µg/L)													
Method SW8270D-SIM													
Benzo(a)anthracene	0.020	0.012 UJ	0.010 U	**3.4** J	2.5 UJ	**0.56** J	**0.42** J	0.010 UJ	0.010 U	0.010 UJ	0.010 U	0.010 U	0.010 U
Chrysene	0.019	0.012 UJ	0.010 U	**7.0** J	2.5 UJ	**0.64** J	**0.51** J	0.010 UJ	0.010 U	0.010 UJ	0.010 U	0.010 U	0.010 U
Benzo(b)fluoranthene	0.018	0.012 UJ	NA	**2.3** J	2.5 UJ	NA	NA	0.010 UJ	NA	0.010 UJ	NA	NA	NA
Benzo(k)fluoranthene	0.036	0.012 UJ	NA	**1.8** J	2.5 UJ	NA	NA	0.010 UJ	NA	0.010 UJ	NA	NA	NA
Benzo(a)pyrene	0.018	0.012 UJ	0.010 U	**1.3** J	2.5 UJ	**0.34** J	**0.26** J	0.010 UJ	0.010 U	0.010 UJ	0.010 U	0.010 U	0.010 U
Indeno(1,2,3-cd)pyrene	0.018	0.012 UJ	0.010 U	1.0 UJ	2.5 UJ	**0.13**	**0.11**	0.010 UJ	0.010 U	0.010 UJ	0.010 U	0.010 U	0.010 U
Dibenz(a,h)anthracene	0.018	0.012 UJ	0.010 U	1.0 UJ	2.5 UJ	**0.050**	**0.043**	0.010 UJ	0.010 U	0.010 UJ	0.010 U	0.010 U	0.010 U
Total Benzofluoranthenes	0.018/0.036 (a)	NA	0.020 U	NA	NA	**0.67** J	**0.54** J	NA	0.020 U	NA	0.020 U	0.020 U	0.020 U
TEQ	0.030	NA	NA	**1.45**	NA	**0.487** J	**0.376** J	NA	NA	NA	NA	NA	NA
PCBs (µg/L)													
Method SW8082													
Aroclor 1016	0.020	0.010 U	0.010 U	0.030 U	0.032 U	0.010 U	0.010 U	0.011 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Aroclor 1242	---	0.010 U	0.010 U	0.030 U	0.032 U	0.010 U	0.010 U	0.011 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Aroclor 1248	---	0.010 U	0.010 U	0.73 J	1.2 J	0.067	0.065	0.011 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Aroclor 1254	0.020	0.010 U	0.010 U	**0.77** J	**1.3** J	**0.096**	**0.084**	0.011 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Aroclor 1260	---	0.010 U	0.010 U	0.11 J	0.18 J	0.015 U	0.015 U	0.011 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Aroclor 1221	---	0.010 U	0.010 U	0.030 U	0.032 U	0.010 U	0.010 U	0.011 U	0.010 U	0.010 U	0.010 U	0.010 U	0.015 U
Aroclor 1232	---	0.010 U	0.010 U	0.030 U	0.032 U	0.010 U	0.010 U	0.011 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Total PCBs	0.020	NA	NA	**1.6**	**2.7**	**0.163**	**0.149**	NA	NA	NA	NA	NA	NA
TOTAL METALS (µg/L)													
Method EPA 200.8/SW7470A													
Arsenic	8.0	1.6	0.5	**85** J	**42** J	**62.8**	**68.0**	**11**	0.3	2.8	0.7	1.6	0.7
Chromium	240,000 (b)	0.5 U	1 U	74 J	27 J	0.5 U	0.5 U	21	1 U	2.8	0.5 U	1 U	1 U
Copper	20	0.5	1.7	**201** J	**68** J	4.6	4.7	**51**	2.6	6.1	3.2	9.4	1.2
Lead	10	1 U	0.1 U	**52** J	**14** J	1.6	1.5	7	0.1 U	1 U	0.1 U	0.3	0.1 U
Mercury	0.15	0.1 U	0.1 U	**0.2**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Zinc	160	4 U	4 U	**340** J	90 J	4 U	4 U	60	7	10	148	4 U	4 U
DISSOLVED METALS (µg/L)													
Method EPA 200.8													
Arsenic	8.0	NA	0.5	NA	NA	**59.3**	**64.4**	NA	0.3	NA	0.7	1.2	0.7
Chromium	240,000 (b)	NA	1 U	NA	NA	1 U	0.5 U	NA	1 U	NA	0.5 U	1 U	1 U
Hexavalent Chromium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	20	NA	1.4	NA	NA	0.5 U	0.5 U	NA	2.3	NA	3.2	7.7	1.2
Lead	10	NA	0.1 U	NA	NA	0.1 U	0.1 U	NA	0.1 U	NA	0.1 U	0.1 U	0.1 U
Mercury	0.15	NA	0.1 U	NA	NA	0.1 U	0.1 U	NA	0.1 U	NA	0.1 U	0.1 U	0.1 U
Zinc	160	NA	4 U	NA	NA	4 U	4 U	NA	7	NA	**168**	4 U	4 U
FIELD PARAMETERS													
pH	---	7.28	7.09	8.94	8.99	7.80	7.80	7.21	7.26	7.20	7.98	7.82	7.33
Conductivity (uS)	---	430	181	3712	3717	1145	1145	1094	112	1298	432	233	655
Turbidity (NTU)	---	low	low	medium	medium	low	low	low	low	low	low	low	low
Dissolved Oxygen (mg/L)	---	0.02	0.02	0.01	0.01	0.01	0.01	0.09	0.01	0.15	0.01	0.02	0.01
Temperature (°C)	---	14.75	8.39	14.50	14.49	8.26	8.26	14.69	8.72	14.03	8.07	8.46	8.07
ORP (mV)	---	-442.1	-57.7	-442.7	-442.6	-143.4	-143.4	-438.5	-54.8	-440.3	-14.3	-16.2	-43.4

TABLE 4
2012 REMEDIAL INVESTIGATION AND 2008 SUPPLEMENTAL INVESTIGATION
GROUNDWATER ANALYTICAL RESULTS
ROD MILL AREA CLOSED LANDFILL
FORMER KAISER SITE
TACOMA, WASHINGTON

		Intermediate Wells								
		Upgradient Wells		Closed Landfill			Downgradient Wells			
Sample Identification:		RM-MW-2(I)*	RM-MW-5(I)	RM-MW-6(I)	RM-MW-6(I)	RM-MW-6(I)	RM-MW-3(I)	RM-MW-3(I)	RM-MW-4(I)	RM-MW-4(I)
Laboratory Identification:	Cleanup	ND73D	ND73E	ND73F	UK18A	UN49A	ND73B	UN48A	ND73C	UN48B
Sample Collection Date:	Levels (a)	7/2/2008	7/2/2008	7/2/2008	02/29/2012	03/21/2012	7/2/2008	03/21/2012	7/2/2008	03/21/2012
TOTAL PETROLEUM HYDROCARBONS (mg/L)										
NWTPH-Dx										
Diesel Range- Organics	0.5	0.25 U	0.25 U	NA	NA	NA	NA	NA	NA	NA
Motor Oil -Range Organics	0.5	0.50 U	0.50 U	NA	NA	NA	NA	NA	NA	NA
VOLATILES (µg/L)										
Method SW8260-SIM										
Vinyl Chloride	2.4	0.2 U	0.2 U	2 U	NA	NA	0.2 U	NA	0.2 U	NA
cPAHs (µg/L)										
Method SW8270D-SIM										
Benzo(a)anthracene	0.020	0.010 U	0.010 U	**0.48**	0.010 U	NA	0.010 U	NA	0.010 U	NA
Chrysene	0.019	0.010 U	0.010 U	**0.52**	0.010 U	NA	0.010 U	NA	0.010 U	NA
Benzo(b)fluoranthene	0.018	0.010 U	0.010 U	**0.28**	NA	NA	0.010 U	NA	0.010 U	NA
Benzo(k)fluoranthene	0.036	0.010 U	0.010 U	**0.28**	NA	NA	0.010 U	NA	0.010 U	NA
Benzo(a)pyrene	0.018	0.010 U	0.010 U	**0.37**	0.010 U	NA	0.010 U	NA	0.010 U	NA
Indeno(1,2,3-cd)pyrene	0.018	0.010 U	0.010 U	**0.2**	0.010 U	NA	0.010 U	NA	0.010 U	NA
Dibenz(a,h)anthracene	0.018	0.010 U	0.010 U	**0.08**	0.010 U	NA	0.010 U	NA	0.010 U	NA
Total Benzofluoranthenes	0.018/0.036 (a)	NA	NA	NA	0.020 U	NA	NA	NA	NA	NA
TEQ	0.030	NA	NA	**0.221**	NA	NA	NA	NA	NA	NA
PCBs (µg/L)										
Method SW8082										
Aroclor 1016	0.020	0.010 U	0.010 U	0.010 U	0.010 U	NA	0.010 U	NA	0.010 U	NA
Aroclor 1242	---	0.010 U	0.010 U	0.010 U	0.010 U	NA	0.010 U	NA	0.010 U	NA
Aroclor 1248	---	0.010 U	0.010 U	0.010 U	0.010 U	NA	0.010 U	NA	0.010 U	NA
Aroclor 1254	0.020	0.010 U	0.010 U	**0.033**	0.010 U	NA	0.010 U	NA	0.010 U	NA
Aroclor 1260	---	0.010 U	0.010 U	0.010 U	0.010 U	NA	0.010 U	NA	0.010 U	NA
Aroclor 1221	---	0.010 U	0.010 U	0.010 U	0.010 U	NA	0.010 U	NA	0.010 U	NA
Aroclor 1232	---	0.010 U	0.010 U	0.010 U	0.010 U	NA	0.010 U	NA	0.010 U	NA
Total PCBs	0.020	NA	NA	**0.033**	NA	NA	NA	NA	NA	NA
TOTAL METALS (µg/L)										
Method EPA 200.8/SW7470A										
Arsenic	8.0	3	3.6	**18**	**39**	NA	1 U	1.0	4	**8.6**
Chromium	240,000 (b)	5	15.4	88	161	NA	1	4.8	11	13
Copper	20	1 U	4.3	NA	NA	NA	NA	NA	NA	NA
Lead	10	2 U	1 U	NA	NA	NA	NA	NA	NA	NA
Mercury	0.15	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA
Zinc	160	10 U	6	NA	NA	NA	NA	NA	NA	NA
DISSOLVED METALS (µg/L)										
Method EPA 200.8										
Arsenic	8.0	NA	NA	NA	**36**	NA	NA	0.5 U	NA	7.3
Chromium	240,000 (b)	NA	NA	NA	155	NA	NA	0.6	NA	13
Hexavalent Chromium	50	NA	NA	NA	NA	10 U	NA	10 U	NA	10 U
Copper	20	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	10	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	160	NA	NA	NA	NA	NA	NA	NA	NA	NA
FIELD PARAMETERS										
pH	---	6.57	7.0	6.72	7.68	7.14	6.6	8.94	6.65	8.80
Conductivity (uS)	---	5359	1340	7181	5158	6159	5299	6934	6912	2237
Turbidity (NTU)	---	low	medium	medium	low	7.53	medium	84.21	medium	19.97
Dissolved Oxygen (mg/L)	---	0.04	0.01	0.03	0.01	0.60	0.04	0.68	0.03	0.53
Temperature (°C)	---	14.88	13.65	14.5	10.82	12.10	13.26	11.65	14.23	11.97
ORP (mV)	---	-447.3	-446.1	-446	-145.8	-186.2	-447.1	-94.6	-447.3	-134.6

Bold value indicates concentration exceeds the cleanup level.
U = The analyte was not detected in the sample at the given reporting limit.
NA = Not analyzed/not applicable
--- = Cleanup level not available

(a) Cleanup levels for Benzo(b)fluoranthene and Benzo(k)fluoranthene respectively.
(b) The cleanup level value shown is for Chromium III.

*Samples for MW-2(I) were incorrectly labeled as MW-21(I) on the chain-of-custody report and the laboratory analytical results.

TABLE 5
VOLUME ESTIMATION FOR LANDFILL WASTE MATERIAL AND ADJACENT SOIL
ROD MILL AREA CLOSED LANDFILL INTERIM ACTION
FORMER KAISER SITE
TACOMA, WASHINGTON

	Closed Landfill
Area (ft^2)	39,000
Assumed Depth of Landfill Waste Material (ft)	7.5
Volume of Landfill Waste Material (yd^3)	10,800
Thickness of Landfill Waste Material Including Underlying 1-ft Soil Zone (ft)	8.5
Estimated Volume of Landfill Waste Material and Adjacent Soil (yd^3) (a)	12,300
Estimated Tonnage of Landfill Waste and Adjacent Soil (tons) (a) (b)	20,900

Notes: (a) Estimated volume includes existing soil on top of the waste material and 1-ft thick soil zone beneath the waste material.

(b) Landfill waste material and adjacent soil assumed to have an average density of 1.7 tons per yd^3.

APPENDIX A

Rod Mill Area Closed Landfill Logs of Exploration

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL(1)	TYPICAL DESCRIPTIONS (2)(3)
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

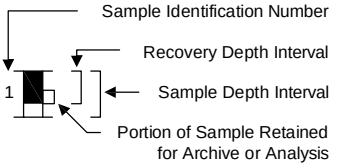
Primary Constituent:	> 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
	> 15% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and ≤ 15% - "with gravel," "with sand," "with silt," etc.
	≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Single-Tube Core Barrel
f	Double-Tube Core Barrel
g	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Rotosonic
5	Air Rotary (Rock)
6	Wash Rotary (Rock)
7	Other - See text if applicable

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽ ATD — Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

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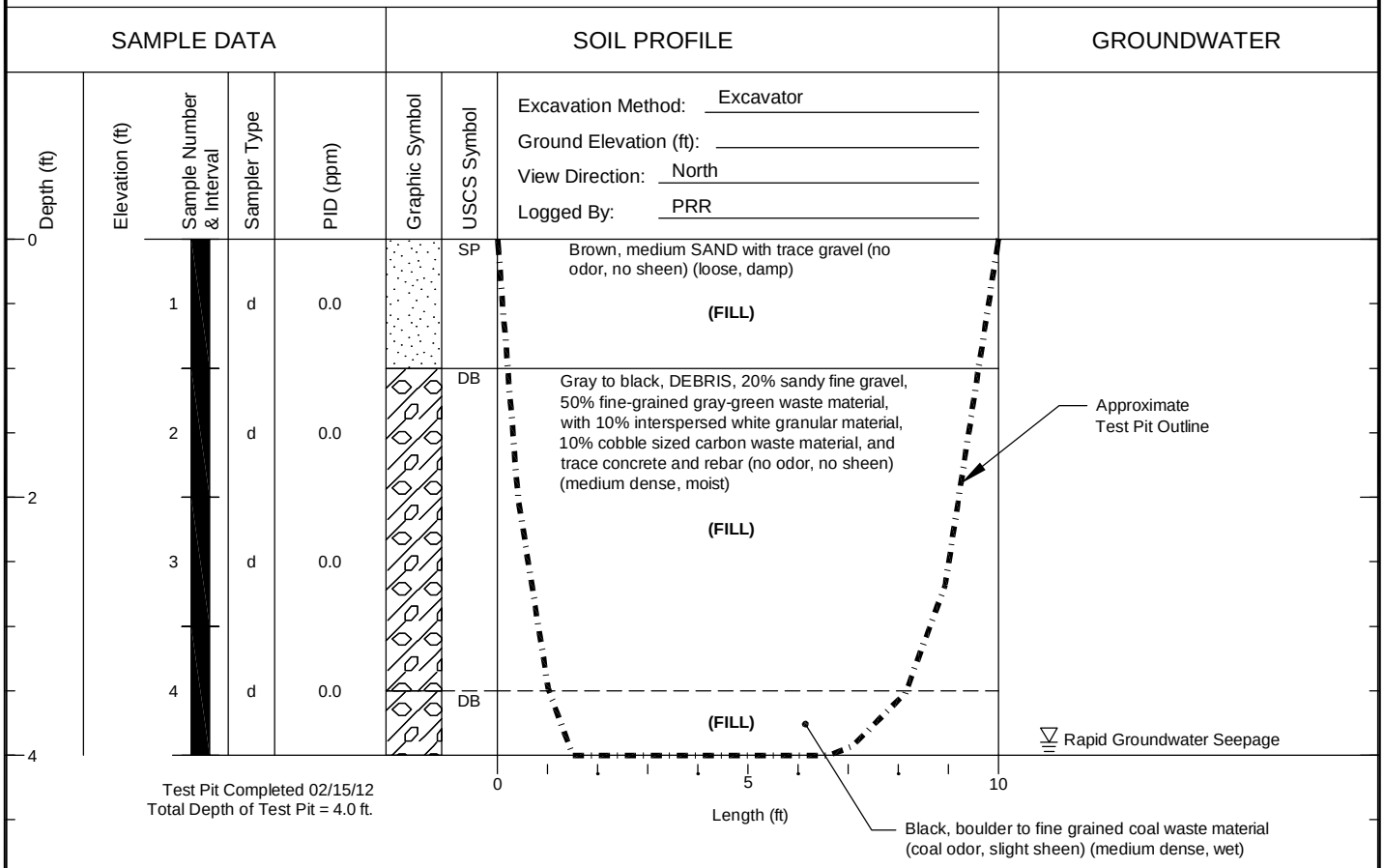
Kaiser Aluminum
Tacoma, Washington

Soil Classification System and Key

Figure
A-1

RM-LF30-2012



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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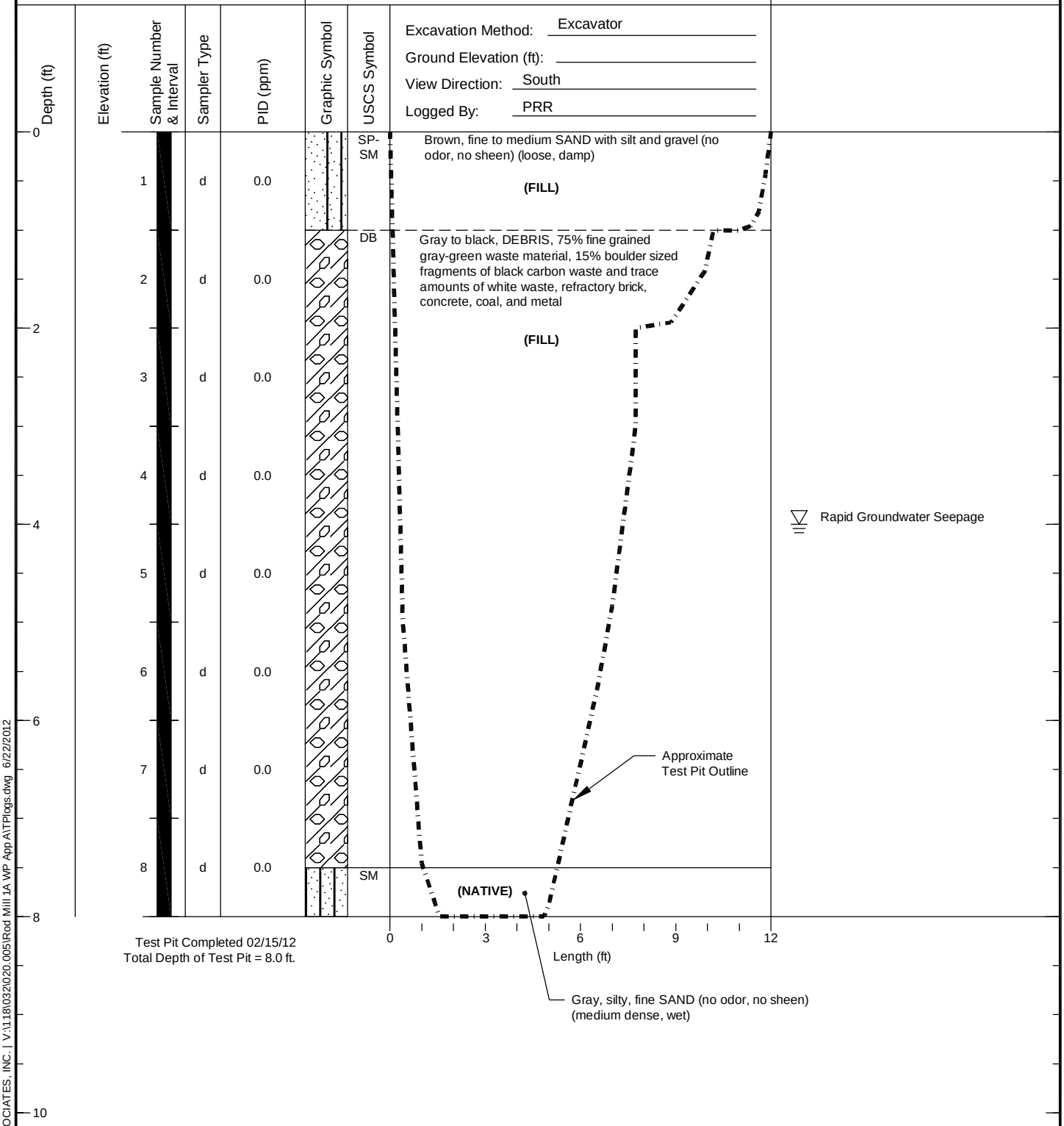
Kaiser Aluminum Tacoma, Washington	Log of Test Pit RM-LF30-2012	Figure A-2

RM-LF31-2012



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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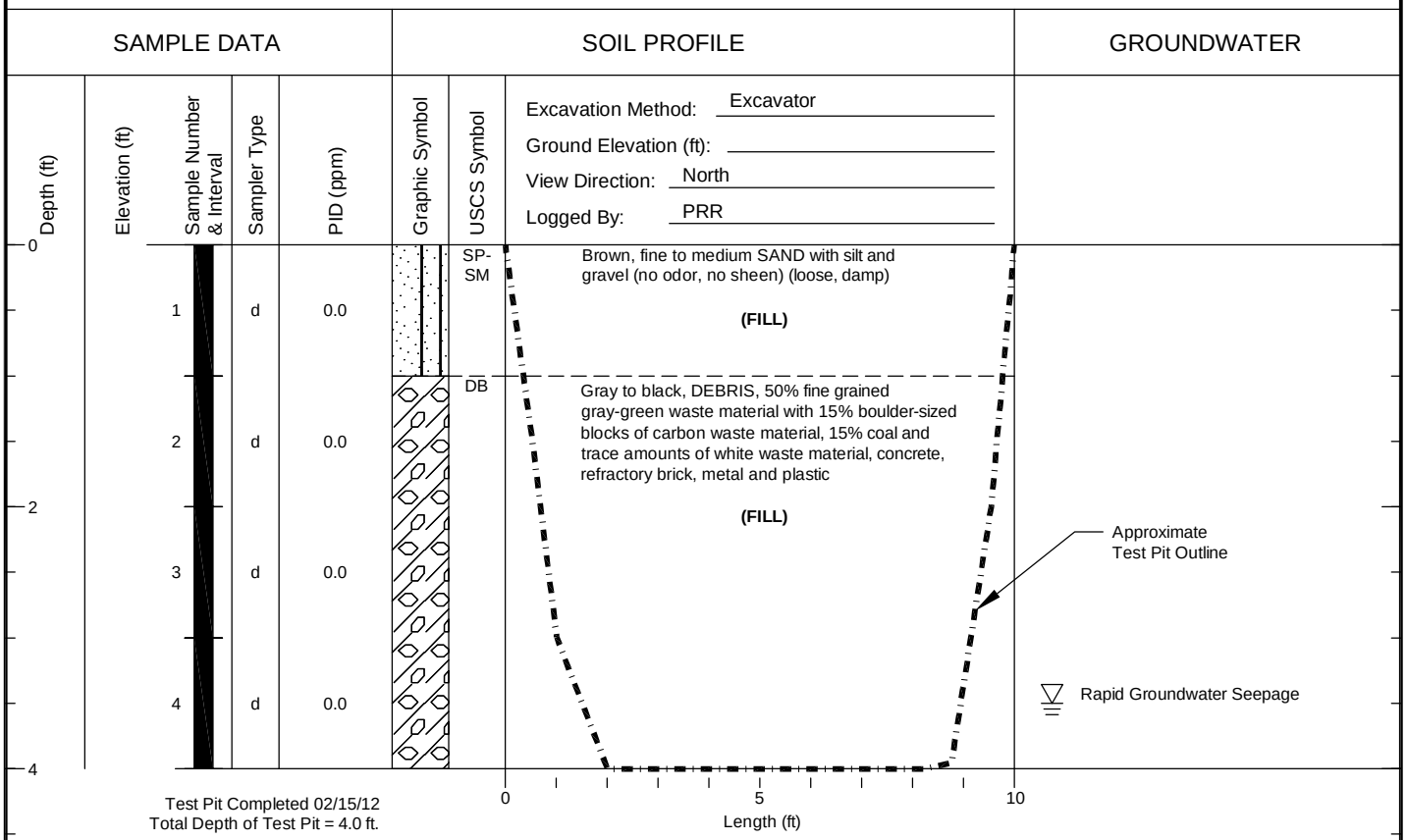
Kaiser Aluminum
Tacoma, Washington

Log of Test Pit RM-LF31-2012

Figure
A-3

RM-LF32-2012



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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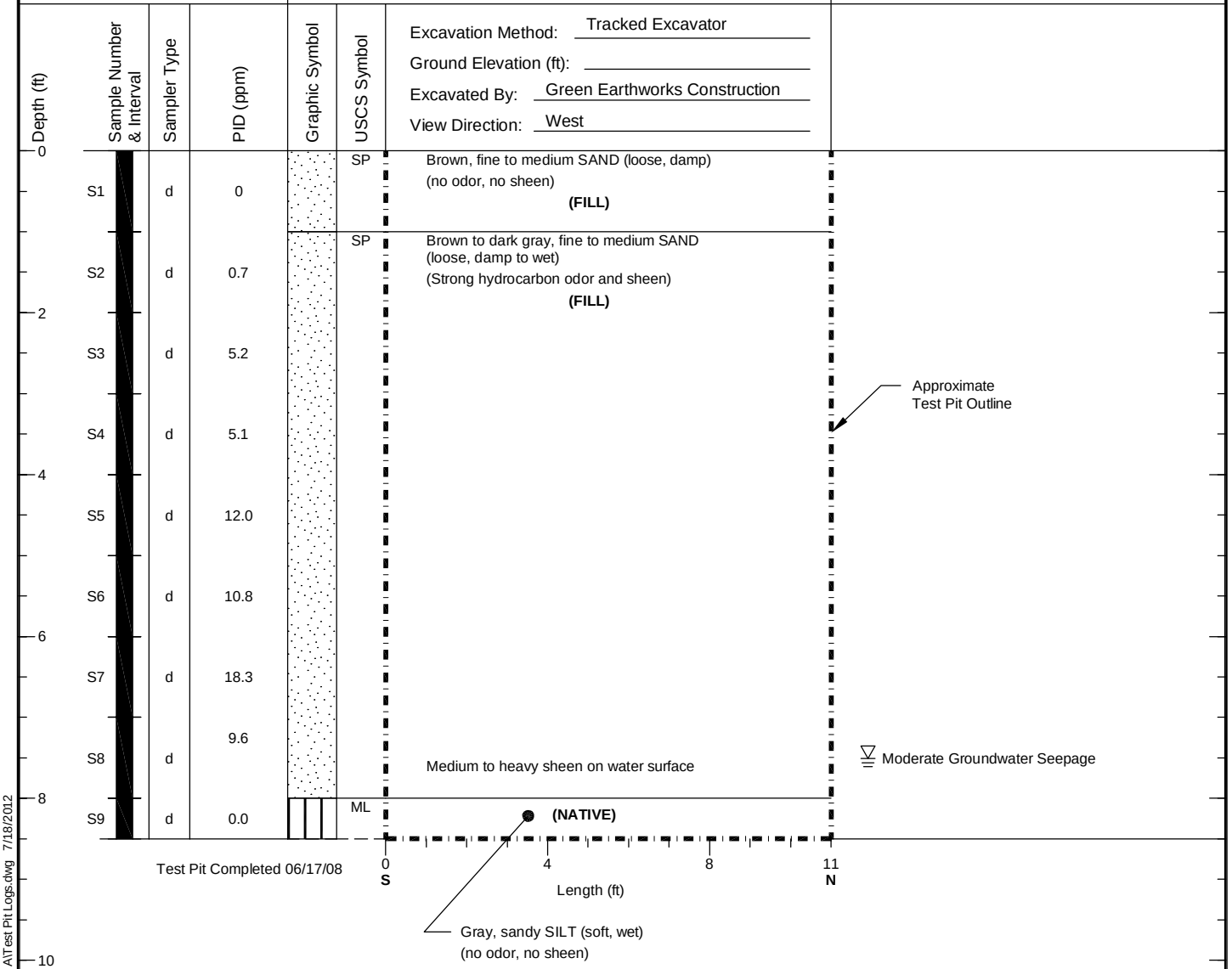
Kaiser Aluminum Tacoma, Washington	Log of Test Pit RM-LF32-2012	Figure A-4

RM-LF13-2008



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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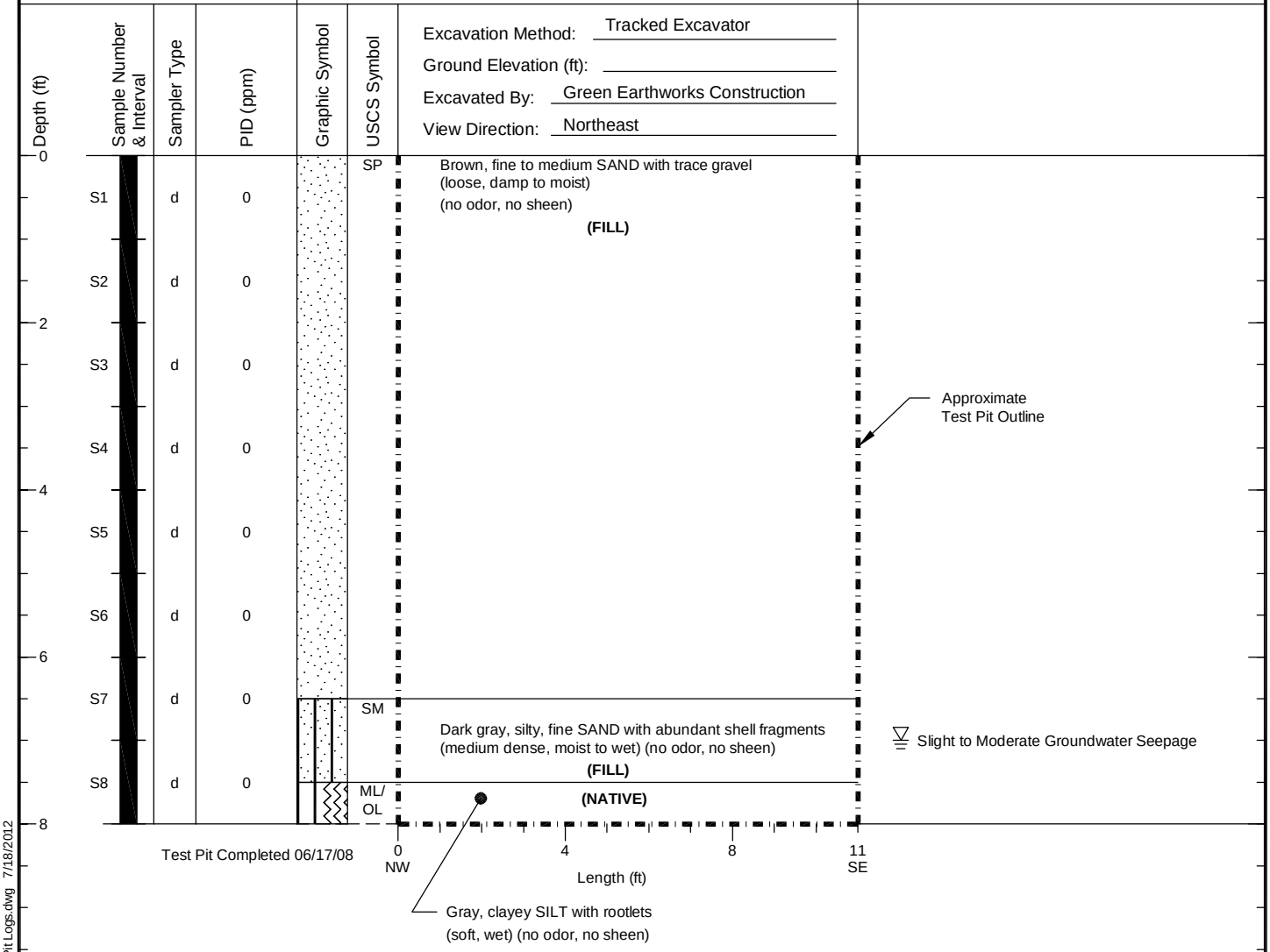
Kaiser Aluminum
Tacoma, Washington

Log of Test Pit RM-LF13-2008

Figure
A-5

RM-LF14-2008



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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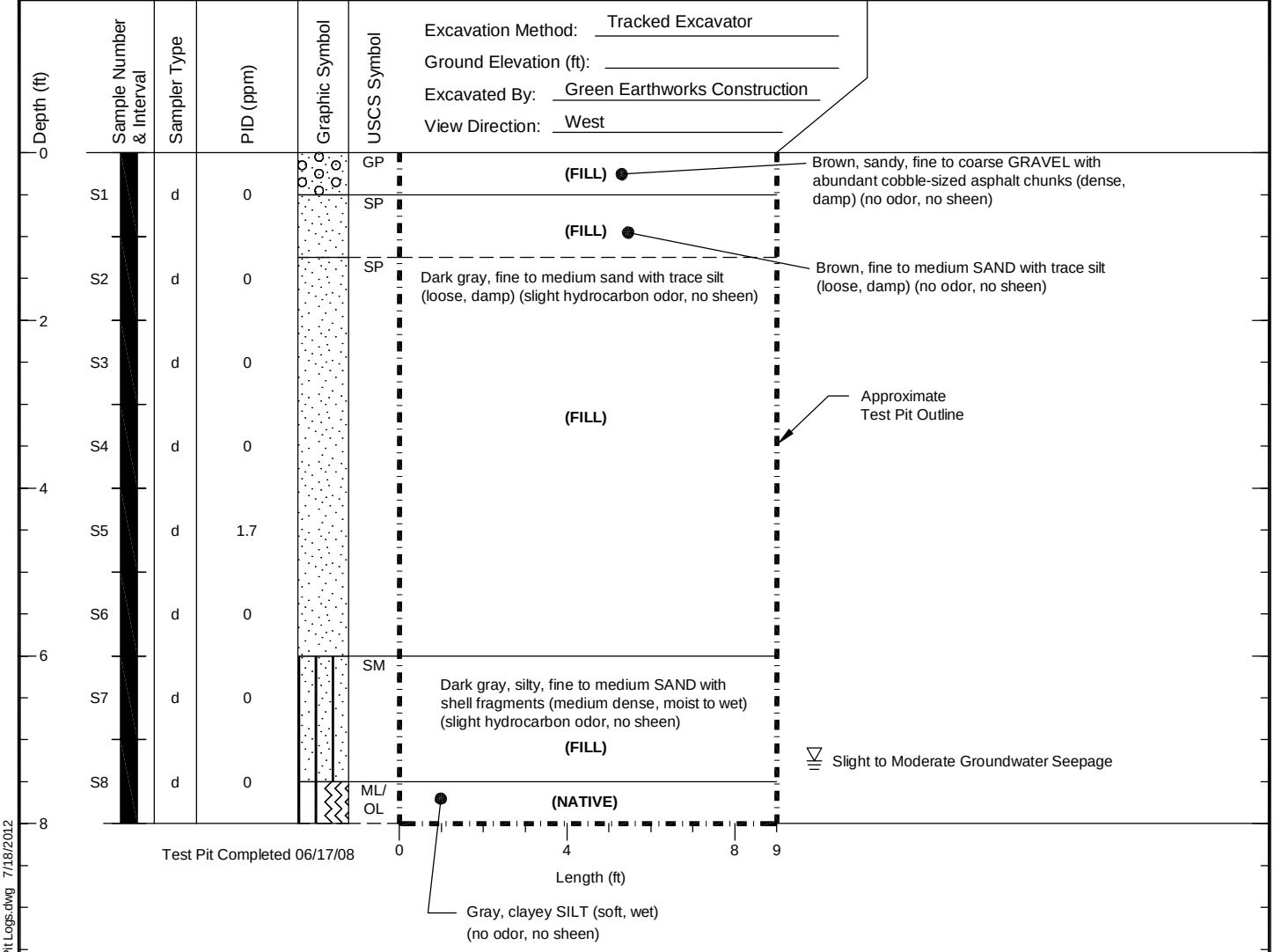
Kaiser Aluminum Tacoma, Washington	Log of Test Pit RM-LF14-2008	Figure A-6

RM-LF15-2008



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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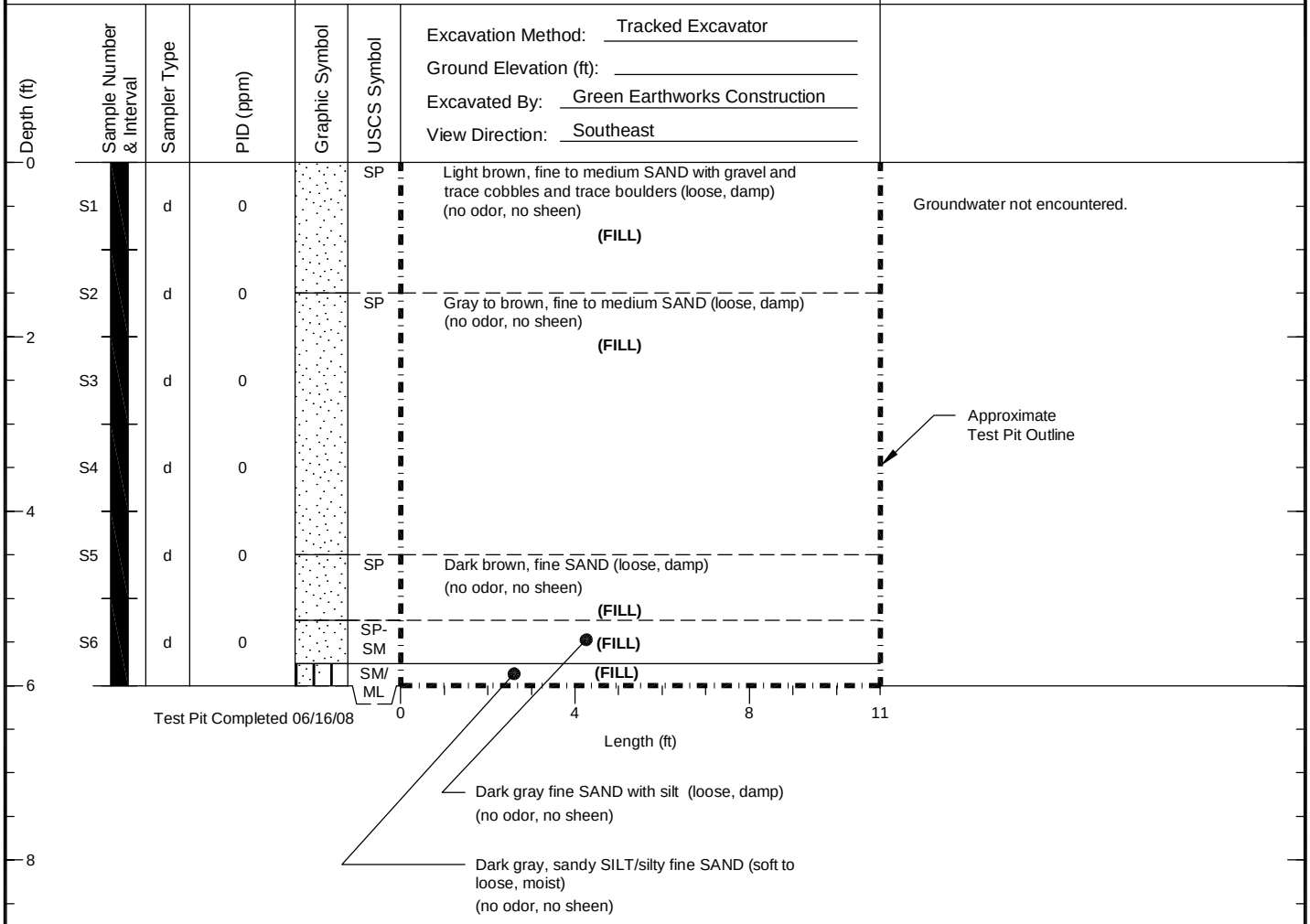
Kaiser Aluminum Tacoma, Washington	Log of Test Pit RM-LF15-2008	Figure A-7

RM-LF16-2008



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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Kaiser Aluminum
Tacoma, Washington

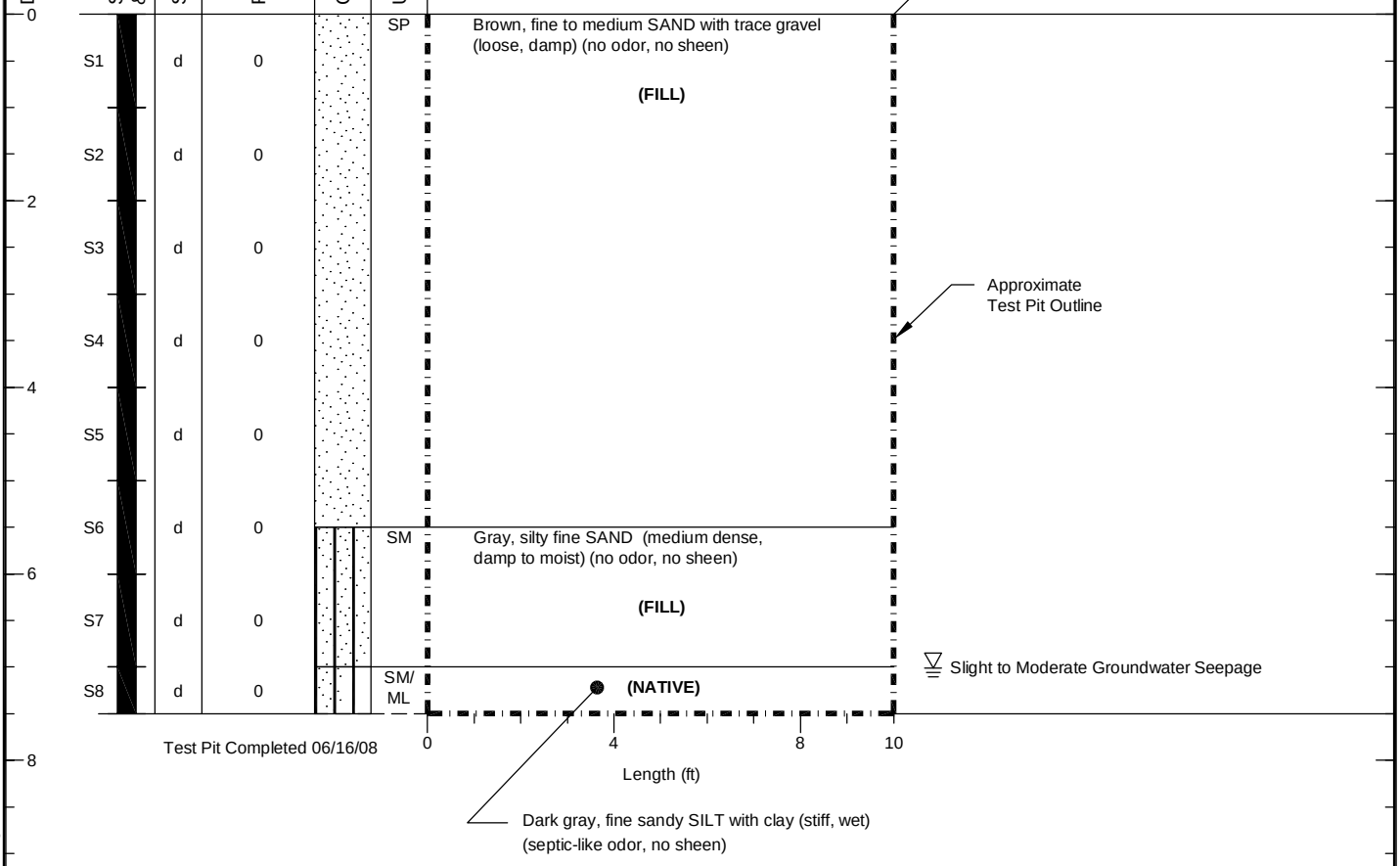
Log of Test Pit RM-LF16-2008

Figure
A-8

RM-LF17-2008

SAMPLE DATA | SOIL PROFILE | NOTES/GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): _____
Excavated By: Green Earthworks Construction
View Direction: West



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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Kaiser Aluminum
Tacoma, Washington

Log of Test Pit RM-LF17-2008

Figure
A-9

RM-LF18-2008

SAMPLE DATA | SOIL PROFILE | NOTES/GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): _____
Excavated By: Green Earthworks Construction
View Direction: East

Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol	Description
0	S1	d	0		SP	Light brown, fine to medium SAND with gravel and trace silt (loose, damp) (no odor, no sheen) **(FILL)**
	S2	d	0		SM	Dark gray, silty fine SAND (medium dense, damp to moist) (no odor, no sheen)
2	S3	d	0			Approximately 70% of total volume from 1 to 4.5 ft bgs is waste. Waste includes:. 40% cobble- and boulder-sized chunks of black carbon waste material; < 5% bauxite ore; 10% refractory brick; 15% mixed waste
	S4	d	0			
4	S5	d	0			Red rubber hoses mixed with waste at 3 ft bgs. Approximately 30% of total volume from 4.5 to 9.5 ft bgs is mixed waste and soil. **(FILL)**
	S6	d	0			
6	S7	d	0			
	S8	d	0			
8	S9	d	0			
	S10	d	0		SM/ ML	**(NATIVE)** Gray, sandy SILT/silty fine SAND (stiff/loose, wet) (septic-like odor, no sheen)
10						
12						
14						

Groundwater not encountered.

Approximate Test Pit Outline

Test Pit Completed 06/16/08

0 4 8 10
Length (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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Kaiser Aluminum
Tacoma, Washington

Log of Test Pit RM-LF18-2008

Figure
A-10

RM-LF19-2008

SAMPLE DATA | SOIL PROFILE | NOTES/GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): _____
Excavated By: Green Earthworks Construction
View Direction: North

Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol	Description
0	S1	d	0		SP	Light brown, medium SAND with trace gravel (loose damp) (no odor, no sheen) **(FILL)**
	S2	d	0		SP-SM	Dark brown, fine to medium SAND with silt and cobbles (medium dense, damp) (no odor, no sheen)
2	S3	d	0			Trace amounts of total volume are waste. Waste includes:. < 5% cobble- and boulder-sized chunks of black carbon waste material < 5% refractory brick < 5% rebar < 1% cloth fabric < 1% metal debris (pipe elbows) **(FILL)**
	S4	d	0			
4	S5	d	0			
	S6	d	0			
6	S7	d	0		SM	Dark gray, silty fine SAND (loose to medium dense, moist to wet) (no odor, no sheen) **(FILL)**
	S8	d	0		ML/OL	**(NATIVE)**
8						Gray, clayey SILT with trace wood debris (twigs) (soft, wet) (no odor, no sheen)
10						
12						
14						

Approximate Test Pit Outline

Moderate Groundwater Seepage

Test Pit Completed 06/17/08

0 4 8
Length (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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Kaiser Aluminum
Tacoma, Washington

Log of Test Pit RM-LF19-2008

Figure
A-11

RM-LF20-2008

SAMPLE DATA				SOIL PROFILE			NOTES/GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol		
0	S1	d	0		SM	Light brown, silty, gravelly, fine-medium SAND (loose, damp) **(FILL)**	Approximate Test Pit Outline
2	S2	d	0				
	S3	d	0				
	S4	d	0		SP-SM	Dark gray to black, gravelly, fine-medium SAND with silt and cobbles (very dense, damp to moist) 25% of total volume is cobble to boulder-sized chunks of concrete <5% of total volume is refractory brick **(FILL)**	
4	S5	d	0				
	S6	d	0				
6	S7	d	0		SP-SM	Dark gray, fine-medium SAND with silt and abundant shell fragments (medium dense, wet) **(FILL)**	Rapid Seepage
	S8	d	0				
8	S9	d	0				
10							
12							
14							

Excavation Method: Tracked Excavator
Ground Elevation (ft): _____
Excavated By: Green Earthworks Construction
View Direction: Northeast

Test Pit Completed 06/17/08

0 NW — 4 — 8 — 12 — 16 — 19 SE
Length (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.

LANDAU ASSOCIATES

Kaiser Aluminum Tacoma, Washington	Log of Test Pit RM-LF20-2008	Figure A-12

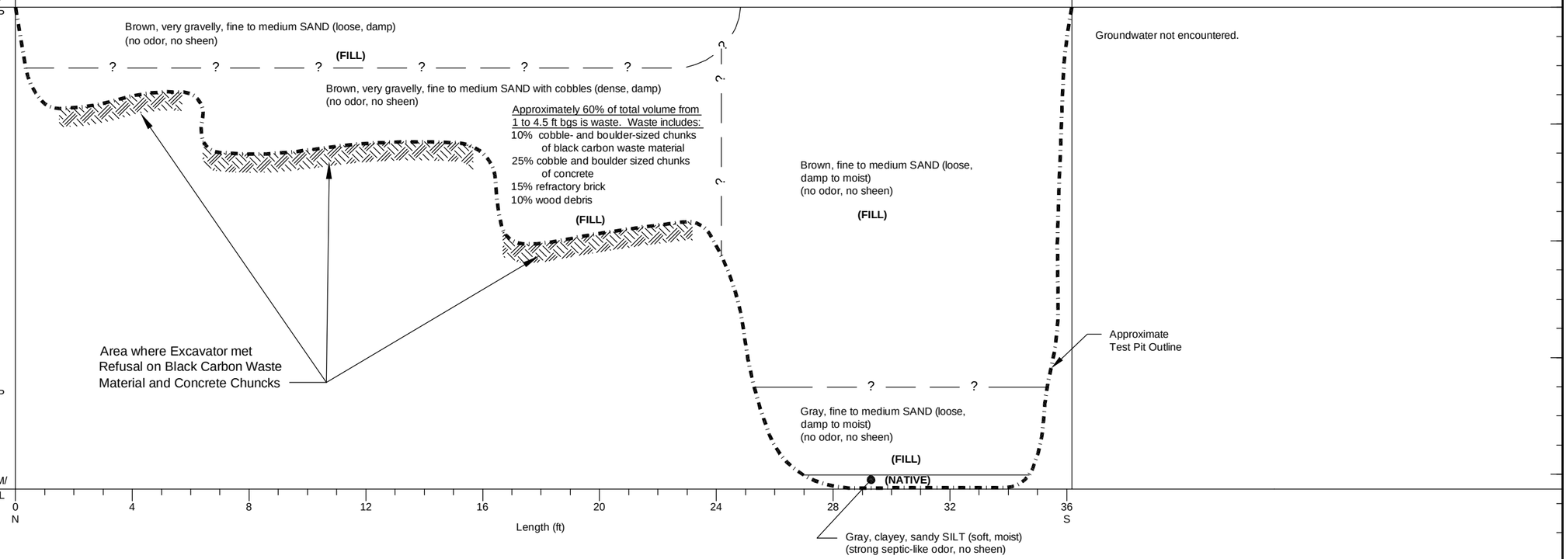
RM-LF21-2008

SAMPLE DATA | SOIL PROFILE | NOTES/GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft):
Excavated By: Green Earthworks Construction
View Direction: East

Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol
0	S1	d	0		SP
	S2	d	0		
2	S3	d	0		
	S4	d	0		
4	S5	d	0		
	S6	d	0		
6	S7	d	0		SP
	S8	d	0		
8	S9	d	0		SM/ ML
10					
12					
14					

Test Pit Completed 06/17/08



Groundwater not encountered.

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.

LANDAU ASSOCIATES

Kaiser Aluminum Tacoma, Washington	Log of Test Pit RM-LF21-2008	Figure A-13

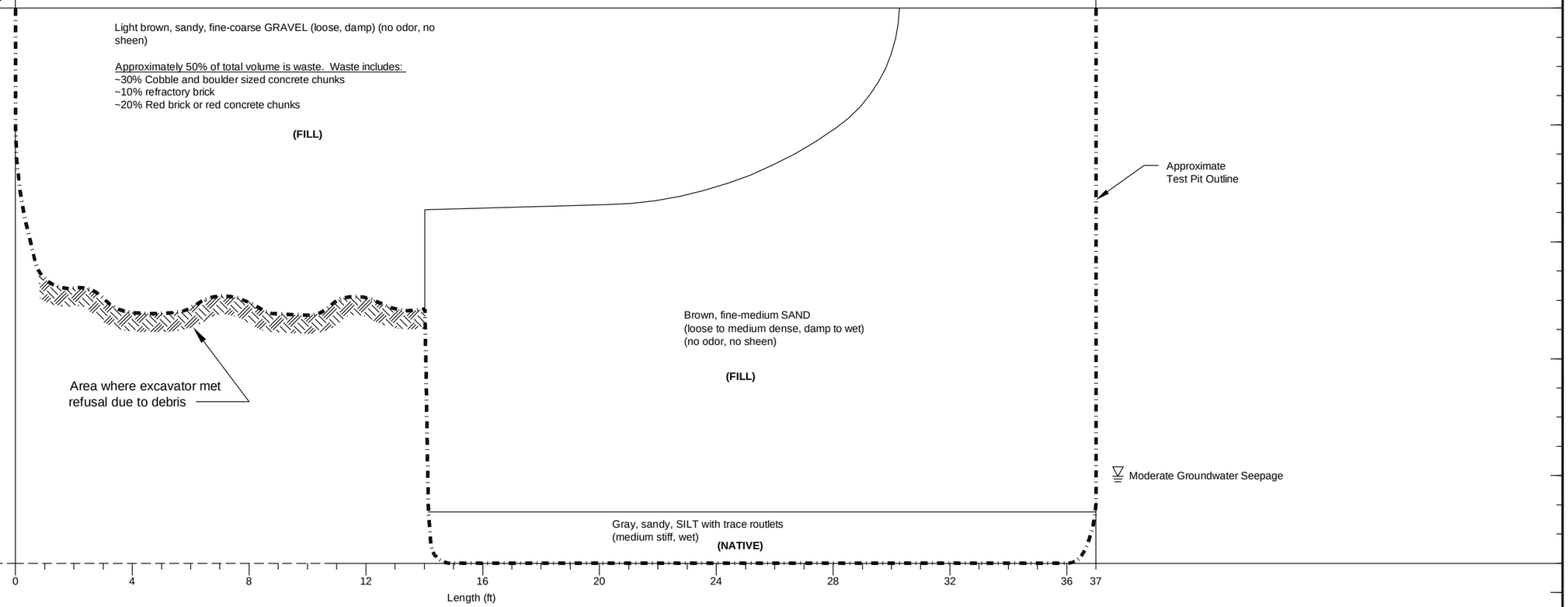
RM-LF22-2008

SAMPLE DATA | SOIL PROFILE | NOTES/GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): _____
Excavated By: Green Earthworks Construction
View Direction: East

Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)
0	S1	d	0
	S2	d	0
2	S3	d	0
	S4	d	0
4	S5	d	0
	S6	d	0
6	S7	d	0
	S8	d	0
8	S9	d	0
	S10	d	0
10			
12			
14			

Test Pit Completed 06/17/08



Notes:
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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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Kaiser Aluminum
Tacoma, Washington

Log of Test Pit RM-LF22-2008

Figure
A-14

RM-LF23-2008

SAMPLE DATA				SOIL PROFILE			NOTES/GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol		

Excavation Method: Tracked Excavator
Ground Elevation (ft): _____
Excavated By: Green Earthworks Construction
View Direction: North

Sample	Sampler Type	USCS Symbol	Description
S1	d	SP-SM	Brown, fine to medium SAND with silt and trace gravel (loose, damp)
S2	d		Trace to 30% of total volume is gravel- to cobble-sized chunks of concrete
S3	d		**(FILL)**
			Volume of concrete chunks increases to approximately 30% to 40% from 1.75 to 7 ft bgs. Boulder-sized chunks of concrete are also present
S4	d	SP-SM	**(FILL)**
S5	d		
S6	d		
S7	d		
S8	d	SM	Dark gray, silty fine SAND with shell fragments (loose to medium dense, wet) (no odor, no sheen) **(FILL)**
S9	d	ML/OL	**(NATIVE)**

Approximate Test Pit Outline

Moderate Groundwater Seepage

Test Pit Completed 06/17/08

Length (ft)

Gray, clayey SILT with sand and twigs (soft, wet) (septic odor)

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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LANDAU ASSOCIATES

Kaiser Aluminum Tacoma, Washington	Log of Test Pit RM-LF23-2008	Figure A-15

RM-LF24-2008

SAMPLE DATA | SOIL PROFILE | NOTES/GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): _____
Excavated By: Green Earthworks Construction
View Direction: North

Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol	Description
0	S1	d			SP	Light brown, fine to medium SAND (loose, damp) (no odor, no sheen) **(FILL)**
2	S2	d			SP	Brown-orange, fine to medium SAND with trace gravel (medium dense, damp) (no odor, no sheen)
	S3	d			SP	Trace amounts of total volume are cobble-sized fragments of black carbon waste material **(FILL)**
4	S4	d				Black to tan-orange fine to medium SAND (medium dense to very dense, damp to wet) (no odor, no sheen)
	S5	d				20% to 50% of total volume is waste. Waste includes: 20% to 65% is cobble- to boulder- sized chunks of black, light, and porous carbon; 20% to 30% is mixture of carbon and coal tar pitch with a vitreous texture 20% is boulder-sized chunks of concrete 10% is white to gray, soft, chalk-like to clay-like mixture of cryolite and bauxite ore. Trace wood debris
6	S6	d				
	S7	d				
8	S8	d			SP	Black medium SAND (medium dense, moist to wet) (no odor, no sheen) **(FILL)**
	S9	d			ML	**(NATIVE)** Dark gray, clayey, fine sandy, SILT (stiff, wet) (no odor, no sheen)
10						
12						
14						

Approximate Test Pit Outline

Slow Seepage

Test Pit Completed 06/17/08

0 4 8 12 14
Length (ft)

Notes:
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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.

LANDAU ASSOCIATES, INC. | V:\118\032\020.005\Rod Mill 1A WP App A\Test Pit Logs.dwg 7/18/2012

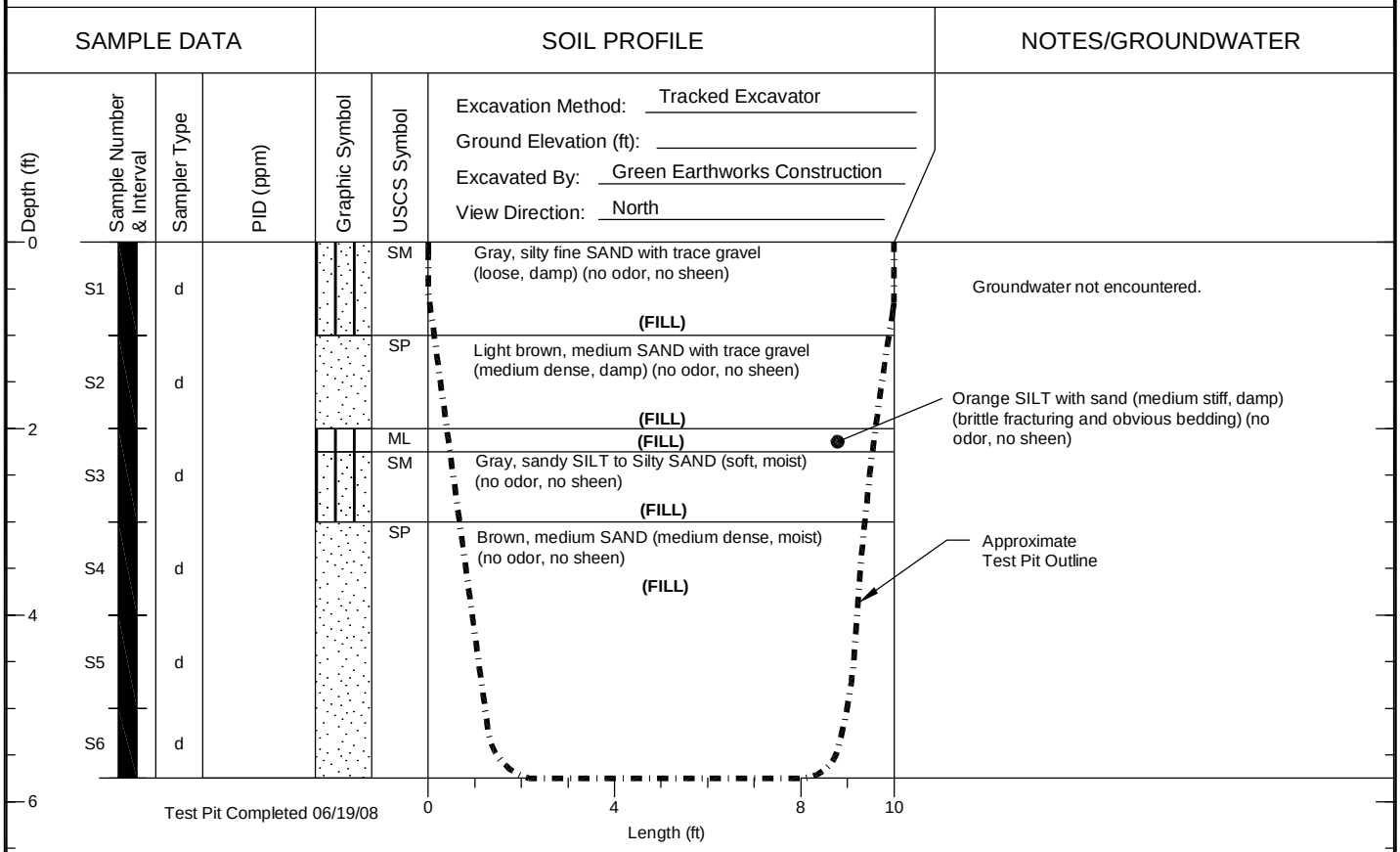
LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Test Pit RM-LF24-2008

Figure
A-16

RM-LF25-2008



Notes:
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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.

LANDAU ASSOCIATES, INC. | V:\118\032\020.005\Rod Mill 1A WP App A\Test Pit Logs.dwg 7/18/2012

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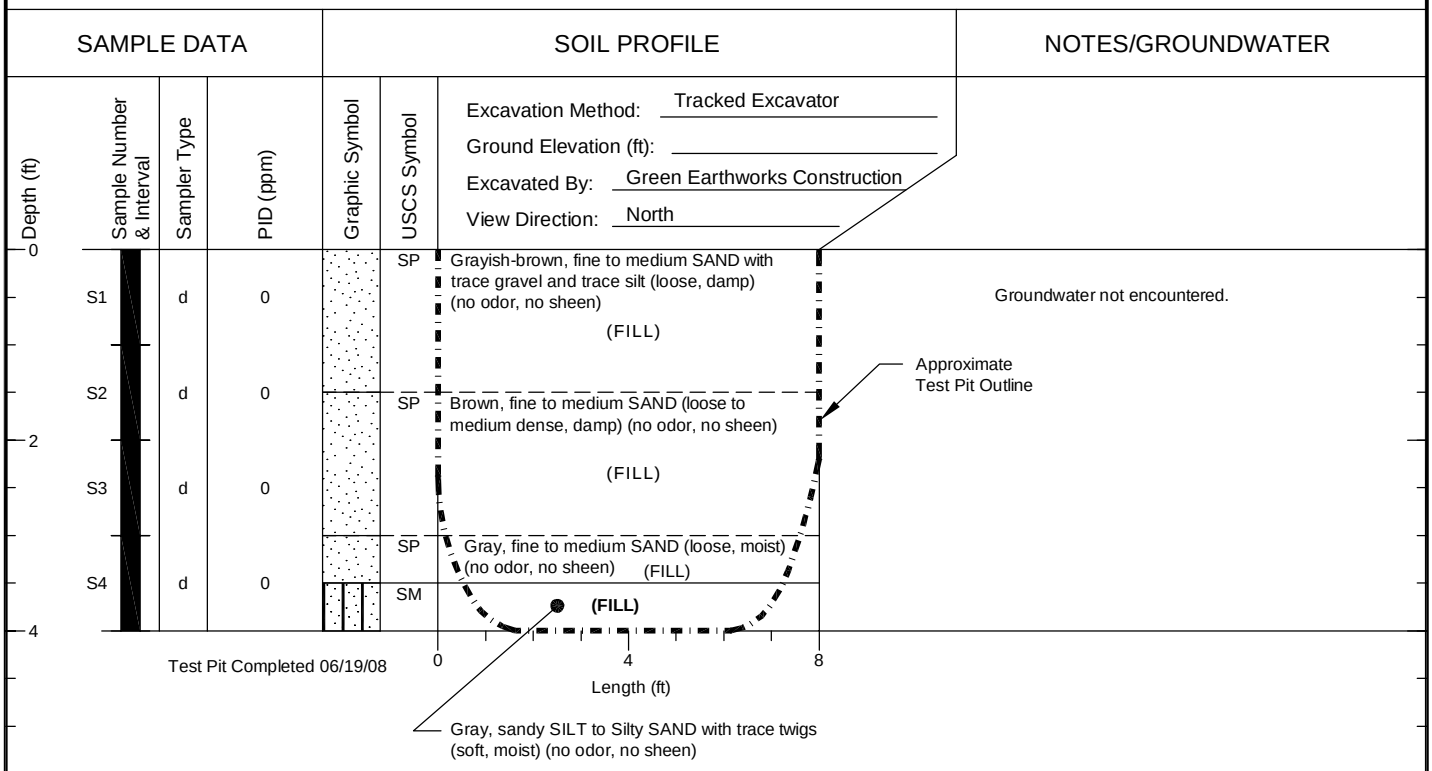
Kaiser Aluminum Tacoma, Washington	Log of Test Pit RM-LF25-2008	Figure A-17

RM-LF26-2008



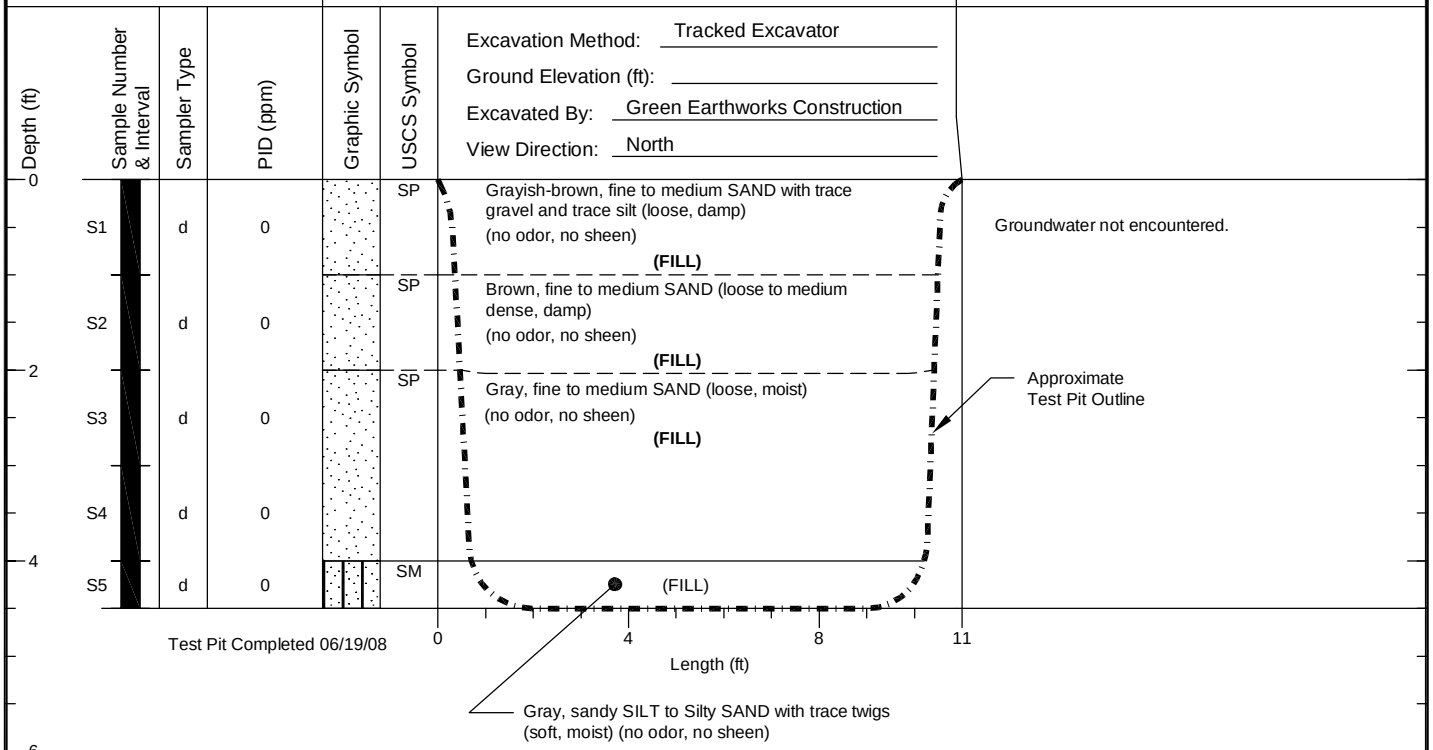
Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES, INC. | V:\118\032\020.005\Rod Mill 1A WP App A\Test Pit Logs.dwg 7/18/2012

LANDAU ASSOCIATES

Kaiser Aluminum Tacoma, Washington	Log of Test Pit RM-LF26-2008	Figure A-18

RM-LF27-2008



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.

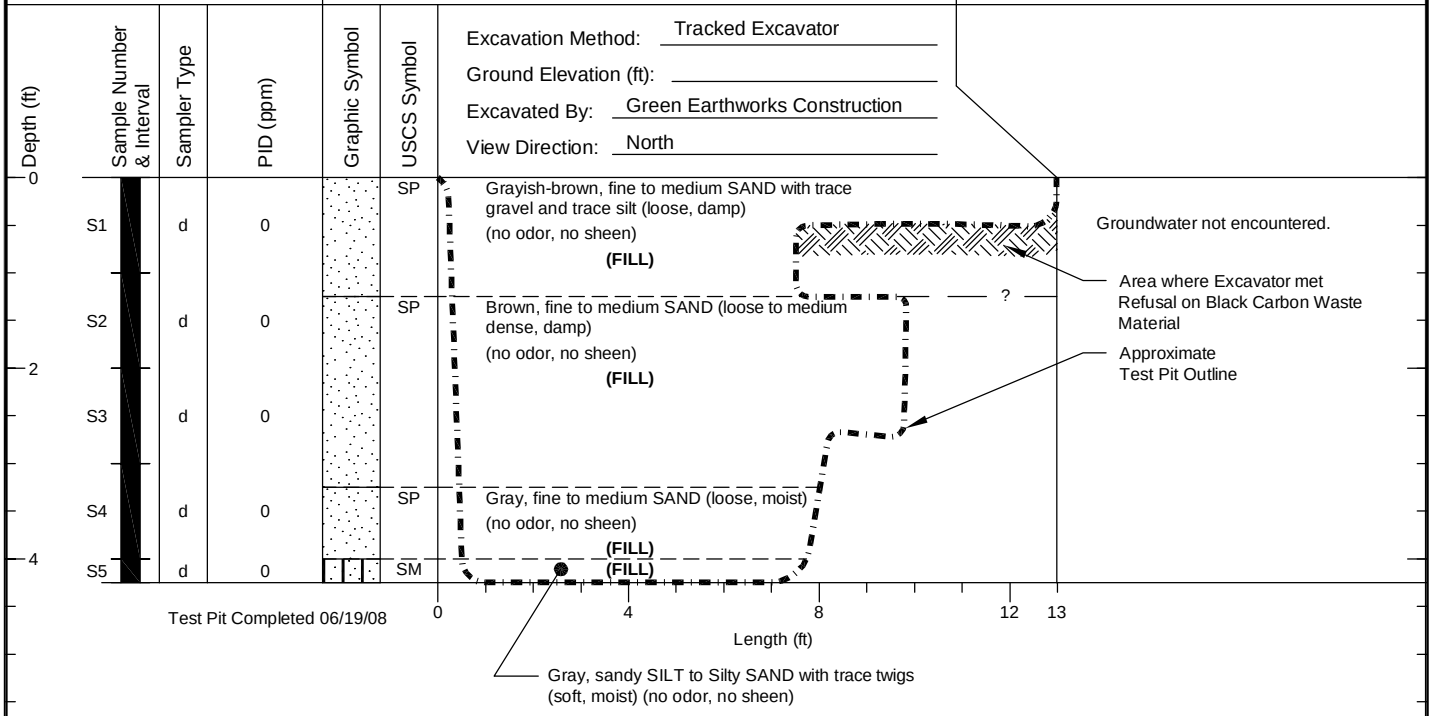
LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Test Pit RM-LF27-2008

Figure
A-19

RM-LF28-2008



Notes:
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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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Kaiser Aluminum
Tacoma, Washington

Log of Test Pit RM-LF28-2008

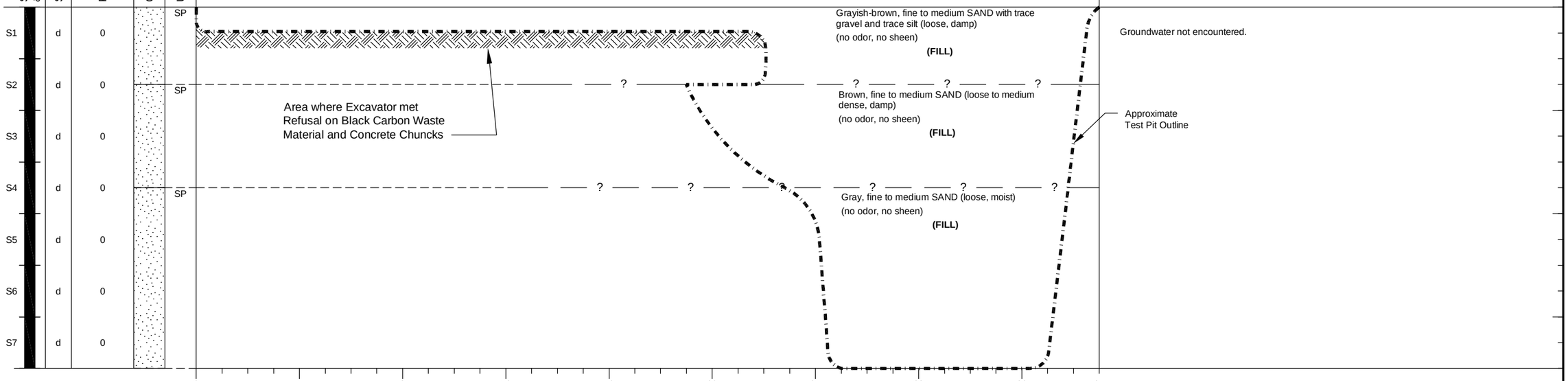
Figure
A-20

RM-LF29-2008

SAMPLE DATA | SOIL PROFILE | NOTES/GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): _____
Excavated By: Green Earthworks Construction
View Direction: South

Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol
0	S1	d	0		SP
2	S2	d	0		SP
	S3	d	0		
4	S4	d	0		SP
	S5	d	0		
6	S6	d	0		
	S7	d	0		
8					
10					
12					
14					

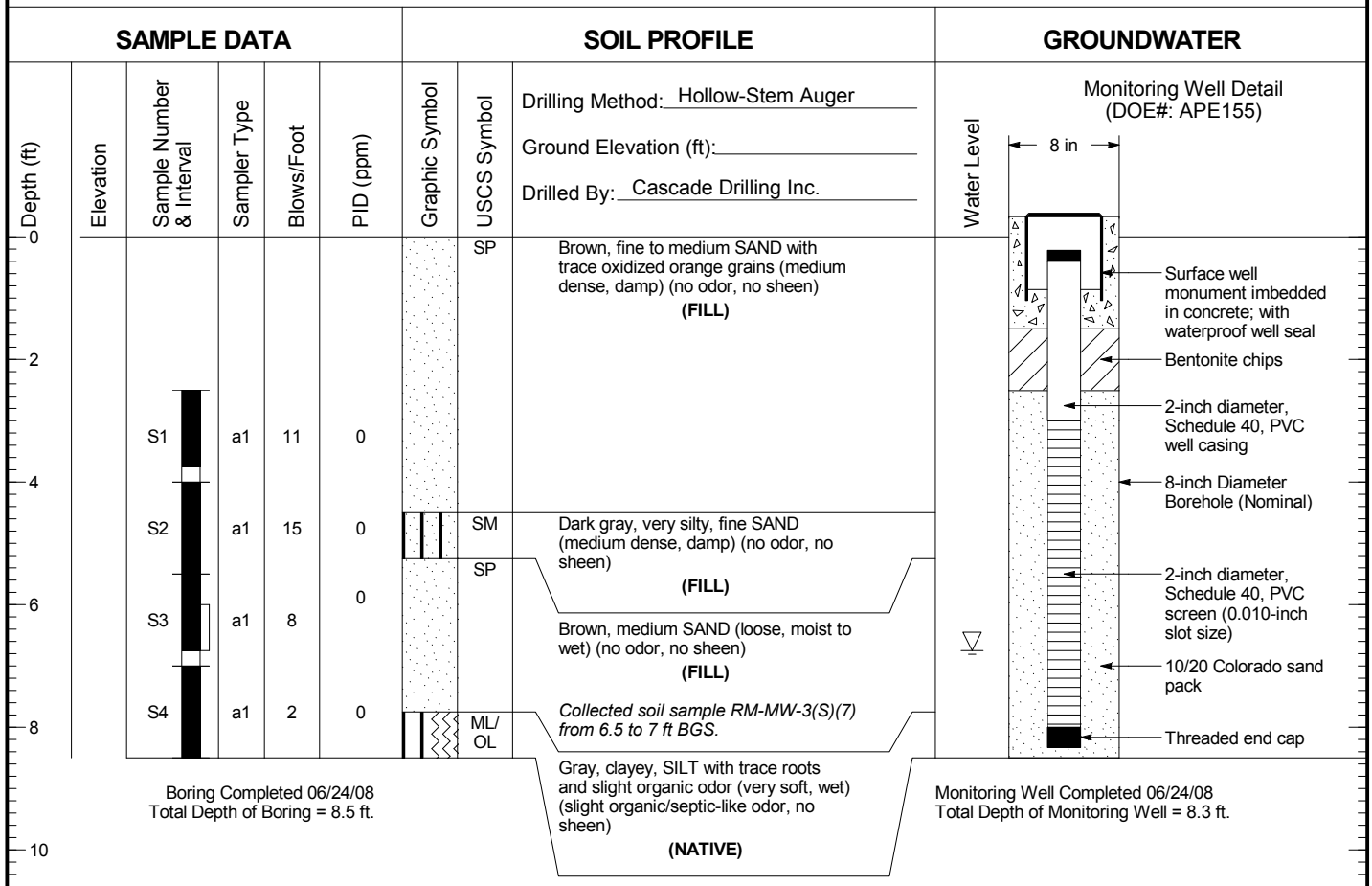


Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Kaiser Aluminum Tacoma, Washington	Log of Test Pit RM-LF29-2008	Figure A-21

RM-MW-3(S)



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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

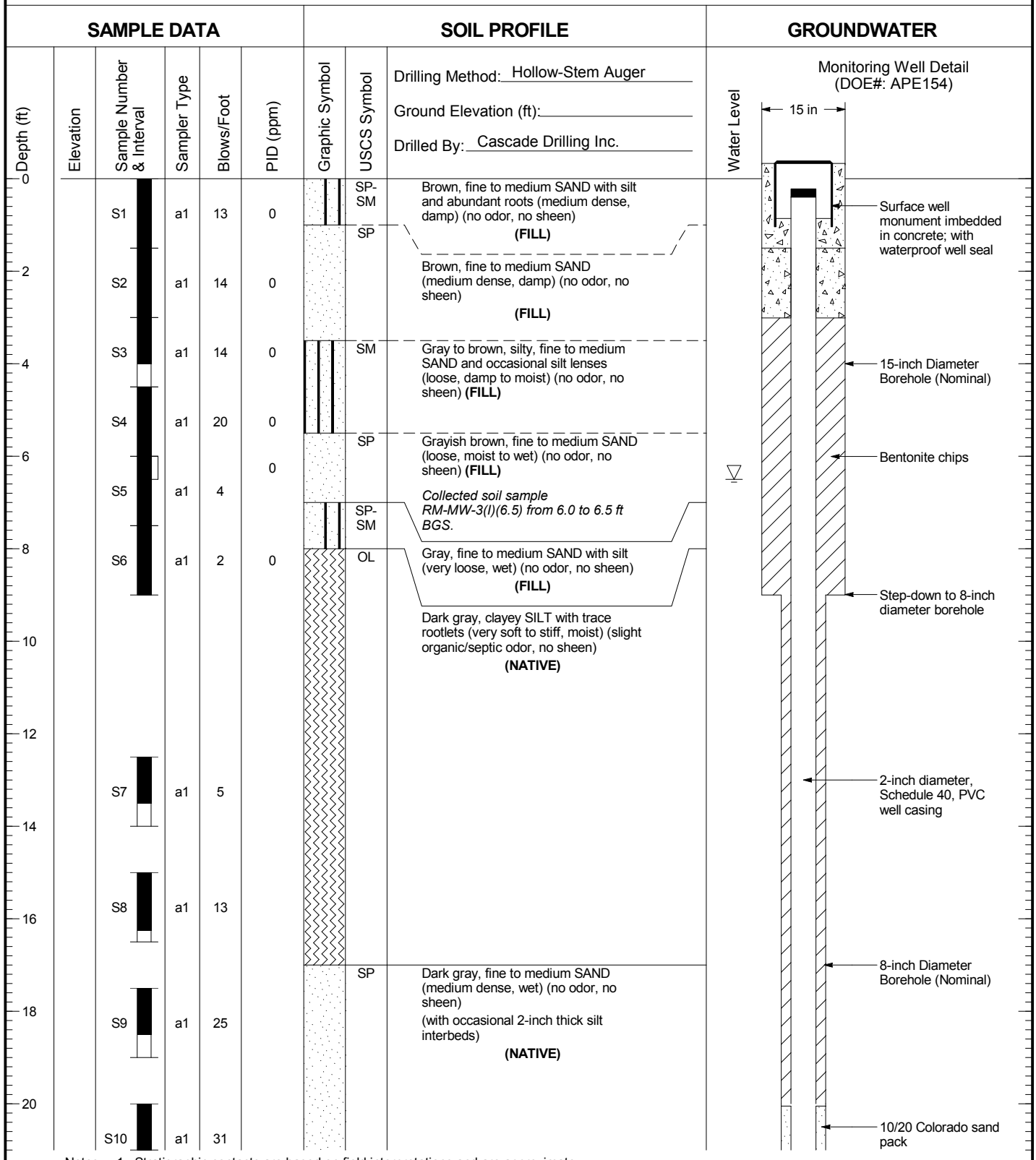
LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-3(S)

Figure
A-22

RM-MW-3(I)



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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

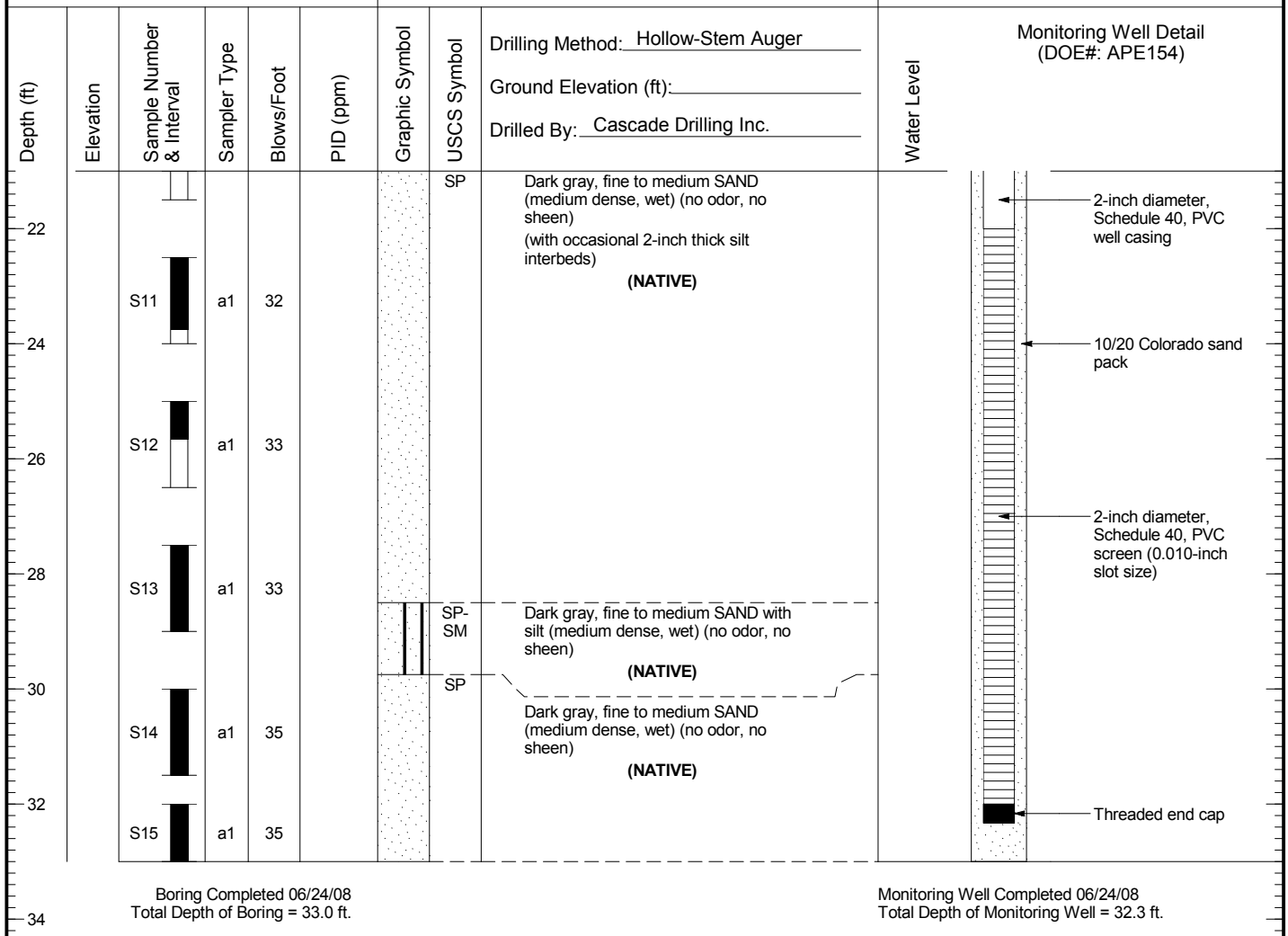
LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-3(I)

Figure
A-23
(1 of 2)

RM-MW-3(I)



Boring Completed 06/24/08
Total Depth of Boring = 33.0 ft.

Monitoring Well Completed 06/24/08
Total Depth of Monitoring Well = 32.3 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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

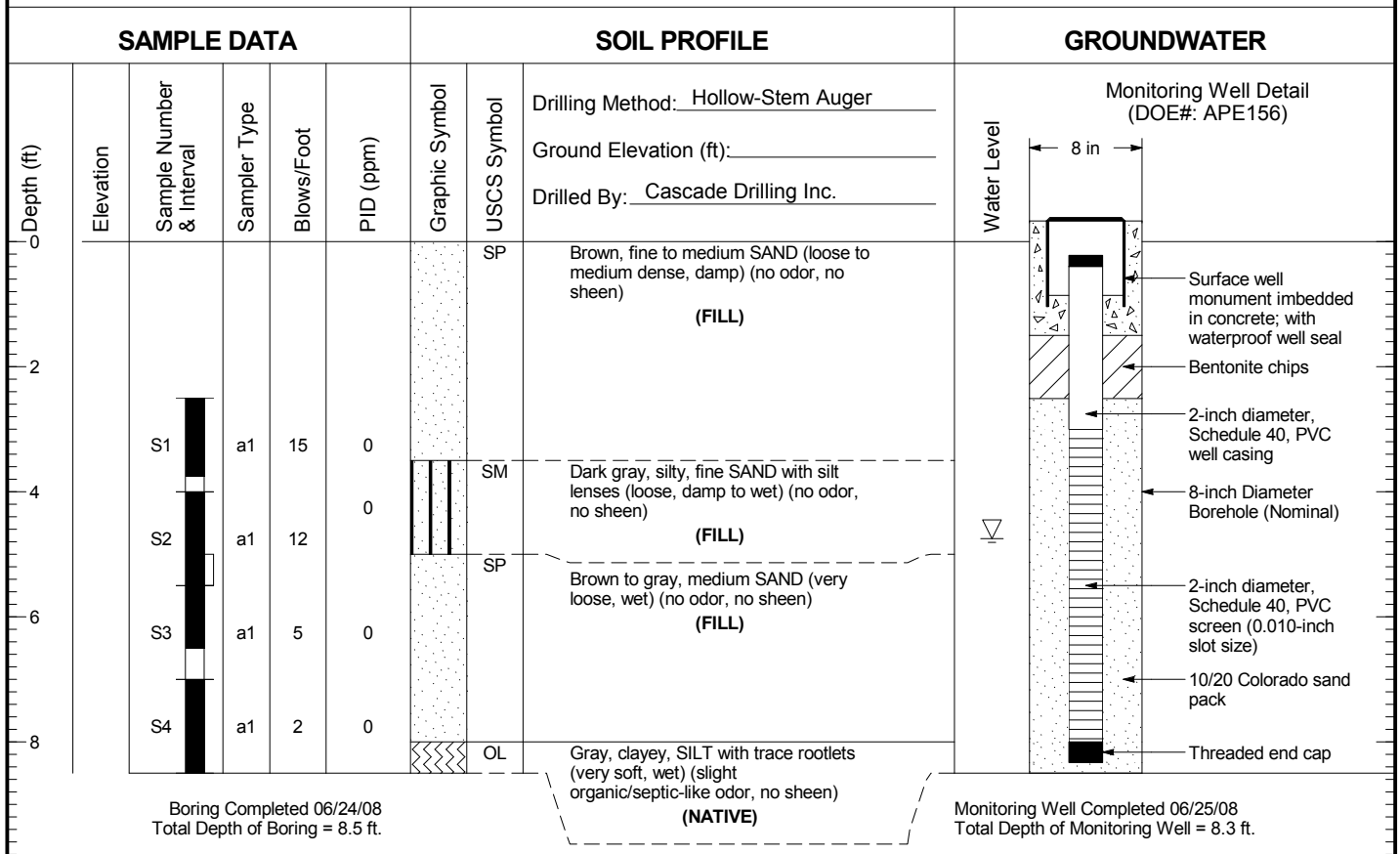
LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-3(I)

Figure
A-23
(2 of 2)

RM-MW-4(S)



Boring Completed 06/24/08
Total Depth of Boring = 8.5 ft.

Monitoring Well Completed 06/25/08
Total Depth of Monitoring Well = 8.3 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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-4(S)

Figure
A-24

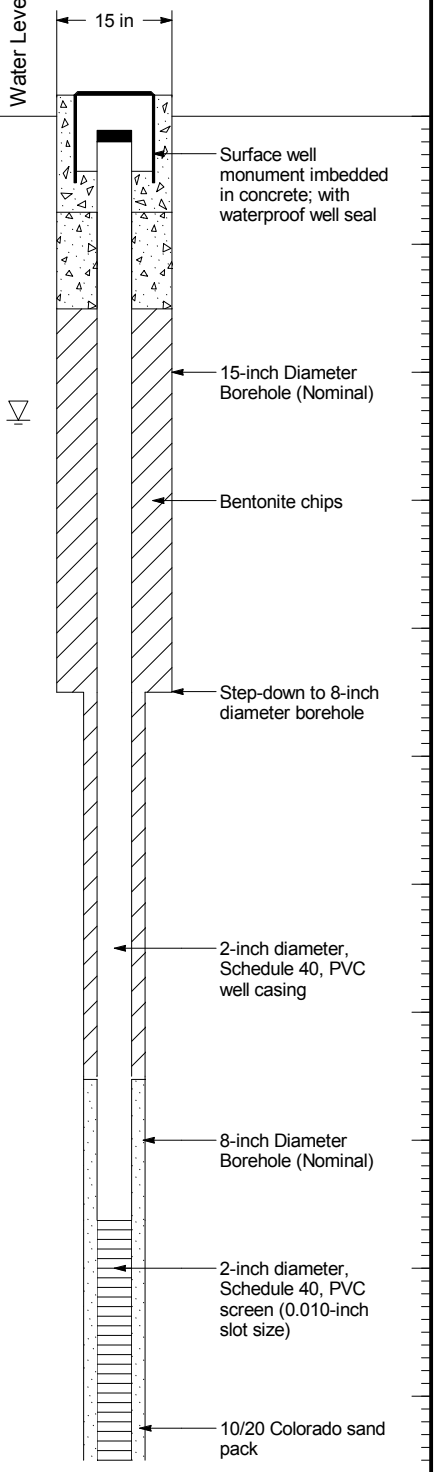
RM-MW-4(I)

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Soil Profile
								Drilling Method: Hollow-Stem Auger
								Ground Elevation (ft):
								Drilled By: Cascade Drilling Inc.
0							SP	Brown, gray, and tan, fine to medium SAND (loose, damp) (no odor, no sheen) **(FILL)**
2		S1	a1	12	0			
4					0.6		SM	Dark gray, very silty, fine SAND with silt lenses (loose, moist to wet) (no odor, no sheen)
		S2	a1	6			SP	Brown, fine to medium SAND (medium dense, damp) (no odor, no sheen) **(FILL)**
6		S3	a1	6	0			Brown to gray, medium SAND (loose, wet) (no odor, no sheen) **(FILL)**
8		S4	a1	3	0		OL	*Collected soil sample RM-MW-4(I)(5.5) from 5.0 to 5.5 ft BGS.* Gray, clayey SILT with trace rootlets (soft, wet) (slight organic/septic-like odor, no sheen) **(NATIVE)**
10								
12								
14								
16							SM	Dark gray, silty to very silty, fine to medium SAND (loose to medium dense, wet) (no odor, no sheen) **(NATIVE)**
18								
20								

Groundwater

Water Level

Monitoring Well Detail
(DOE#: APE157)



Notes:
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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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-4(I)

Figure
A-25
(1 of 2)

RM-MW-4(I)

SAMPLE DATA						SOIL PROFILE			GROUNDWATER	
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-Stem Auger Ground Elevation (ft): Drilled By: Cascade Drilling Inc.	Water Level	Monitoring Well Detail (DOE#: APE157)
22							SM	Dark gray, silty to very silty, fine to medium SAND (loose to medium dense, wet) (no odor, no sheen) **(NATIVE)**		2-inch diameter, Schedule 40, PVC screen (0.010-inch slot size)
24										10/20 Colorado sand pack
26										
28							SP	Gray, fine to medium SAND with trace silt and trace sandy silt interbeds (medium dense, wet) (no odor, no sheen) **(NATIVE)**		Threaded end cap
30										
32										
34										
36										
38										
40										
42										

Boring Completed 06/24/08
Total Depth of Boring = 29.0 ft.

Monitoring Well Completed 06/25/08
Total Depth of Monitoring Well = 27.5 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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-4(I)

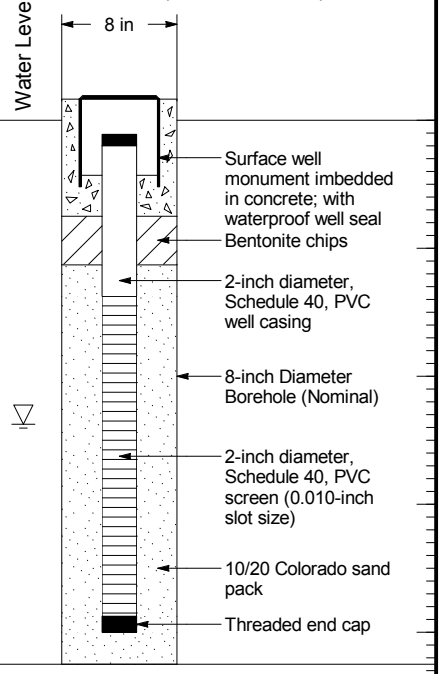
Figure
A-25
(2 of 2)

RM-MW-5(S)

SAMPLE DATA						SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol		Water Level
0							SP	Drilling Method: Hollow-Stem Auger Ground Elevation (ft): Drilled By: Cascade Drilling Inc. Brown, fine to medium SAND (loose, damp to wet) (no odor, no sheen) **(FILL)**	
2		S1	a1	11	0				
4		S2	a1	11	0			Dark brown in color	▽
6		S3	a1	7	0.9			*Collected soil sample RM-MW-5(S)(6) from 5.5 to 6 ft BGS.* Dark gray in color	
8		S4	a1	2	0		OL	Gray, clayey SILT with rootlets (very soft, wet) (no odor, no sheen) **(NATIVE TIDEFLAT DEPOSIT)**	
10									
12									
14									
16									
18									
20									

Boring Completed 06/25/08
Total Depth of Boring = 8.5 ft.

Monitoring Well Detail
(DOE#: APE159)



Monitoring Well Completed 06/25/08
Total Depth of Monitoring Well = 8.0 ft.

Notes:
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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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

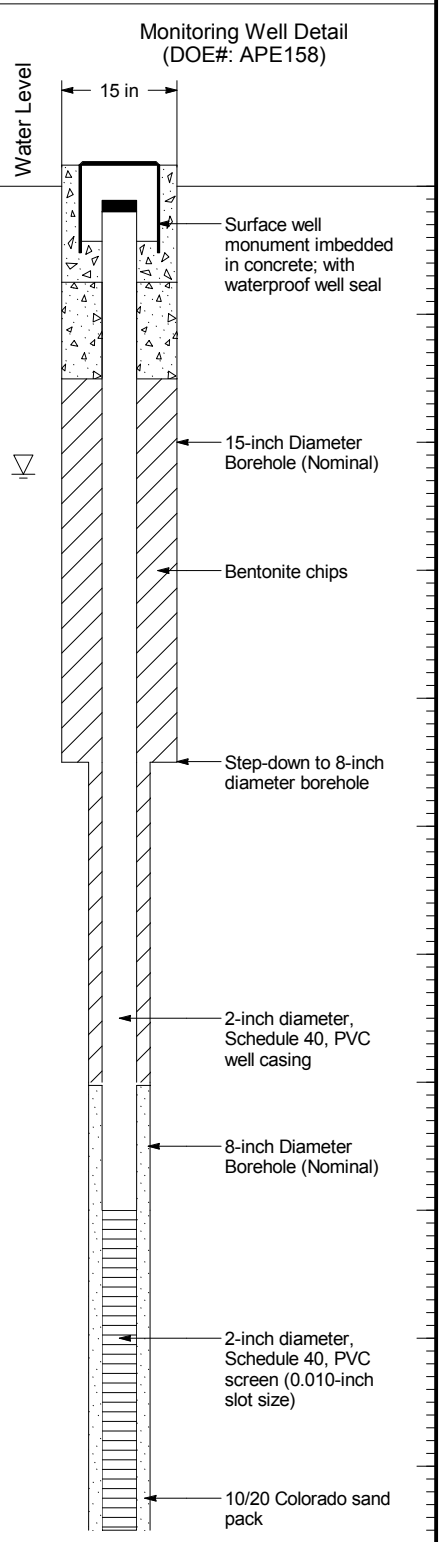
Log of Monitoring Well RM-MW-5(S)

Figure
A-26

RM-MW-5(I)

Drilling Method: Hollow-Stem Auger
Ground Elevation (ft):
Drilled By: Cascade Drilling Inc.

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Soil Profile
0							SP	Brown to gray, fine to medium SAND (loose, moist to wet) (odor, no sheen) **(FILL)**
2		S1	a1	11	0			
4		S2	a1	11	0			
6		S3	a1	7	2.7			*Collected soil sample RM-MW-5(I)(6) from 5.5 to 6 ft BGS.*
8		S4	a1	2	0			
10		S5	a1	2	0		OL	Gray, clayey, SILT with abundant rootlets (very soft, wet) (slight organic/septic odor, no sheen) **(NATIVE)**
12		S6	a1	7	0			
14		S7	a1	12			SM	Dark gray, silty, fine to medium SAND with occasional silt interbeds (loose, wet) **(NATIVE)**
16								
18		S8	a1	13			SP	Dark gray, fine to medium SAND (loose to medium dense, wet) **(NATIVE)**
20		S9	a1	17				



Notes:
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3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-5(I)

Figure
A-27
(1 of 2)

RM-MW-5(I)

SAMPLE DATA						SOIL PROFILE			GROUNDWATER	
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-Stem Auger Ground Elevation (ft): Drilled By: Cascade Drilling Inc.	Water Level	Monitoring Well Detail (DOE#: APE158)
22							SP	Dark gray, fine to medium SAND (loose to medium dense, wet) **(NATIVE)**		2-inch diameter, Schedule 40, PVC screen (0.010-inch slot size)
24		S10	a1	17						10/20 Colorado sand pack
26		S11	a1	20						Threaded end cap
28										
30										
32										
34										
36										
38										
40										
42										

Boring Completed 06/25/08
Total Depth of Boring = 27.5 ft.

Monitoring Well Completed 06/25/08
Total Depth of Monitoring Well = 26.3 ft.

Notes:
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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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

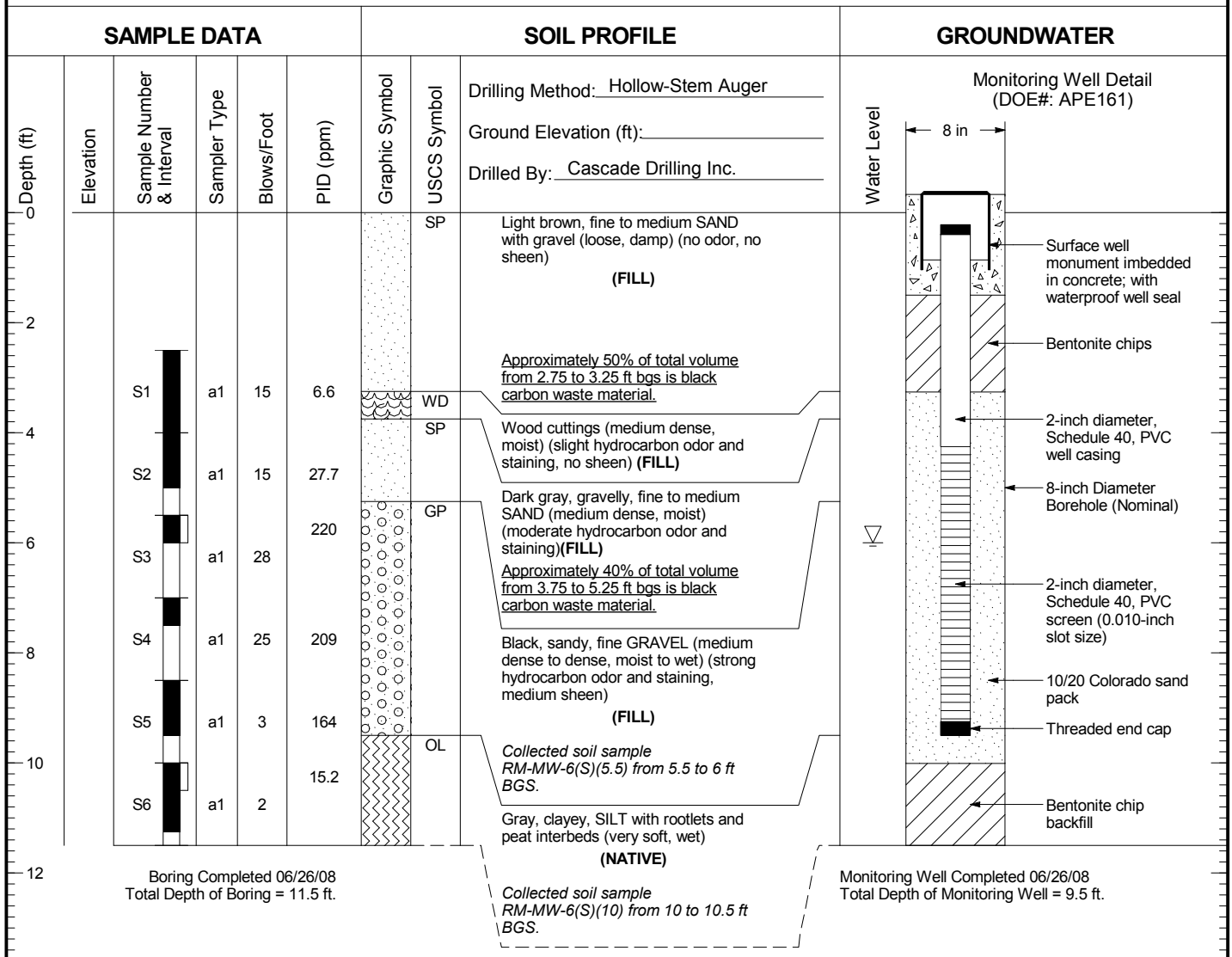
LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-5(I)

Figure
A-27
(2 of 2)

RM-MW-6(S)



Notes:
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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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

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Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-6(S)

Figure
A-28

RM-MW-6(I)

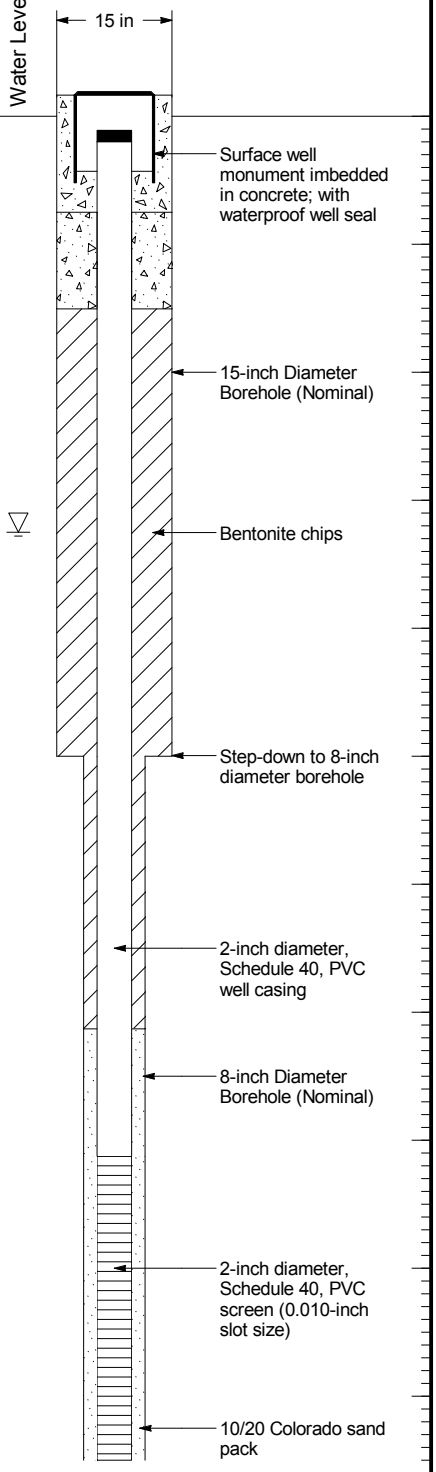
SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Drilling Method: Hollow-Stem Auger
Ground Elevation (ft):
Drilled By: Cascade Drilling Inc.

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Soil Description
0					SP	Light brown to tan, fine to medium SAND with gravel (loose, damp) (no odor, no sheen) **(FILL)**
2	S1	a1	23	0		Approximately 75% of total volume from 3 to 3.5 ft bgs is black carbon waste material with fragments of petroleum coke and coal tar pitch. Approximately 70% of total volume from 3.5 to 4 ft bgs is a moist light gray, silt/ash
4	S2	a1	19	0	SM	Dark gray, silty, fine to medium SAND **(FILL)**
6	S3	a1	10	6.2		Approximately 50% of total volume from 6 to 6.75 ft bgs is black carbon waste material
				46.1	SM	Black, silty, gravelly, fine to medium SAND with shell fragments (very loose, wet) (strong petroleum odor and sheen) **(FILL)**
8	S4	a1	2			
	S5	a1	2	65.7		*Collected soil sample RM-MW-6(I)(7) from 7 to 7.5 ft BGS.*
10					OL	*Collected soil sample RM-MW-6(I)(9) from 9 to 9.5 ft BGS.*
	S6	a1	3	0		Gray, clayey, SILT with trace rootlets (very soft, wet) **(NATIVE)**
12					PT	
	S7	a1	2	0	OL	*Collected soil sample RM-MW-6(I)(10.5) from 10.5 to 11 ft BGS.*
14	S8	a1	7	0	SM	Brown, sandy, PEAT (very soft, damp) **(NATIVE)**
	S9	a1	13			Gray, clayey, SILT with trace rootlets (very soft, wet) **(NATIVE)**
16						Gray to dark gray, silty, fine sand with occasional silt interbeds (loose, wet) **(NATIVE)**
18	S10	a1	11		SP	Dark gray, fine to medium SAND with trace silt interbeds (loose, wet) **(NATIVE)**
20	S11	a1	10			

Water Level

Monitoring Well Detail
(DOE#: APE160)



Notes:
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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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-6(I)

Figure
A-29
(1 of 2)

RM-MW-6(I)

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Drilling Method: Hollow-Stem Auger
Ground Elevation (ft):
Drilled By: Cascade Drilling Inc.

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Description
22							SM	Gray, fine to medium SAND (loose, wet) **(ALLUVIUM)**
							SP	Dark gray, fine to medium SAND (loose, wet) **(ALLUVIUM)**
24		S12	a1	14				
26		S13	a1	13				

Water Level

Monitoring Well Detail
(DOE#: APE160)

- 2-inch diameter, Schedule 40, PVC screen (0.010-inch slot size)
- 10/20 Colorado sand pack
- Threaded end cap

Boring Completed 06/26/08
Total Depth of Boring = 26.5 ft.

Monitoring Well Completed 06/26/08
Total Depth of Monitoring Well = 26.5 ft.

28 30 32 34 36 38 40 42

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.

168004.02 7/17/12 N:\PROJECTS\168004.020.GPJ WELL LOG W/ ELEVATION

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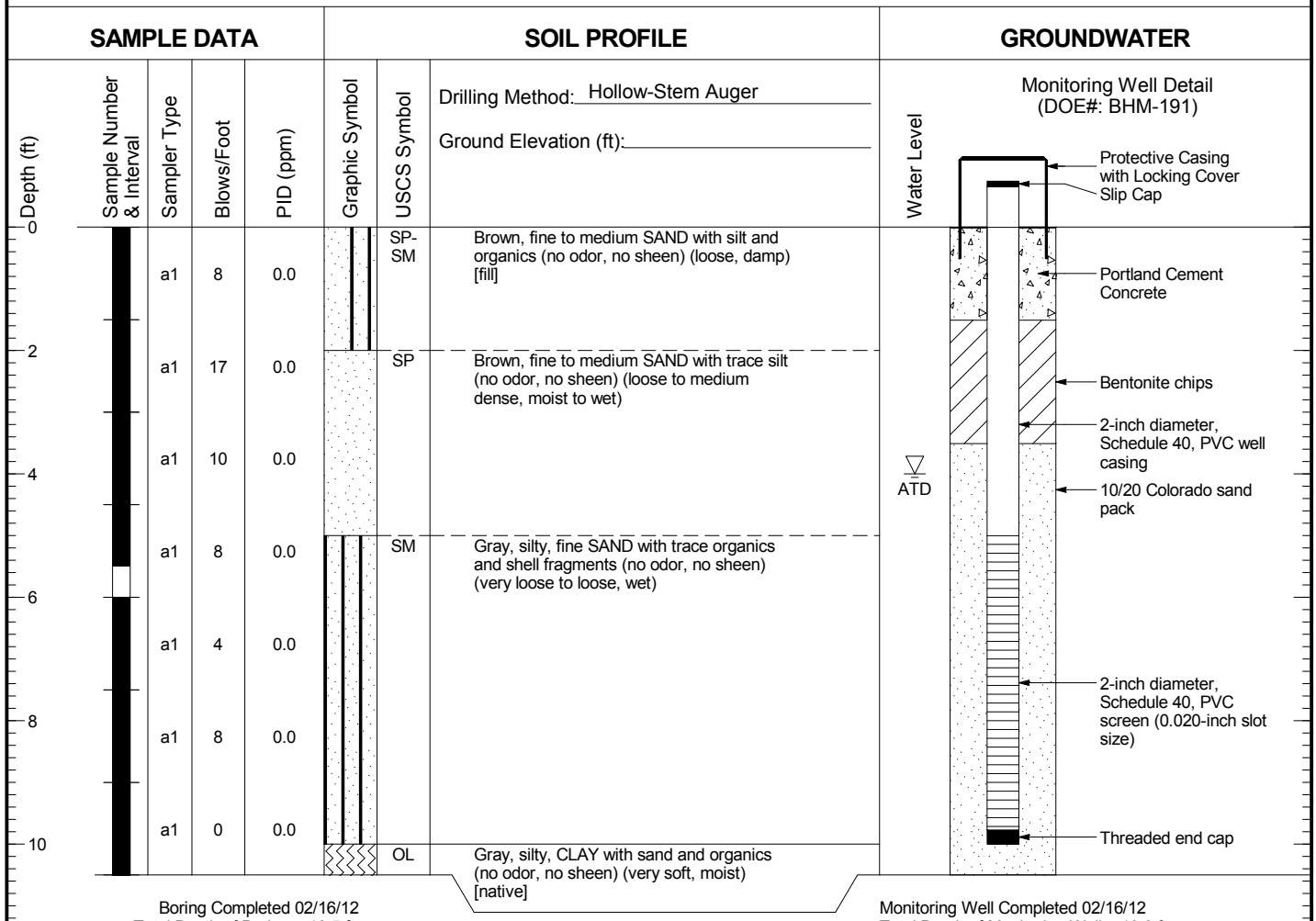
Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well RM-MW-6(I)

Figure
A-29
(2 of 2)

MW-7(s)



Boring Completed 02/16/12
Total Depth of Boring = 10.5 ft.

Monitoring Well Completed 02/16/12
Total Depth of Monitoring Well = 10.0 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.

118032.02 11/7/12 N:\PROJECTS\118032.020.GPJ WELL LOG

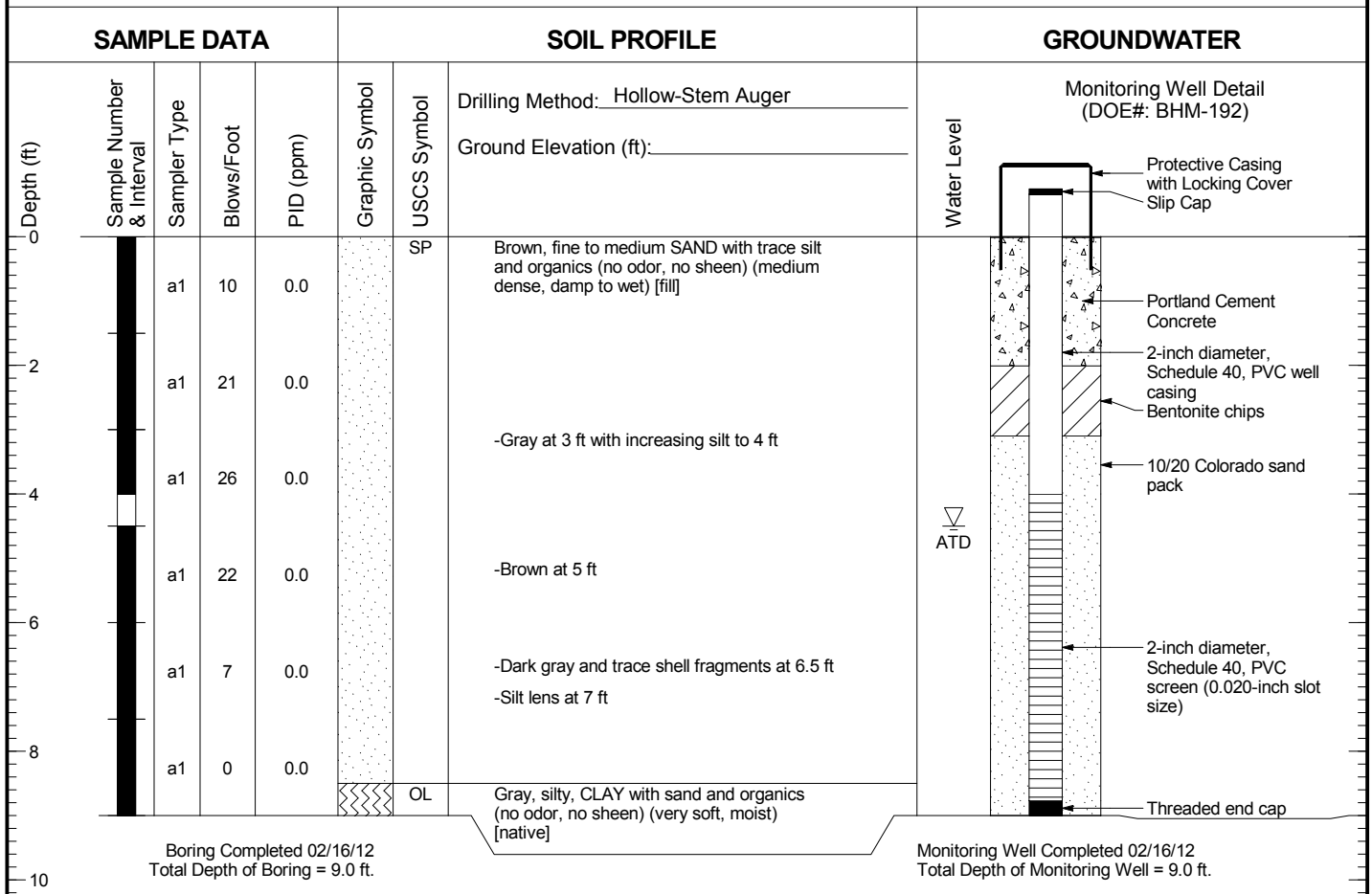
LANDAU ASSOCIATES

Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well MW-7(s)

Figure
A-30

MW-8(s)



Boring Completed 02/16/12
Total Depth of Boring = 9.0 ft.

Monitoring Well Completed 02/16/12
Total Depth of Monitoring Well = 9.0 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.

118032.02 11/7/12 N:\PROJECTS\118032.020.GPJ WELL LOG

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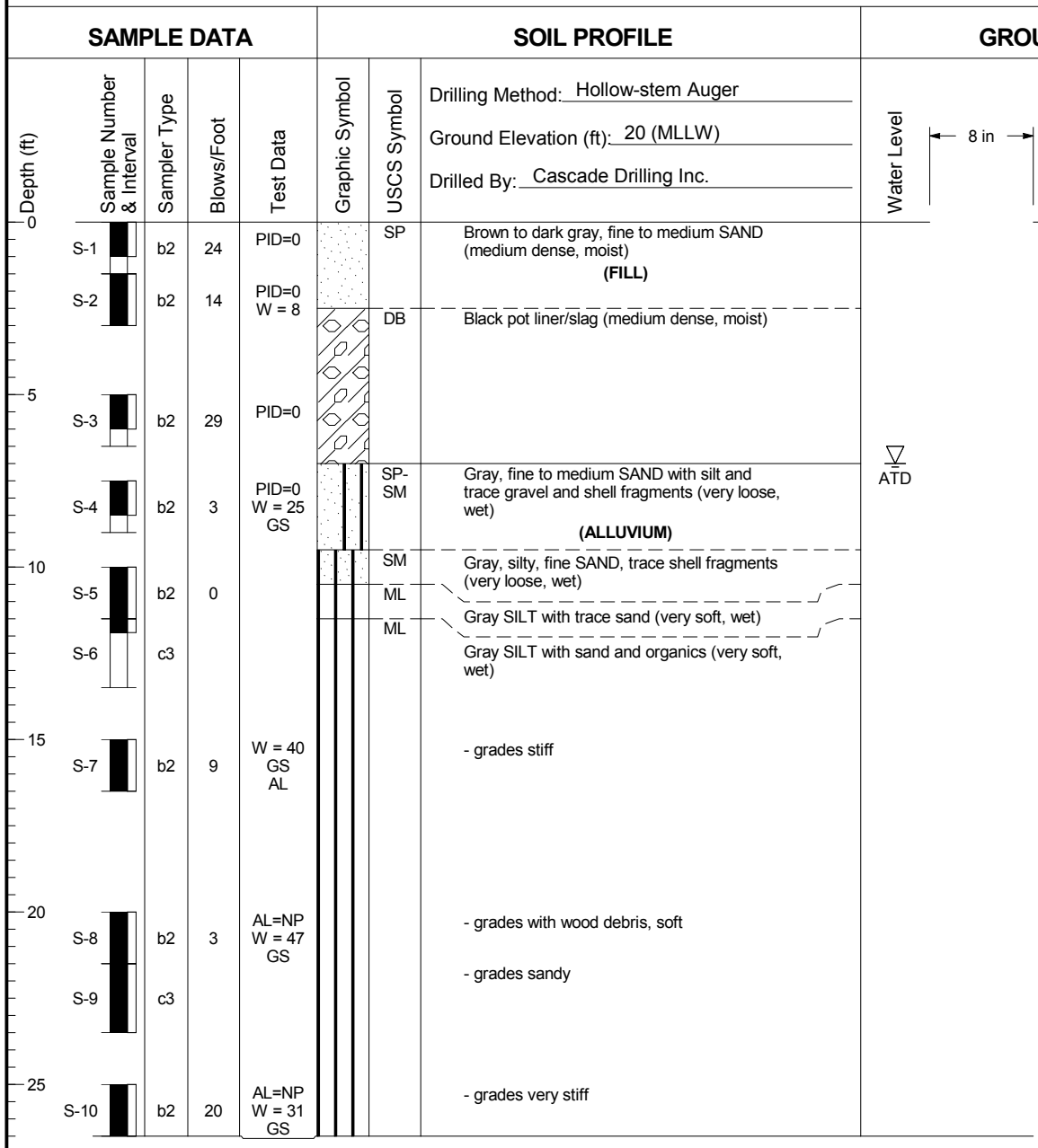
Kaiser Aluminum
Tacoma, Washington

Log of Monitoring Well MW-8(s)

Figure
A-31

RRI-B-23(X)



Boring Completed 11/07/07
Total Depth of Boring = 26.5 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.

168005.03 11/7/12 N:\PROJECTS\168005 REV 04.15.09.GPJ WELL LOG

LANDAU ASSOCIATES

RRI-Blair Hylebos Peninsula Terminal Redevelopment Project Tacoma, Washington

Log of Soil Boring RRI-B-23(X)

Figure A-32

TABLE 2
Test Pit and Boring/Well Logs
Rod Mill Area - Kaiser-Tacoma Facility

TEST PIT	DEPTH INTERVAL (feet bgs)	DEPTH TO WATER (feet bgs)	Test Pit Orientation	DESCRIPTION
WASTE COOLANT DISPOSAL AREA - Area-Wide Investigation				
RM-WCDA1	0 - 5	4.5	N - S	sand with shells, brown
RM-WCDA2	0 - 5.5	5.3	N - S	sand with shells, brown
RM-WCDA3	0 - 5	5.3	N - S	sand, brown, few roots
	5 - 5.5			silty sand, gray, saturated
RM-WCDA4	0 - 5	4.7	N - S	sand, brown
RM-WCDA5	0 - 5	4.5	N - S	sand with shells, brown
RM-WCDA6	0 - 4	6	N - S	layered fine to medium sand, brown
	4 - 6			silty sand, brown, water at 6 feet bgs
RM-WCDA7	0 - 4	---	E - W	sand, brown
	4 - 6			silt, gray
RM-WCDA8	0 - 3.6	---	NE - SW	fine to coarse sand with shells, brown,
	3.6 - 4			silt, gray
	4 - 6			silt, brown, with layers of iron oxide staining and black and white sand
RM-WCDA9	0 - 4	3.7	N - S	sand, brown, 3.5 to 4 feet bgs iron oxide staining
	4 - 5.5			silty sand, gray, moist
	5.5 - 6			silt, gray, wet
RM-WCDA10	0 - 1	4	N - S	sand cover material
	1 - 3			fine sand waste, white and gray with cooker brick and hoses
	3 - 5			sand, brown
RM-WCDA11	0 - 5	4.7	N - S	fine to medium sand, brown with layers of black, tan, and iron oxide staining
RM-WCDA12	0 - 5.5	5.3	N - S	fine to medium sand, brown to tan
RM-WCDA13	0 - 4	---	N - S	fine to medium sand with shells, brown
RM-WCDA14	0 - 5	4.7	N - S	sand with shells, brown, some concrete and rebar, 1 red brick, concrete footing
RM-WCDA15	0 - 5	4.3	S - N	sand, some shells, brown with some iron oxide staining
RM-WCDA16	0 - 5	4.7	N - S	sand with shells, brown
RM-WCDA17	0 - 5.5	4.8	N - S	sand with shells, brown
RM-WCDA18	0 - 6	6	N - S	fine to medium sand, few shells, brown
RM-WCDA19	0 - 5	5	N - S	fine to medium sand with shells, some to few coarse sand, brown
FORMER LANDFILL - Area-Wide Investigation				
RM-LF1	0 - 5	4.5	S - N	fine to coarse sand with shells, brown
RM-LF2	0 - 5	4.7	S - N	medium sand with shells
RM-LF3	0 - 5	4	S - N	sand with shells, brown to gray brown
RM-LF4	0 - 5	4.2	SE - NW	fine to coarse sand, shells and roots, brown with iron oxide staining between 4-4.5 feet bgs
RM-LF5	0 - 2.8	5.5	E - W	fine to coarse sand, brown
	2.8 - 3.3			fine sand and silt, gray with iron oxide staining (dark red and yellow orange)
	3.3 - 6			fine to coarse sand, brown
RM-LF6	0 - 3.7	3.7	E - W	fine to coarse sand, brown, iron oxide staining at 3.7 feet bgs
	3.7 - 5			silt, gray
RM-LF7	0 - 4	4	E - W	fine to medium sand, brown
	4 - 5.25			silt, gray

TABLE 2
Test Pit and Boring/Well Logs
Rod Mill Area - Kaiser-Tacoma Facility

TEST PIT	DEPTH INTERVAL (feet bgs)	DEPTH TO WATER (feet bgs)	Test Pit Orientation	DESCRIPTION
	5.25 - 5.5			sand, black and white (rounded shells)
RM-LF8	0 - 1	4.7	E - W	sand cover material, lt brown
	1 - 7			gray to white waste, blocky waste, cooker brick, possible piece of asbestos, lots of water in hole -no native encountered
RM-LF9	0 - 1	4.7	N - S	medium sand cover material
	1 - 1.5			yellowish (poss iron oxide stained) waste/fill
	1.5 - 2.5			black, gray, and white sand-size waste, cooker brick, wood, metal
	2.5 - 3.5			cemented black medium sand size waste
	3.5 - 8.5			as above, 1.5 - 2.5
	8.5 - 9			silt to clayey silt, grayish brown, wet to saturated, native
RM-LF10	0 - 1	4.7	NE - SW	medium sand cover material
	1 - 6			gray and white sand size waste, wood, metal, cloth, large blocks of angular waste up to 1.5-foot size, gay and white layered sand size waste toward bottom of hole
RM-LF11	0 - 6	6	W - E	medium to coarse sand, brown, some to few fine to very coarse sand, moist to very moist, shells at 5-6 feet bgs
	6 - 7			silt, gray, wet
RM-LF12	0 - 1	4.7	SE - NW	sand cover material
	1 - 5.5			dark gray to black sandy waste with various sizes of shiny, black coal
	5.5 - 6			sand and silt size waste, white gray, black, wet to saturated, lots of water in hole, no native encountered
STORMWATER CONVEYANCE DITCH - Focused Investigation				
RM-SCD1	0 - 0.5	---	SE - NW	sandy loam, light brown
RM-SCD2	0 - 0.5	---	SE - NW	sandy loam, light brown
RM-SCD3	0 - 0.5	---	SE - NW	sandy loam, dark brown
RM-SCD4	0 - 0.5	---	SE - NW	sandy loam, medium brown
RM-SCD5	0 - 0.5	---	SW - NE	sandy loam, light brown
ROOF DRAINAGE AREA - Focused Investigation				
RM-RDA1	0 - 0.5	---	na	sandy gravel (removed overlying stained gravel and root zone)
RM-RDA2	0 - 0.5	---	na	sandy gravel (removed overlying stained gravel and root zone)
DPT SUBSURFACE SOIL BORINGS				
RM-DPT1	0 - 8	3.9	na	medium to fine sand, brown, minor shells
RM-DPT2	0 - 2	4	na	fine to medium sand, brown; grades to medium to coarse sand
	2 - 5			medium to coarse sand, brown, few subangular to subrounded 1/8-inch pebbles
	6 - 8			medium sand, dark brown, shells
	at 8			brown silt in bit
RM-DPT3	0 - 0.5	4	na	medium sand, yellowish brown, cover soil
	0.5 - 3.5			sandy gravel, brown, subrounded gravel up to 3/4-inch size
	3.5 - 3.75			gray and white fine sand waste, wet
	3.75 - 5			medium sand, brown
	5 - 6			medium sand, yellowish orange with iron oxide staining
	6 - 6.75			fine sand, brown, saturated
	6.75 - 7.75			silt to silty fine sand, brown, wet to saturated
	7.75 - 8			fine sand, gray, wet to saturated

TABLE 2
Test Pit and Boring/Well Logs
Rod Mill Area - Kaiser-Tacoma Facility

TEST PIT	DEPTH INTERVAL (feet bgs)	DEPTH TO WATER (feet bgs)	Test Pit Orientation	DESCRIPTION
RM-DPT4	0 - 0.5	6	na	silty sand, dark brown, organics
	0.5 - 3			medium to coarse sand, brown, very moist
	3 - 4.5			as above, 0.5 - 3 feet, interbedded with coarse sand and fine sand layers approx. 1-inch thick, iron oxide staining
	4.5 - 5.75			as above, with silty layers and one layer with wood, very moist to wet
	5.75 - 7			fine to medium sand, brown, some to few coarse sand, iron oxide staining, saturated
	7 - 10			fine to medium sand, dark brown, few coarse sand, saturated
RM-DPT5	0 - 4	6	na	fine to medium sand, brown, some iron oxide stained layers at 3.74 to 4 feet bgs
	4 - 10			medium sand, brown with iron oxide staining, very moist to wet, grades to wet to saturated at 6 feet bgs
Well Borings / Well Construction				
RM-MW-1I	0 -5.75		na	Sand, olive gray, medium, minor gravel up to 1.5-inch size, few to some iron oxide staining, moist
	5.75 - 6			as above, laminated and increase in iron oxide staining
	6 - 7			as above, with shells
	7 - 10			Sand, dark gray, medium, scattered shell fragments, saturated
	10 - 10.5			as above, very moist to moist
	10.5 - 11.2			Silt, grayish brown, very moist to wet
	11.2 - 11.3			Peat with silt, blak
	11.3 - 11.5			Silty Peat to Peat with silt, brown
	11.5 - 15			Sand to silty sand, light brown to gray, fine, minor organics (roots), laminated, very moist
	15 - 17.5			Silt to sandy silt, brown to grayish brown, grades to fine sand to silty sand, very moist
	17.5 - 18.6			Sand to silty sand, brown to grayish brown , very fine to fine sand, increase in patches of organics (sticks, roots)
	18.6 - 18.8			Sand, gray, fine to medium
	18.8 - 19			Sand to silty sand, brown to grayish brown , very fine to fine sand, increase in patches of organics (sticks, roots)
	20 - 23.5			Sand, gray, medium, few lobes of brown silty sand with organics to sand with silt with organics, very fine to fine sand,
	23.5 - 24.5			Sand, medium, few to coarse sand, wet to saturated
	24.5 - 28			Sand, fine to coarse, wet to saturated
	28 - 31.5			Silt, gray to grayish brown, wet
	Well Construction			Total Depth of Well: 28 ft bgs; Well Screen Interval: 22.5 ft to 27.5 ft bgs; Sand: 20.5 ft to 31.5 ft bgs; Bentonite: 1 ft to 20.5 ft bgs; Concrete: 0 ft to 1 ft bgs; Well Stickup: approx. 3 ft above ground surface; Water Level 11/12/04: 10.75 ft below
	0 - 5.7			Sand, gray to brown, iron oxide staining, few subrounded pebbles up to 1/2-inch size
	5.7 - 7.5			Sand, dark gray, medium, wet to saturated
	7.5 - 8.2			Sand, gray to brown, medium, very moist to wet
	8.2 - 8.8			Silt, gray, wet to saturated
	8.8 - 10			Peat, black, almost all organics (grasses, plant stalks, plant matter)
	10 - 11.3			Silt, gray, wet to saturated
	11.4 - 11.5			Sand, fine, gray to brownish gray
	11.5 - 14			Sand, grayish brown, very fine to fine, few to some silt, moist to very moist
	14 - 18			as above, moist to very moist

TABLE 2
Test Pit and Boring/Well Logs
Rod Mill Area - Kaiser-Tacoma Facility

TEST PIT	DEPTH INTERVAL (feet bgs)	DEPTH TO WATER (feet bgs)	Test Pit Orientation	DESCRIPTION
RM-MW2I	18 - 22		na	as above, slight increase in silt, very moist, minor organics (roots)
	22 - 25			Silty sand, gray, very fine, very moist to moist
	25 - 27.5			Silt to sandy silt, very fine sand, very moist
	27.5 - 28.5			Silt
	28.5 - 32.5			Sand, gray, fine, moist to very moist
	32.5 - 33			Sand, gray, fine to medium, wet
	33 - 33.25			Peat
	33.25 - 34			Silt, dense, few roots and plant matter
	Well Construction			Total Depth of Well: 33 ft bgs; Well Screen Interval: 22.5 ft to 32.5 ft bgs; Sand: 20.5 ft to 24 ft bgs; Bentonite: 1 ft to 20.5 ft bgs; Concrete: 0 ft to 1 ft bgs; Well Stickup: approx. 3 ft above ground surface; Water Level 11/12/04: 10.45 ft below top

APPENDIX B

Health and Safety Plan

Appendix B
Health and Safety Plan
Interim Action Work Plans
Former Kaiser Aluminum Property
3400 Taylor Way
Tacoma, Washington

January 2, 2013

Prepared for

Port of Tacoma

LANDAU ASSOCIATES
130 2nd Avenue South
Edmonds, WA 98020
(425) 778-0907

TABLE OF CONTENTS

TABLES

ATTACHMENTS

Site Health and Safety Plan
Summary

Site Name: Former Kaiser Aluminum Property

Location: 3400 Taylor Way, Tacoma, Washington

Client: Port of Tacoma (Port)

Proposed Dates of Activities: 2013 - 2014

Type of Facility: Former aluminum smelter; currently vacant land

Land Use of Area Surrounding Facility: Industrial

Site Activities: Excavation, including:

- Excavation and backfilling to be conducted with construction excavation equipment
- Well installation
- Waste characterization and confirmation sampling
- Management of work-derived wastes

Potential Site Contaminants: Metals, diesel- and motor oil-range petroleum hydrocarbons, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), vinyl chloride, polychlorinated biphenyls (PCBs), and cyanide

Routes of Entry: Skin contact with soil, groundwater, or waste materials; incidental ingestion of soil, water, or waste materials; and inhalation of airborne droplets, dusts, or vapors

Protective Measures: Hard hat, safety glasses, gloves, protective clothing, steel-toed boots

1.0 INTRODUCTION

This Site-specific health and safety plan (HASP) addresses procedures to minimize the risk of chemical exposures, physical accidents to onsite workers, and environmental contamination.

1.1 PURPOSE AND REGULATORY COMPLIANCE

The HASP covers each of the required elements as specified in 29 CFR 1910.120 or equivalent Washington State Department of Labor and Industries regulations. When combined with the Landau Associates Health and Safety Program, this Site-specific HASP meets all applicable regulatory requirements.

This HASP will be made available to all Landau Associates' personnel and subcontractors involved in field work on this project. This HASP does not apply to Port contractors or subcontractors. Landau Associates' subcontractors are responsible for their own safety while present on site or conducting work for this project. Subcontractor work may involve safety and health procedures not addressed in the HASP. By signing the documentation form provided with this HASP (Attachment B-3), project workers also certify their agreement to comply with this HASP. Both Landau Associates and its subcontractors are independently responsible for the health and safety of their own employees on the project.

1.2 CHAIN OF COMMAND

The Landau Associates chain-of-command for health and safety on this project involves the following individuals:

Landau Associates' Interim Action Task Manager: Dave Pischer. The Interim Action Task Manager, in conjunction with the Agreed Order Support Project Manager (Kris Hendrickson), has overall responsibility for the successful outcome of the project. The Task Manager, in consultation with Corporate Health and Safety (H&S) Manager and the Agreed Order Support Project Manager, makes final decisions regarding questions concerning the implementation of the Site HASP.

Landau Associates' Project H&S Coordinator: To be determined. As the Project H&S Coordinator, this individual is responsible for implementing the HASP in the field. The Project H&S Coordinator informs subcontractors of the minimum requirements of this HASP. This person will conduct ambient air monitoring to determine the level of personal protective equipment (PPE) and monitor for PPE upgrade action levels. This person will also assure that proper protective equipment is available and used in the correct manner, decontamination activities are carried out properly, and that employees have knowledge of the local emergency medical system.

Landau Associates' Corporate H&S Manager: Christine Kimmel. The Landau Associates Corporate H&S Manager has overall responsibility for preparation and modification of this HASP. In the event that health and safety issues arise during Site operations, the H&S Manager will attempt to resolve them in discussion with the appropriate members of the project team.

Project Team Members: Project team members are responsible for having the correct training and understanding the H&S requirements for this project and implementing these procedures in the field. Team members will receive technical guidance from the Project H&S Coordinator.

1.3 SITE WORK ACTIVITIES

This HASP covers Site field activities to be conducted throughout the Spent Pot Lining (SPL) Area Interim Action and the Rod Mill Closed Landfill Area Interim Action at the Port of Tacoma (Port) former Kaiser Aluminum property (Site). The field activities associated with the Interim Actions include:

- Excavation and backfilling to be conducted with construction excavation equipment
- Well decommissioning and installation
- Waste characterization and confirmation sampling
- Management of work-derived wastes.

1.4 SITE DESCRIPTION

The Site encompasses approximately 96 acres of the Blair Hylebos Peninsula in Tacoma, Washington. The Hylebos Waterway is located northeast of the property and the Blair Waterway is located to the southwest. An aluminum smelter operated at the property until 2001. Currently, only two buildings (both used for offices) remain onsite; subsurface structures, such as footings and slabs, are still in place and in most areas have been covered with soil and a layer of gravel. Current uses of the property include staging of construction materials (primarily soil, crushed concrete, and crushed asphalt), and short-term use by contractors for lay down and staging of materials. The two Interim Action areas include the Rod Mill Closed Landfill Area and the SPL Area. The Rod Mill Area Closed Landfill is located on the southeast portion of the Site and consists of a landfill that was used for disposal of miscellaneous smelter wastes. The SPL Area is located on the eastern portion of the Site and is an area that was historically used to dismantle reduction cells, and temporarily store SPL and potroom duct dust.

2.0 HAZARD EVALUATION AND CONTROL MEASURES

2.1 TOXICITY OF CHEMICALS OF CONCERN

Based on previous information and knowledge of the types of activities conducted at the Site, the following chemicals may be present: metals, diesel- and motor oil-range petroleum hydrocarbons, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), vinyl chloride, polychlorinated biphenyls (PCBs), and cyanide. Human health hazards of these chemicals are summarized in Table B-1. The information provided in this table covers potential toxic effects that might occur if relatively significant acute and/or chronic exposure occurred. However, this information does not indicate that such effects are likely to occur from the planned Site activities. The chemicals that may be encountered at this Site are not expected to be present at concentrations that could cause significant health hazards from short-term exposures. The types of planned work activities and use of monitoring procedures and protective measures will further limit potential exposures at this Site.

Health standards are presented using the following abbreviations:

- TWA – Time-weighted average exposure limit for any 10-hour work shift
- IDLH – Immediately Dangerous to Life or Health.

2.2 POTENTIAL EXPOSURE ROUTES

2.2.1 INHALATION

Inhalation of dusts generated during soil excavation and backfilling activities, sampling and drilling, and any other activity that results in disturbance of soil could be an issue if the weather is dry, windy, or warm. Exposure via this route could potentially occur if chemicals are present in the soil and dust particles become airborne during Site activities or if volatile organic compounds (VOCs) are liberated when Site soil or waste materials are exposed to air or during drilling of soil boreholes. Visual indicates of dust will be used to indicate if dust suppression activities are warranted.

2.2.2 SKIN CONTACT

Exposure via this route could occur if contaminated soil, groundwater, or waste materials contact the skin or clothing. Protective clothing and decontamination activities specified in this HASP will minimize the potential for skin contact with the contaminants.

2.2.3 INGESTION

Exposure via this route could occur if individuals eat, drink, or perform other hand-to-mouth contact in the contaminated (exclusion) zones. Decontamination procedures established in this HASP will minimize the inadvertent ingestion of contaminants.

2.3 HEAT STRESS AND HYPOTHERMIA

2.3.1 HEAT STRESS

Use of impermeable clothing reduces the cooling ability of the body due to evaporation reduction. This may lead to heat stress. If such conditions occur during Site activities, appropriate work-rest cycles will be utilized and water or electrolyte-rich fluids (Gatorade or equivalent) will be made available to minimize heat stress effects.

Also, when ambient temperatures exceed 70°F, monitoring of employee pulse rates will be conducted. Each employee will check his or her pulse rate at the beginning of each break period. Take the pulse at the wrist for 6 seconds, and multiply by 10. If the pulse rate exceeds 110 beats per minute, then reduce the length of the next work period by one-third.

Example: After a 1-hour work period at 80°F, a worker has a pulse rate of 120 beats per minute. The worker must shorten the next work period by one-third, resulting in a work period of 40 minutes until the next break.

2.3.2 HYPOTHERMIA

Hypothermia can result from abnormal cooling of the core body temperature. It is caused by exposure to a cold environment and wind-chill. Wetness or water immersion can also play a significant role.

Typical warning signs of hypothermia include fatigue, weakness, lack of coordination, apathy, and drowsiness. A confused state is a key symptom of hypothermia. Shivering and pallor are usually absent, and the face may appear puffy and pink. Body temperatures below 90°F require immediate treatment to restore temperature to normal.

Current medical practice recommends slow re-warming as treatment for hypothermia, followed by professional medical care. This can be accomplished by moving the person into a sheltered area and wrapping with blankets in a warm room. In emergency situations, where body temperature falls below 90°F and a heated shelter is not available, use a sleeping bag, blankets, and body heat from another individual to help restore normal body temperature.

2.4 OTHER PHYSICAL HAZARDS

2.4.1 SLIPS/FALLS

As with all field work sites, caution will be exercised to prevent slips on wet or slippery surfaces, stepping on sharp objects, falls in excavation areas, etc. Personnel will maintain good housekeeping procedures and keep the work area clear of debris and/or equipment. Barriers will be set up around excavation areas to prevent unauthorized access.

Excavations greater than 4-ft deep pose a hazard of falls and sidewall collapse. Personnel will not be allowed to enter excavations greater than 4-ft deep without proper shoring with egress equipment or proper grading of excavation sideslopes.

2.4.2 HEAVY EQUIPMENT AND MACHINERY

The excavation, grading, and drilling equipment may be equipped with various winches, motors, booms, and other machines. These present a general physical hazard from moving parts. Personnel will stand clear of machinery at all times unless specific instructions are given by the equipment operator or other person in authority. Hard hats, steel-toed shoes or boots, and high-visibility safety vests are to be worn at all times when interim action construction activities are being conducted at the Site. When possible, appropriate guards will be in place during equipment use.

During relocation of drums containing work-derived waste by a subcontractor, the subcontractor will verify that all lids are secure and any straps used for lifting the drums are also adequately secure. Personnel will be aware of any pinch points when using straps to move drums and when securing lids on open top drums using a ring. Personnel will also be aware of the swing radius of the construction equipment being used at the Site and stand well outside the swing radius of nearby equipment. Personnel will make eye contact with the equipment operator prior to advancing within the swing radius or potential blind spots of the equipment.

2.4.3 CONFINED SPACES

Confined space entry is not anticipated for this project. Personnel will not enter any confined space without certified training and specific approval of the Project Manager, Task Manager, Corporate H&S Manager, and Port project representative.

2.4.4 NOISE

Appropriate hearing protection (ear muffs or ear plugs with a noise reduction rating of at least 20 decibels (acoustic; dBA) will be used if individuals work near high-noise-generating equipment

(> 85 dBA). Determination of the need for hearing protection will be made by the Project H&S Coordinator.

3.0 PROTECTIVE EQUIPMENT AND AIR MONITORING

3.1 PROTECTIVE EQUIPMENT

Work for this project will be conducted in Level D protection. Level C protection is presented as a contingency only and represents a modified protection level, incorporating respiratory protection only where required by Site conditions. Situations requiring Levels A or B protection are not anticipated for this project; should they occur, work will stop and the HASP will be amended, as appropriate, prior to resuming work.

Workers performing general Site activities where skin contact with potentially contaminated materials is unlikely and inhalation risks are not expected will wear coveralls or rain gear, safety glasses, gloves (whenever appropriate), hearing protection (if required), steel-toed boots, and hard hats.

Workers performing Site activities where contaminated materials are encountered or suspected will wear the protective equipment noted above along with steel-toed chemical-resistant boots, chemical-resistant gloves (nitrile, neoprene, or other appropriate outer and inner gloves) and coated Tyvek or other chemical-resistant suits. Workers will use face shields or goggles, as necessary, to avoid splashes.

When performing activities in which inhalation of chemical vapors and dusts is a concern, engineering practices (i.e., wetting of the ground) will be utilized to minimize the generation of dust. If chemical vapors or dust remain an issue after implementation of engineering practices, then workers will wear half-mask or full-face air-purifying respirators with combination particulate and organic vapor protection cartridges. Cartridges should be changed, at a minimum, on a daily basis. They should be changed more frequently if chemical vapors are detected inside the respirator or other symptoms of breakthrough are noted (e.g., irritation, dizziness, breathing difficulty).

3.2 AIR MONITORING

Direct-reading instruments give immediate, real time readings of contaminant levels. Reliable direct-reading instruments, such as the combustible gas indicator, photoionization detector (PID), flame ionization detector, dust meter, and colorimetric tubes, are available for situations commonly encountered at hazardous and contaminated substance sites. The appropriate type of monitoring equipment depends on the suspected type and concentration of chemical contaminants. The primary limitation of direct-reading instruments is that most do not quantify specific chemical compounds.

Air monitoring for VOCs and dust will be conducted during excavation, drilling or other intrusive activities. A PID will be used to monitor for VOCs and air monitoring for dust will be conducted using a SKC HAZ-DUST 1 (or equivalent) particulate meter (Attachment B-1). The instruments will be calibrated prior to each day's activity according to manufacturer's instructions. Calibration will be

recorded in the health and safety logbook or field notes. Readings will be entered into the logbook at a minimum of 30-minute intervals.

Attachment B-1 identifies the air monitoring strategy to be used during field activities.

4.0 SAFETY EQUIPMENT LIST

The following safety equipment must be available on site:

- First aid kit
- Mobile telephone
- Steel-toed safety boots
- Chemical-resistant coveralls and gloves
- Safety glasses and splash guards
- Hard hats
- Air monitoring instruments
- Safety vest
- Half-face or full face respirator with cartridges.

5.0 EXCLUSION AREAS

If migration of chemicals from the work area is a possibility, or as otherwise required by regulations or client specifications, Site control will be maintained by establishing clearly identified work zones. These will include the exclusion zone, contaminant reduction zone, and support zone, as discussed below.

5.1 EXCLUSION ZONE

Exclusion zones will be established around each contaminated substance activity location. Only persons with appropriate training and authorization from the Project H&S Coordinator will enter this perimeter while intrusive work is being conducted.

5.2 CONTAMINATION REDUCTION ZONE

A contamination reduction zone will consist of a decontamination station that must be used to exit the exclusion zone. The station will have the brushes and wash fluids necessary to decontaminate personnel and equipment leaving the exclusion zone. Care will be taken to prevent the spread of contamination from this area.

5.3 SUPPORT ZONE

A support zone will be established outside the contamination reduction area to stage clean equipment, don protective clothing, take rest breaks, etc.

6.0 MINIMIZATION OF CONTAMINATION

To make the work zone procedures function effectively, the amount of equipment and number of personnel allowed in contaminated areas must be limited. In addition, the amounts of sample collected should not exceed what is needed for laboratory analysis and record samples. Do not kneel on contaminated ground, stir up unnecessary dust, or perform any practice that increases the probability of hand-to-mouth transfer of contaminated materials. Eating, drinking, chewing gum, or using smokeless tobacco is forbidden in the exclusion zone. Smoking is prohibited everywhere on the Site.

7.0 DECONTAMINATION

Decontamination is necessary to limit the migration of contaminants between sampling intervals, from the work zone(s) onto the Site, or from the Site into the surrounding environment. The following types of equipment will be available to perform equipment and personnel decontamination activities:

- Boot and glove wash bucket and rinse bucket
- Scrub brushes – long handled
- Spray rinse applicator
- Plastic garbage bags
- 5-gallon container with soap solution.

Proper decontamination (decon) procedures will be employed to ensure that contaminated materials do not contact individuals and are not spread from the Site. These procedures will also ensure that contaminated materials generated during Site operations and during decontamination are managed appropriately. All nondisposable equipment will be decontaminated in the contamination reduction zone.

Personnel working in exclusion zones will perform a limited decontamination in the contamination reduction zone prior to changing respirator cartridges (if worn), taking rest breaks, drinking liquids, etc. They will decontaminate fully before eating lunch or leaving the Site. The following describes the procedures for decon activities:

1. In the contamination reduction zone, wash and rinse outer gloves and boots in portable buckets.
2. Inspect protective outer suit, if worn, for severe contamination, rips, or tears.
3. If suit is highly contaminated or damaged, full decontamination will be performed.
4. Remove outer gloves. Inspect and discard if ripped or damaged.

7.1 DECONTAMINATION PROCEDURES FOR CONSTRUCTION EQUIPMENT

- Once equipment has entered the exclusion zone, it will be decontaminated prior to leaving the area.
- Construction equipment and vehicles will be swept at the excavation area to remove any gross contamination. Prior to leaving the exclusion zone, the equipment will be routed through a wheel wash area and a pressure washer or other appropriate methods will be used to decontaminate the equipment. If contamination is still observed, the process will be repeated.
- All generated decontamination water will be stored in labeled containers for disposal or treatment prior to discharge to an appropriate system/location.

8.0 DISPOSAL OF CONTAMINATED MATERIALS

All disposable sampling equipment and personal protective equipment will be rinsed to remove gross contamination and placed inside of a polyethylene bag or other appropriate container. These disposable supplies and containers will be removed from the site and disposed in a normal refuse container (dumpster) and/or at an appropriate upland landfill facility, unless visibly contaminated with hazardous substances. In such cases, the Project Manager and/or the Port will determine the need for special handling and disposal, according to applicable regulations.

9.0 SITE SECURITY AND CONTROL

The Site is fenced. When work is not occurring, the gate into the Site will be locked. The "buddy system" will be used when working in designated hazardous areas. Any security or control problems will be reported to the Port.

10.0 EMERGENCY RESPONSE PLAN

The Tacoma Tideflats Emergency Response Plan (Attachment B-4) outlines the steps necessary for appropriate response to emergency situations. The following paragraphs summarize the key Tacoma Tideflats Emergency Response Plan procedures for this project.

10.1 PLAN CONTENT AND REVIEW

The principal hazards addressed by the Tacoma Tideflats Emergency Response Plan include the following: fire or explosion, medical emergencies, uncontrolled contaminant release, natural emergencies (i.e., earthquakes, lahars, tsunami) and situations such as the presence of chemicals above exposure guidelines or inadequate protective equipment for the hazards present. In order to help anticipate potential emergency situations, field personnel should always exercise caution and look for signs of potentially hazardous situations, including the following as examples:

- Visible or odorous chemical contaminants
- Drums or other containers
- General physical hazards (e.g., traffic, cranes, moving equipment, ships, sharp or hot surfaces, slippery or uneven surfaces)
- Possible sources of radiation
- Live electrical wires or equipment; underwater pipelines or cables; and poisonous or dangerous animals.

These and other potential problems should be anticipated and steps taken to avert problems before they occur. All personnel will certify (Attachment B-3) that they are familiar with the contents of this HASP and acknowledge their agreement to comply with the provisions of this HASP.

The Tacoma Tideflats Emergency Response Plan will be reviewed during the onsite health and safety briefing so that all personnel will know what their duties are should an emergency occur.

Additionally, Site personnel must know who to notify in the event of Tacoma Tideflats Emergency Response Plan implementation and the rally point(s) to conduct head counts. The following information will be readily available at the Site in a location known to all workers:

- Emergency Telephone Numbers: see list in Attachment B-2
- Route to Nearest Hospital: see directions and map in Attachment B-2
- Site Location: see the description of the Site location in Section 1.4 of this HASP
- Evacuation routes; see direction in Attachment B-4
- Rally point(s) for meeting and conducting head counts; see Attachment B-4.

10.2 PLAN IMPLEMENTATION

The Project H&S Coordinator will act as the lead individual in the event of an emergency situation and will evaluate the situation. This individual will determine the need to implement the emergency procedures, in concert with other resource personnel including client representatives and the Corporate H&S Manager. Other onsite field personnel will assist the H&S Coordinator, as required, during the emergency.

If the Tacoma Tideflats Emergency Response Plan is implemented, the Project H&S Coordinator or designees are responsible for alerting all personnel at the affected area by use of a signal device (such as a hand-held air horn), visual, or shouted instructions, as appropriate.

Emergency evacuation routes and safe assembly areas will be identified and discussed in the onsite health and safety briefing, as appropriate. The buddy system will be employed during evacuation to ensure safe escape, and the Project H&S Coordinator will be responsible for roll-call to account for all personnel.

In the event of an emergency situation requiring implementation of the Tacoma Tideflats Emergency Response Plan (e.g., fire or explosion, serious injury, tank leak or other material spill, presence of chemicals above exposure guidelines, natural emergency, inadequate personnel protection equipment for the hazards present), cease all work immediately. Offer whatever assistance is required, but do not enter work areas without proper protective equipment. Workers not needed for immediate assistance will decontaminate per normal procedures (if possible) and leave the work area, pending approval by the Project H&S Coordinator for re-start of work. The following general emergency response safety procedures should be followed.

10.2.1 FIRE

Landau Associates' personnel will attempt to control only very small fires. If an explosion appears likely, evacuate the area immediately. If a fire occurs that cannot be readily controlled, then immediate intervention by the local fire department or other appropriate agency is imperative and the following procedures shall be implemented in the order presented: .

- Call 911
- Call Port Security
- Call Port project manager
- Notify Landau Associates project manager.

The Landau Associates project manager will notify Landau Associates Corporate H&S Manager as soon as possible after an emergency situation has been identified.

10.2.2 MEDICAL EMERGENCY

If a worker leaves the Site to seek medical attention, another worker should accompany the patient. When in doubt about the severity of an accident or exposure, always seek medical attention as a conservative approach. Notify the Project Manager of the outcome of the medical evaluation as soon as possible. An onsite first aid kit will be available for use to treat minor cuts and bruises.

If a worker is seriously injured or becomes ill or unconscious, immediately call 911 and then notify other personnel in the order presented below:

- Port Security
- Port project manager
- Landau Associates project manager.

The Landau Associates project manager will notify Landau Associates Corporate H&S Manager as soon as possible after an emergency situation has been identified.

Do not attempt to assist an unconscious worker in an untested confined space without applying confined space entry procedures or without using proper respiratory protection, such as a self-contained breathing apparatus.

In the event that a seriously injured person is also heavily contaminated, use clean plastic sheeting to prevent contamination of the inside of the emergency vehicle. Less severely injured individuals may have their protective clothing carefully removed or cut off before transport to the hospital. If it is deemed appropriate to transport the victim to the hospital, follow the route map on Attachment B-2.

10.2.3 RELEASE OF CONTAMINANTS TO THE ENVIRONMENT

If a significant release of contaminants to the environment occurs, the Port is responsible for notifying the appropriate federal, state, and local agencies. If the release consists of hazardous contaminants, immediately contact the Port project manager and he/she will be responsible for notifying the agencies listed in Attachment B-2. If the release consists of a petroleum product, immediately notify Port Security and then the Port project manager. After Port personnel have been notified, contact the Landau Associates project manager. The Landau Associates project manager will notify Landau Associates Corporate H&S Manager as soon as possible after an emergency situation has been identified.

10.3 PLAN DOCUMENTATION AND REVIEW

The Landau Associates project manager and Corporate H&S Manager will critique the emergency response action following the event. The results of the critique will be used to improve future Emergency Response Plans and actions.

11.0 MEDICAL SURVEILLANCE

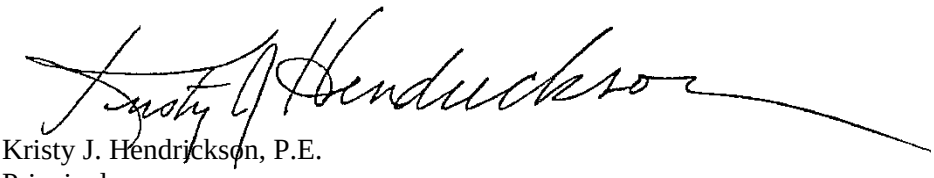
A medical surveillance program has been instituted for Landau Associates and will also be in effect for Subcontractor employees having exposures to hazardous substances. For Landau Associates, exams are given before employment; annually, thereafter; and upon termination. Content of exams is determined by the Occupational Medicine physician, in compliance with applicable regulations, and is detailed in the Landau Associates' General Health and Safety Program.

Each team member will have undergone a physical examination as noted above in order to verify that he/she is physically able to use protective equipment, work in hot environments, and not be predisposed to occupationally induced disease. Additional exams may be needed to evaluate specific exposures or unexplainable illness.

* * * * * * * * * *

This document has been prepared under the supervision and direction of the following key staff:

LANDAU ASSOCIATES, INC.



Kristy J. Hendrickson, P.E.
Principal

Colette M. Griffith
Project Engineer

KJH/CMG/DAP/kes

TABLE B-1
HUMAN HEALTH INFORMATION FOR CONTAMINANTS OF CONCERN

Contaminant	TWA	IDLH	Route of Exposure	Symptoms of Acute Exposure	Instruments Used to Monitor Contaminant
Vinyl Chloride	1 ppm	Unknown	Inhalation, ingestion, dermal contact	Weakness, abdominal pain (carcinogen)	PID
Diesel-range petroleum hydrocarbons	100 ppm	500 ppm	Absorption, ingestion, inhalation	Irritation of eyes, nose, throat; dizziness, nausea; chemical pneumonia	PID
Chromium	0.5 mg/m^3	250 mg/m^3	Inhalation, ingestion, dermal contact	Irritated eyes and skin	Dust Meter
Zinc (Zinc Oxide)	5 mg/m^3 (fume) 15 mg/m^3 (total dust) 5 mg/m^3 (resp dust)	500 mg/m^3	inhalation	Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function	Dust Meter
Carcinogenic Polycyclic Aromatic Hydrocarbons	0.2 mg/m^3	10 mg/m^3	Inhalation, ingestion, dermal and eye contact	Nausea, vomiting, low blood pressure, abdominal pain, convulsions, and coma (carcinogen)	Dust Meter
Cyanide	5 mg/m^3	50 mg/m^3	Inhalation, ingestion, dermal and eye contact	Asphyxia, weakness, headache, nausea, vomiting, increased hear rate and depth of respiration, gasping, thyroid failure, blood changes	Dust Meter
Copper	1 mg/m^3	100 mg/m^3	Inhalation, skin or eye contact, ingestion	Irritated eyes, respiratory system; cough dysprea; wheezing	Dust Meter
Arsenic	0.002 mg/m^3	5.0 mg/m^3	Inhalation, eye contact, dermal contact	Skin and mucous membrane irritation; respiration irritation (potential occupational carcinogen)	Dust Meter
Mercury	0.05 mg/m^3	10 mg/m^3	Inhalation eye contact, dermal contact	Irritated eyes, skin; cough; chest pains	Dust Meter
Lead	0.05 mg/m^3	100 mg/m^3	Inhalation, ingestion, dermal contact	Weakness, lassitude, facial pallor, kidney disease	Dust Meter

TABLE B-1
HUMAN HEALTH INFORMATION FOR CONTAMINANTS OF CONCERN

Contaminant	TWA	IDLH	Route of Exposure	Symptoms of Acute Exposure	Instruments Used to Monitor Contaminant
PCBs	0.2 mg/m^3	10 mg/m^3	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritated eyes; chloracne; liver damage; reproductive effects	Dust Meter

TWA = Time-weighted average.
IDLH = Immediately dangerous to life and health [National Institute for Occupational Safety and Health (NIOSH)].

Notes: Benzo(a)pyrene is listed as an indicator for polycyclic aromatic hydrocarbons (PAHs).

ATTACHMENT B-1

Air Monitoring Strategy

ATTACHMENT B-1
AIR MONITORING STRATEGY

EXPOSURE	METHOD	MONITORING DESCRIPTION	ACTION LEVEL (a)	ACTION
Total Volatile Organics	Photoionization Detector (PID)	Periodically, or when odors are noted	<25 parts per million (ppm) 25-75 ppm >75 ppm	Level D Protection Level C Protection Shut Down; Contact Corp. Health & Safety Officer; Implement Engineering Controls
Particulate Contaminants	Dust Meter	Handling samples/ Continuously	<0.001 milligrams per cubic meter ($mg/m^{3)}$ >0.002 mg/m^3	Level D Protection Implement Engineering Controls; Upgrade to Level C in Interim

(a) For ambient air monitoring.

Emergency Information and Route to Hospital Map

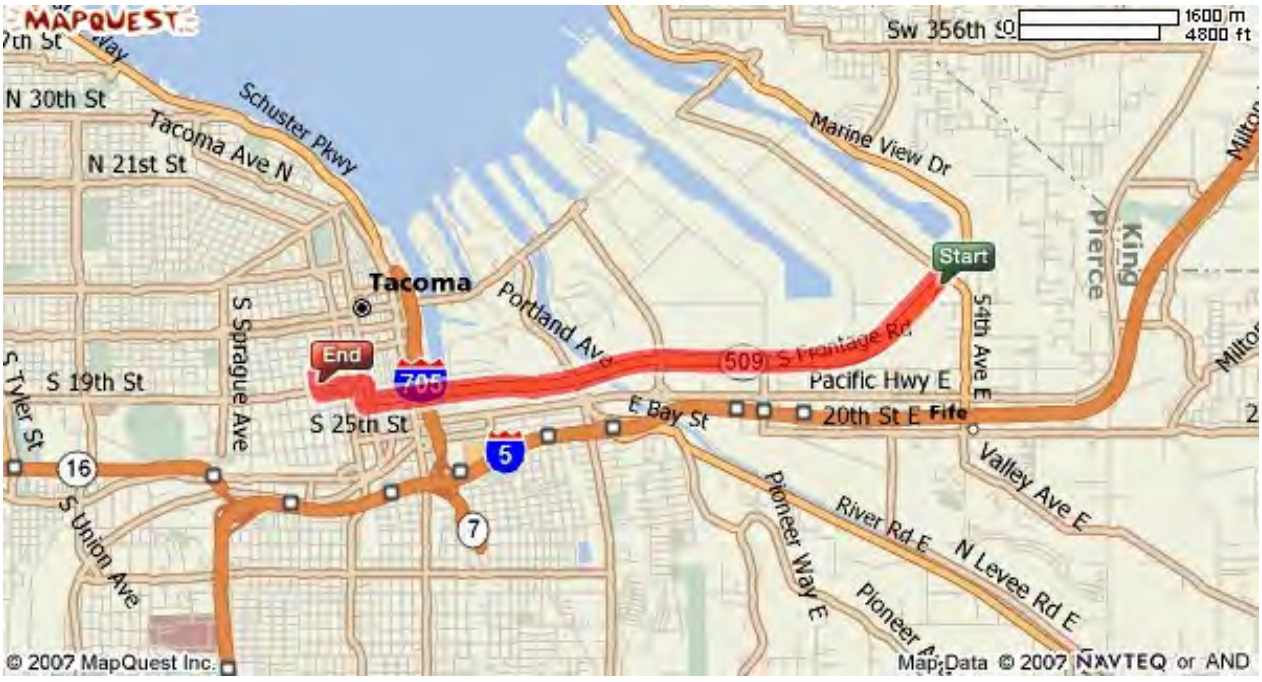
ATTACHMENT B-2

EMERGENCY INFORMATION

HOSPITAL - **St. Joseph's Hospital**
1717 South J Street
Tacoma, Washington 98405

Information: (253) 426-4101

Directions			Distance
		Total Est. Time: 10 minutes **Total Est. Distance:** 4.74 miles	
START	**1:**	Start out going SOUTH on N FRONTAGE RD / WA-509 S toward E MARSHALL AVE. Continue to follow WA-509 S.	3.9 miles
	2:	Stay STRAIGHT to go onto S 21ST ST.	0.2 miles
	3:	Turn RIGHT onto TACOMA AVE S.	0.1 miles
	4:	Turn LEFT onto S 19TH ST.	0.2 miles
	5:	Turn RIGHT onto S J ST.	0.1 miles
END	**6:**	End at **1717 S J St** Tacoma, WA 98405-4933, US	



TELEPHONE - Cellular telephones to be carried by each team on.

EMERGENCY (Fire, Police, Ambulance) -**911**

EMERGENCY ROUTES - Map (see above)

EMERGENCY CONTACTS -

Port of Tacoma:	(253) 383-5841
Security – Main No.	(253) 383-9472
Security – Alternate No.	(253) 926-6844
Project Manager – Bill Evans	(253) 593-4563, cell (253) 307-6591
Landau Associates:	
Project Manager – Kris Hendrickson	(425) 778-0907, cell (206) 910-1378
Corporate H&S Manager – Chris Kimmel	(425) 778-0907, cell (206) 786-3801
Other:	
Poison Control Center	(206) 526-2121
National Response Center	(800) 424-8802
WA Div. of Emergency Management	(800) 258-5990

In the event of an emergency on land, call for help as soon as possible.

Dial 911 and give the following information:

- WHERE the emergency is - use cross streets or landmarks
- PHONE NUMBER you are calling from
- WHAT HAPPENED - type of injury
- HOW MANY persons need help
- WHAT is being done for the victim(s)
- YOU HANG UP LAST - let the person you called hang up first.

Certification

ATTACHMENT B-3
CERTIFICATION

All field members are required to read and familiarize themselves with the contents of this Health & Safety Plan and acknowledge their agreement to comply with the provisions of the plan through the entry of a signature and date on the section below.

By my signature, I certify that:

- I have read
- I understand
- I will comply with this Site Health and Safety Plan for the Former Kaiser Aluminum Property Interim Action Activities.

Printed Name	Signature	Date	Affiliation

Personnel health and safety briefing conducted by:

_____	_____	_____
Name	Signature	Date

Plan prepared by:

_____/_____	_____/_____	_____/_____
Name	Signature	Date

Plan reviewed by:

_____/_____	_____/_____	_____/_____
Name	Signature	Date

Tacoma Tideflats Evacuation Plan

TACOMA TIDEFLATS
EVACUATION PLAN

Prepared with the cooperation of:

City of Fife | **Pierce County** | **Port of Tacoma** | **City of Tacoma** | **Puyallup Tribe of Indians**

September 2009

The Tacoma Tideflats is a unique industrial area, vital to the Pierce County and State of Washington economies. On a given day, over 14,000 workers are employed in the area. The Port of Tacoma is located within the Tideflats area and is a leading North American seaport handling more than $36 billion in annual trade. The area is linked to two transcontinental railroads and easy access to Interstate 5, Interstate 90, SR 509 and SR 167.

The area is exposed to a number of natural and man-made events that could trigger the need for a small or large scale evacuation. With the unique geography and limited routes in and out of the area, any evacuation will be challenging.

For several months, a group of City of Tacoma, City of Fife, Port of Tacoma, Puyallup Tribe, and Pierce County police, fire, and emergency management personnel have worked to create this evacuation plan. The plan is written to aide emergency responders who would implement an evacuation, and to provide information to business owners and their employees.

Please familiarize yourself with the plan. Make sure your workplace has a plan for evacuation of your site or facility, and that you and your co-workers are knowable of your routes they should take for a Tideflats evacuation. Business owners should ensure this information is shared with their employees. That knowledge could save your life.

Ron Stephens
Fire Chief
City of Tacoma

Don Ramsdell
Police Chief
City of Tacoma

Brad Blackburn
Police Chief
City of Fife

Joe Duenas
Chief
Puyallup Tribal Police

Eric Holdeman
Director, Security
Port of Tacoma

Steve Bailey
Director, Department of Emergency Management
Pierce County

CONTENTS

Contents

Limitations

Since this Plan represents participants' capability that is constantly altered by changes that occur in the law, public policy, organizations, programs, systems, process and the environment, it is impossible to promise the delivery of a perfect emergency management system. Actions may also be constrained because hazards can create effects that may impair the availability and use of government assets, along with other essential services provided by the private sector. Despite these unavoidable limitations, the emergency responders in this plan will endeavor to make every reasonable effort within their capability to deal with the dangers and hardships imposed, i.e., based on the situation, the available information, and the resources at hand.

This Plan is adopted as an exercise of the police powers of the participants to protect and preserve the public peace, health, safety and welfare. Its provisions shall be liberally construed for the accomplishment of these purposes.

No provision of or terms used in this Plan is intended to impose any duty whatsoever upon the participants or any of its officers or employees, for whom the implementation or enforcement of this Plan is intended to be nor shall be construed to create or form the basis for any liability on the part of the participants or its officers, employees or agents, for any injury or damage resulting from the failure of any public official or employee to comply with the provisions of this Plan, or by reason or in consequence of any act or omission in connection with the implementation or enforcement of this Plan on the part of the participants by any of its officers, employees or agents.

It is expressly the purpose of this Plan to provide for and promote the health, safety, and welfare of the general public. It is not intended to create or otherwise establish or designate any particular class or group of persons who will or should be especially protected or benefited by its provisions.

Liability

The extent of liability protection afforded public officials is codified in RCW 4.24.470(1), which states

> An appointed or elected official or member of the governing body of a public agency is immune from civil liability for damages for any discretionary decision or failure to make a discretionary decision within his or her official capacity, but liability shall remain on the public agency for the tortuous conduct of its officials or members of the governing body.

The following is quoted from RCW 70.136.050, Hazardous Materials Incidents:

> An incident command agency in the good faith performance of its duties, is not liable for civil damages resulting from any act or omission in the performance of its duties, other than acts or omissions constituting gross negligence or willful or wanton misconduct.
>
> Any person or public agency whose assistance has been requested by an incident command agency, who has entered into a written hazardous materials assistance agreement before or at the scene of the incident pursuant to RCW 70.136.060 and 70.136.070, and who, in good faith, renders emergency care, assistance, or advice with respect to a hazardous materials incident, is not liable for civil damages resulting from any act or omission in the rendering of such care, assistance, or advice, other than acts or omissions constituting gross negligence or willful or wanton misconduct.

1. Introduction - Purpose of This Evacuation Plan

Evacuations take place when lives are put in danger due to a disaster or emergency. They are the organized, phased and supervised withdrawal of civilians from dangerous areas and occur under many different circumstances. A jurisdiction may need to evacuate one block of office buildings (water main break), a neighborhood (forest fire), a major portion of the downtown area (terrorist attack), or even an entire city (earthquake). Evacuations are often multi-jurisdictional activities, making successful evacuations challenging to execute due to the level of coordination required among agencies and jurisdictions.

Disasters/emergencies can occur with little or no warning. Most evacuations result from natural disasters, particularly wildfire threats to populated areas; technical disasters, including fixed site and transportation-related industrial accidents; and malevolent acts, including terrorist attacks. Combine these larger-scale evacuations with much more frequent small-scale ones, and it becomes clear that evacuations occur on an almost daily basis.

An evacuation plan will help streamline the evacuation process, particularly in little or no-notice situations, by providing an organized framework for the activities involved in coordinating and conducting an evacuation.

The goal of this plan is to Identify the critical elements of an evacuation including :

- Agencies involved, and their respective roles and responsibilities
- Command structure elements and protocols
- Operational strategies and tactics
- Communications protocols
- Resources and assets used to support operations

By addressing these issues, this plan will enable agencies to prepare themselves for the roles they must undertake during an evacuation, and facilitate the overall interaction and mutual support among the many agencies, facilities, systems, and assets needed to conduct an evacuation.

The Tacoma Tideflats area has unique risks in terms potential for an event that would trigger an evacuation. There are industrial processes and cargo that have potential a hazardous materials release. There is the potential for a terrorist event in the area that might trigger an evacuation. The area is also subject to a variety of natural event hazards such as Puyallup River flooding, a lahar from Mt. Rainier, or volcanic activity.

This plan is the strategic framework for an evacuation of people from part, or parts, of the Tacoma Tideflats. It includes the process by which assessments will be made, decisions taken, and action coordinated to achieve the evacuation of large numbers of people from places of danger in the Tideflats to places of safety.

Mass evacuation will always be a last resort and only undertaken when absolutely necessary. However, the City of Tacoma is a large and complex city, and in a climate of heightened awareness of the consequences from acts of terrorism or natural events such as extensive flooding and there is a need to consider an evacuation plan within the Tacoma Tideflats.

This plan is intended to enhance and complement existing City of Tacoma and Pierce County emergency plans and procedures and to provide the overarching document from which partner agencies may develop their own supporting plans.

The plan provides a general overview of actions, roles and responsibilities and provides an overview of options available. This plan has been developed on the basis and understanding that the agencies involved in the planning and activation of an evacuation will have given careful consideration to the possible issues that may arise and that participant organizations will have undertaken their own specific risk assessments in respect of the processes and procedures they will implement in support of this plan.

Scope

This plan is intended to cover the Tacoma Tideflats bordered by the Foss Waterway, Interstate 5, and Marine View Drive. While the geographic area mostly lies within the City of Tacoma, the area includes the City of Fife, and Pierce County. The Puyallup Tribe owns property within the Tideflats. The State of Washington Department of Transportation has jurisdiction over Interstate 5.

There are densely populated neighborhoods bordering the Tideflats including Brown's Point, Federal Way, Milton, Downtown Tacoma, Fife, as well as traffic on Interstate 5.

Potential Evacuation Populations

The Tacoma Tideflats is primarily an industrial area with a daytime population estimated at 14,000. Most potential evacuees come and go by personal vehicle. There is transit service by Pierce Transit.

Other groups of note include heavy truck traffic primarily servicing the Port of Tacoma. There is an Immigration Detention Center (jail) at 1623 East J Street with an estimate inmate population of 760. Many crew members of ships at the Port of Tacoma are non-English speaking or have limited ability. They are also not familiar with the local geography.

Within the Tacoma Tideflats are numerous facilities with hazardous materials processing.

Parties involved in planning and conducting an evacuation

The City of Tacoma Police and Fire Departments are expected to be the primary agency providing first responders. Other responding agencies may include Port of Tacoma Security Department, City of Fife Police, Puyallup Tribal Police, Washington State Patrol, Washington State Department of Transportation, Washington State Department of Emergency Management, Pierce County Department of Emergency Management, and Pierce Transit.

Organizations and private-sector companies that may support an evacuation include US Coast Guard, Foss Tug, Crowley Tug, Washington State Ferries, and the Red Cross.

This Plan will coordinate with other plans including:

The Pierce County and City of Tacoma Comprehensive Emergency Management Plans (CEMP) provides guidance for a systematic and coordinated effort to: emergency and disaster mitigation, emergency preparedness, disaster response and recovery operations. The CEMP details the capabilities, authorities and responsibilities of county departments and, primary and support agencies in emergency management.

The National Incident Management System (NIMS) is adopted by the Pierce County as Resolution Number R2005-3 and the City of Tacoma proclamation of September 19, 2006. NIMS is a single, comprehensive incident management system that provides universal terminology and details emergency management functions such as command and general staff, planning, operations, logistics and finance / administration. As outlined in Homeland Security Presidential Directive / HSPD-5, it will allow for seamless operations, transitioning over jurisdictional boundaries and layers of government.

Limitations of This Evacuation Plan

- Evacuation plan is designed to support preservation of life in response to imminent threat.
- Each jurisdiction will do everything within its capabilities to support preservation of life, but there is no guarantee that the jurisdiction will be able to ensure the absolute safety of all people affected by the threat.
- Numerous circumstances can limit the response capabilities of the jurisdiction, or create situations that are beyond the capabilities of the jurisdiction.

2. Authorities

Federal statutes / regulations

Public Law 920, Federal Defense Act of 1950, as amended

Public Law 960-342, Improved Civil Defense 1980

Public Law 93-288 Disaster Relief Act of 1974, as amended

Title III of the Superfund and Re-authorization Act of 1986

Homeland Security Act of 2002

Homeland Security Presidential Directive / HSPD-5

Homeland Security Presidential Directive / HSPD-8

State of Washington statutes / regulations

Chapter 38.52, RCW Emergency Management

Chapter 35.33.081 and 35.33.101, RCW, as amended

Chapter 34.05, RCW Administrative Procedures Act

Chapter 118-30 WAC

Local statutes / regulations

Pierce County - Sections 2.06 and 2.07, Pierce County Charter,

Chapter 2.118, Pierce County Code

City of Tacoma – City of Tacoma Charter and Municipal Code Chapter 1.10

3. Critical Assumptions

Regulatory issues in State of Washington (Constitution and RCW) relevant to conducting an evacuation.

The City of Tacoma is responsible for evacuations that occur within the City limits. Within the City of Tacoma, the Tacoma Fire Department is the emergency management agency. An evacuation may be ordered by the incident commander, or after the Mayor or his /her designee has proclaimed a civil emergency.

Pierce County Emergency Management and the State of Washington Department of Emergency Management will support the City with carrying out evacuation and sheltering activities.

Local parameters (e.g., unique structure for emergency management, unusual conditions or opportunities, etc.)

The plan area is primarily industrial and mixed use, rather than a residential area. There are some residential areas on the fringes of the Tideflats. The plan includes educational information for individuals and businesses within the plan area to help them in the event of an evacuation. See Appendix A

Local limitations (e.g., unique geography, weather-related issues, etc.)

The Tacoma Tideflats is a peninsula with water only access on the north and west sides. The Murray Morgan and Hylebos Bridges are currently (2009) out of service. Consequently any land side evacuation has limited routes towards I-5 a congested freeway. The Puyallup River bisects the Tideflats and is itself a flood hazard. The East 11th Bridge over the river has a weight restriction of 10 tons. The river is the likely pathway for Mt Rainier lahar flow.

4. All-Hazards

The Tacoma Tideflats is exposed to a number of natural and man made hazards.

There are industrial processes in the Tideflats that can not immediately shut down. The McChord Pipeline runs through the Tideflats.

Hazardous Materials – Historically there have been small evacuations in the Tacoma Tideflats due to hazardous materials events. An event may occur as the bi-product of another disaster. They can progress rapidly or slowly. Evacuations can be warranted with little information on the released material causing response process to be slow and methodical.

Flooding and Dam Failure - Much of the Tacoma Tideflats area has been designated by FEMA as being in a floodway or floodplain. Floods in 2007 and 2009 were severe enough that an evacuation was considered by incident commanders. The area is also downstream of the Mud Mountain Dam (White River). Port of Tacoma operation is dependent on road and rail infrastructure. Most of the Port's rail cargo moves over a single Puyallup River bridge. During the December 2008 Puyallup River floods, the Washington State Department of Transportations prepared to close Interstate 5 at Fife in anticipation of water over the river levee.

Earthquakes - In 2001 the Nisqually earthquake struck. While the Tideflats experience little damage, the fact that much of the area is built on fill soils, increases earthquake liquefaction potential and resulting damage.

Other Hazards -The Tideflats is exposed to other natural hazards such as winter storms, high wind, tsunamis /seiches, and volcanic activity including lahars. These hazards can be detected in advance and the need for area evacuations is low.

5. Objectives of this Evacuation Plan:

- To enable the Tacoma Tideflats to respond effectively to an event that requires the evacuation of the area in part or in full.
- To provide responding organizations with the necessary strategy to allow them to effectively implement their roles and responsibilities in support of an evacuation.
- To provide the process by which appropriate information is supplied to all responding agencies, the public and businesses, at the start of and throughout the evacuation process.
- To provide the process by which appropriate information will be distributed to the public and to businesses in advance of any evacuation, to enable them to understand the concept and to plan for their own response.

6. All-Hazards Incident Command System:

In response to "All-Hazards" the established Command, will utilize the Incident Command System (ICS), a component of the National Incident Management System (NIMS). The ICS is a management system designed to enable effective and efficient incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organized structure.

The ICS may be utilized to manage incidents/events regardless of cause, size, location, or complexity. Incident Command may consist solely of one responding agency (for smaller incidents) or multiple agencies (for larger, more complex incidents) where a Unified Command structure may be established. The ICS can expand or contract as necessary to match escalating or diminishing situations. The level and/or type of ICS structure established will vary based on the size and complexity of the incident and response. In most cases, since emergencies occurring in Tacoma could invariably impact the surrounding neighborhood and require a response from both Tacoma Emergency Management personnel and neighboring municipalities, the ICS may involve the implementation of a Unified Command structure to facilitate the coordination of the various governmental and/or private agencies.

This document is intended for organizations within the Tacoma Tideflats and neighboring regions that would participate in and support the process of evacuating a large number of people from an area in the Tideflats.

The plan will assist those directing the evacuation process, to coordinate the activities of the responding organizations.

7. STRATEGIES/TACTICS:

The Tacoma Tideflats Evacuation Plan is intended to be scalable based on the incident/event assessment.

Phase 1

An evacuation WARNING has been issued for this area.

Persons are warned that current or projected threats from hazards associated with the approaching (fire, HAZMAT, tsunami, etc) are severe.

- This is time for preparation, precautionary movement of persons with special needs, mobile property and pets or livestock.
- You will be kept advised as conditions change. Area and radio stations have been asked to broadcast periodic updates.
- If conditions worsen, we will make every attempt to locate you personally. If you are absent from your home for more then a short time, please leave a note with your name and a contact telephone number in a door or window where it can be easily seen.

Phase 2

An evacuation REQUEST has been issued for this area.

Events dictate a good probability that hazards associated with the approaching (fire, HAZMAT, tsunami, etc) will severely limit our ability to provide emergency services protection. Dangerous conditions exist that may threaten residents or businesses.

- You must prepare to leave at a moment's notice. Fire and law enforcement personnel are working in this area to provide specific information about when to leave and the route(s) to take.
- This may be the only notice you receive.
- You will be kept advised as conditions change. Area and radio stations have been asked to broadcast periodic updates.

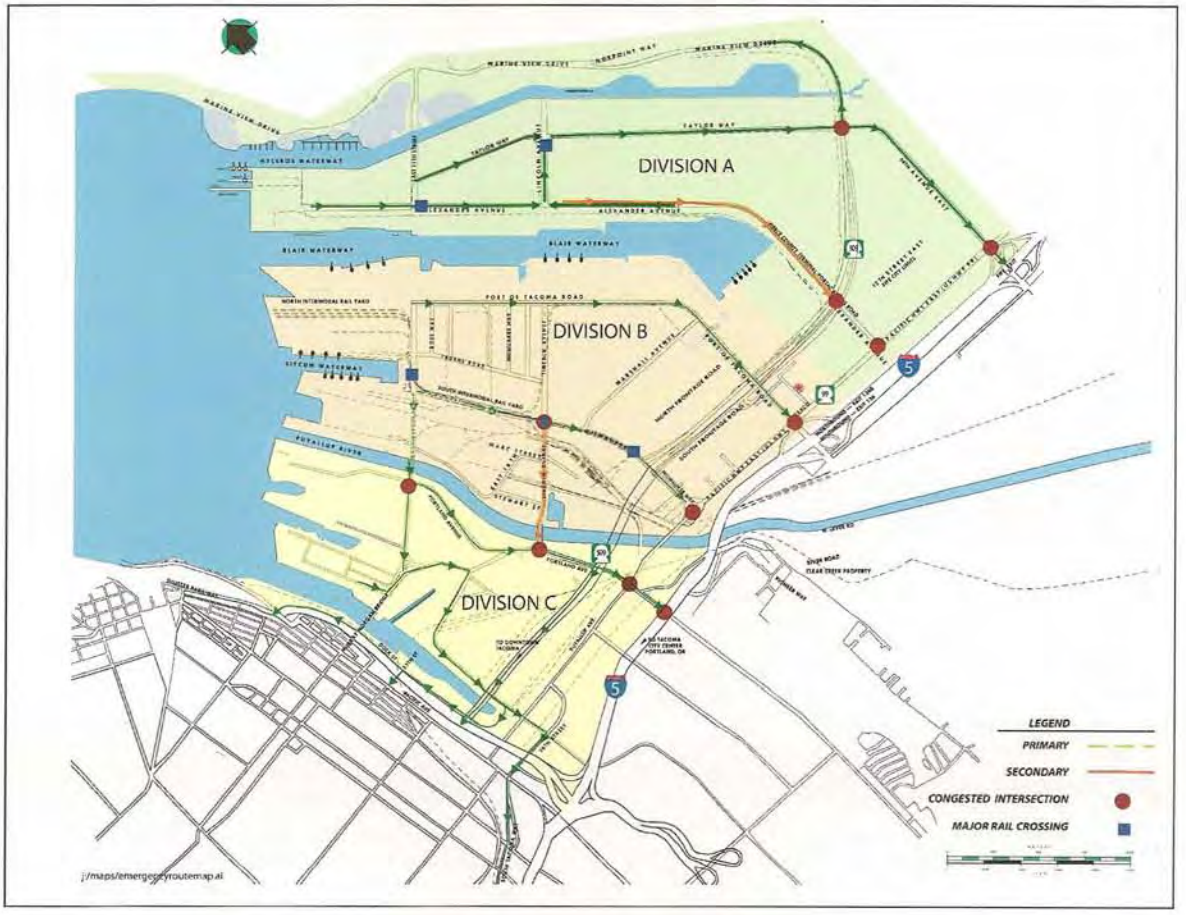
Phase 3

An evacuation ORDER has been issued for this area.

Current conditions present specific and immediate threat(s) to the life and safety of persons within this area.

- You are ordered to immediately evacuate. Fire and law enforcement personnel are working in this area to provide specific information about when to leave and the route(s) to take.
- If you choose to ignore this order, you must understand that emergency services will not be available and there is a good chance we would be unable to rescue you. Volunteers will not be allowed to enter the area to provide assistance.
- You will be kept advised as conditions change. Area and radio stations have been asked to broadcast periodic updates.

Evacuation routes based on Tideflats entities geographical locations and roadway engineering:



Division A (Marine View Drive and Blair Hylebos Peninsula :

Primary Routes - Marine View Drive, Taylor Way

Secondary Routes – Alexander Avenue, subject to Pierce County Terminal Gates being opened.

Division B (Blair Waterway to Puyallup River):

Primary Routes – Port of Tacoma Road, East 11th, Portland Avenue

Secondary Routes – Milwaukee Avenue, Lincoln Avenue

Division C (Puyallup River to Dock Street):

Primary - Portland Avenue,

Secondary Routes – St Paul to Portland Avenue or to East 15th and East D Street.

Each business should decide if an off site rally point is necessary, identify that site and communicate that to their employees.

Other areas of concerns to consider are:

- To manage those evacuees who are able to self evacuate by providing relevant information
- To identify the approximate number of people requiring managed evacuation
- To identify suitable locations for sheltering people (it is assumed that a large proportion of people evacuating from the area would disperse and not require shelter provision but this will vary according to location, timing and nature of incident
- To identify suitable transportation methods: personal vehicle, business vehicles, bus, train, watercraft, etc
- To provide operational direction to dispatching local authorities on how to manage those needing to be evacuated from their areas
- To provide information to the Public Information Officer so s/he can provide the strategic public information messages
- Contaminated People – In any Chemical, Biological, Radiological or Nuclear (CBRN) incident contaminated persons will be decontaminated before being evacuated, or that sheltering-in-place would be the chosen course of action.
- ICE Detention Center will require special evacuation protocols.
- Industrial operations that remain even during an evacuation.
- To close area to inbound traffic including Interstate 5 and SR 509 to maximize egress routes.
- Staging Areas

8. Other

Communications:

Existing communication protocols will be sufficient and each responding agency is responsible for establishing communication links with other agencies as appropriate. The Law Enforcement Support Agency is the communication coordinator. The incident commander will establish a communication plan based on situational needs using the ICS 205 form.

Warning and Informing Tideflats Populations

The key element to successful evacuation warning and informing is to ensure consistent, coordinated, informative, accurate and timely messages are given to affected populations.

Examples of some of the systems responders currently have in place to distribute messages are:

- Reverse 911
- Port of Tacoma PIER System
- PC Warn
- Websites and emergency email warning systems
- Public loudspeaker systems.
- Business information cascade systems.
- Physical police and security personnel present to inform and direct the public.

Responders will also need to consider how to ensure their messages reach vulnerable persons and those who may have difficulty understanding the warning and informing messages also convened.

The message given to people will be essential. It is important to encourage to those who can help themselves, and provide enough information for those who need help.

Medical Plan

The assessment of the incident/event will determine the medical response for both responders and incident/event victims. Triage, Treatment, and Transport Areas will be setup as needed. Medical personnel will follow established protocol for activating a mass causality type incident response.

Finance

Finance Section requirements will be determined based on the incident/event. Otherwise each agency will be responsible for tracking their costs.

Exercising and Training

In order to be successful the plan must be disseminated, trained and exercised.

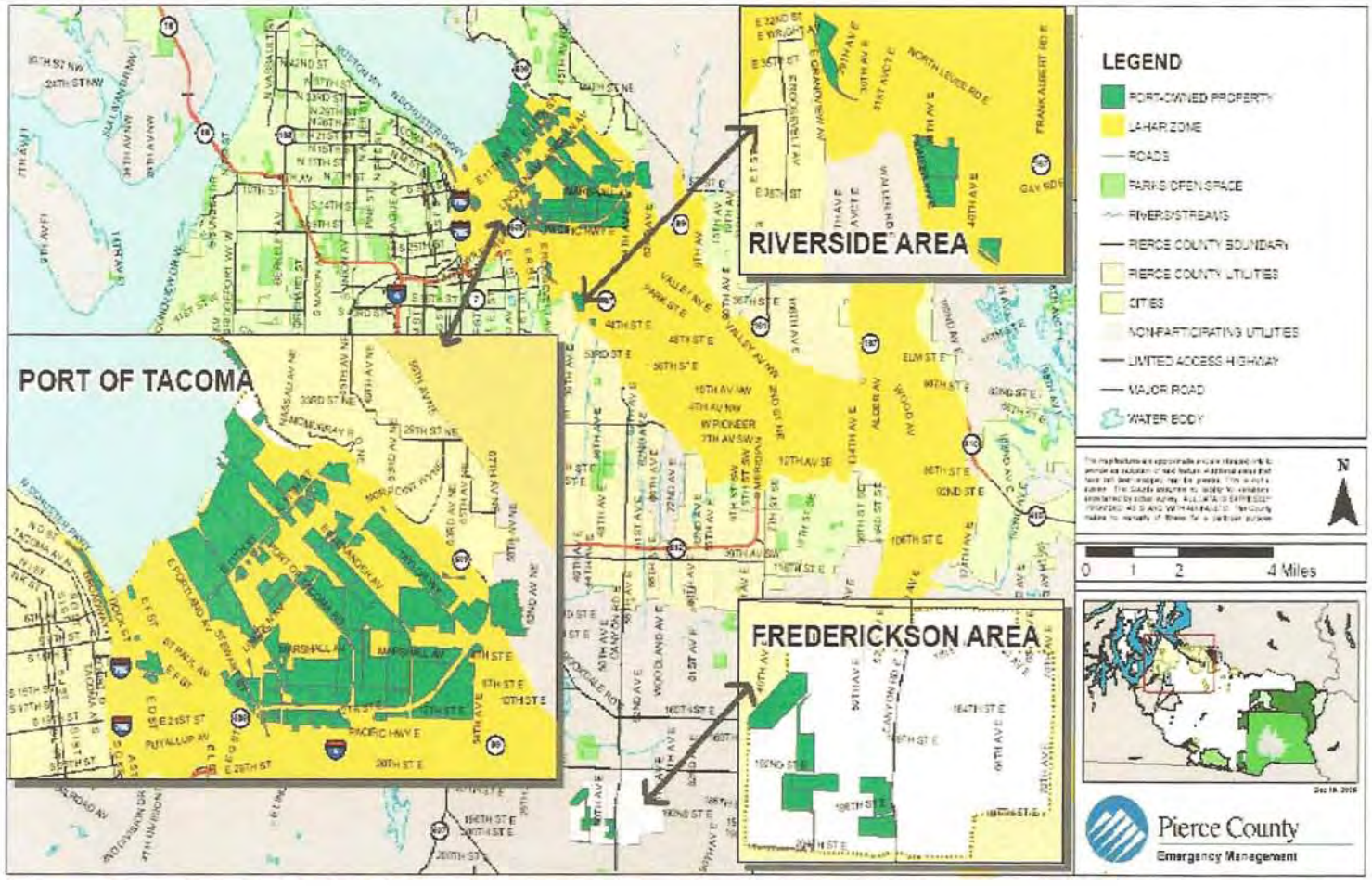
Plan Review and Maintenance

This plan should be reviewed and updates (if necessary) yearly or when there has been a substantial change made in the Tacoma Tideflats area.

Potential Plan Participants

- U.S. Coast Guard
- Port of Tacoma Security Department
- City of Tacoma Traffic Engineering, Fire, Police, Emergency Management
- Pierce County Department of Emergency Management
- Fife Police Department
- Pierce County Sheriff's Department
- Puyallup Tribe
- Burlington Northern Railroad
- Union Pacific Railroad
- Tacoma Rail
- US Immigration & Enforcement
- Washington State Ferries
- Washington State Patrol
- Washington State Department of Transportation

PORT OF TACOMA - LAHAR HAZARD AREA



Appendix A

What Can I Do On Site to Prepare for Evacuation?

This evacuation plan is intended to guide responders and evacuees in the event of an evacuation of part or all of the Tacoma Tideflats. Police and Fire resources may be obligated to the emergency site and not available to assist every evacuee. The following information is intended to assist in your planning at your site.

Prepare for your site's evacuation

Designate exit routes from your facilities, create a local alarm system to notify your employees of an emergency (see WAC 296-800-310). Create a rally point(s) where employees and site visitors meet upon exiting buildings so that a head count can be conducted and evacuation information can be disseminated.

Consider "Shelter in Place"

"Shelter-in-place" means to take immediate shelter where you are—at home, work, school or in between—usually for just a few hours. Local authorities may instruct you to "shelter-in-place" if chemical or radiological contaminants are released into the environment.

For some emergencies, immediate evacuation may not be possible (routes are blocked) or advised (evacuation would require traveling through the event hazardous area).

The Red Cross has shelter in place information on their web site at http://www.redcross.org/preparedness/cdc_english/Sheltering.asp

Consider the shut down of industrial processes.

Many area businesses have industrial processes that can not go unmanned or be quickly shut down in the event of an emergency. What contingencies are prepared for ensuring the safety of these processes and staff when an evacuation is called for?

Educate and train employees know the evacuation routes and alternative routes.

Have the routes designated in this plan been discussed with staff and posted on safety bulletin boards? Has consideration been given to car pooling to leave the site and thereby reducing the total number of vehicles on the roads? How will site visitors who may not know the geography or have limited language skills, be assisted in evacuating?

Has an "out of area" rally point been designated?

Once employees have successfully evacuated the area are they expected to rally at a pre determined site out of the Tideflats for another head count or to receive information such as the Tacoma Mall?

Communicate during and after the event.

Establish a communication plan, such as a phone tree or email group, to provide information such as site and personnel status or resumption of activity. Ensure that contact information is available off site.

Appendix B

Port of Tacoma Terminal

Evacuation Routes

Pierce County Terminal – 4015 SR 509, North Frontage Road

Primary Route:	South on Alexander Avenue
Secondary Route:	North on Alexander to Lincoln and Taylor Way to SR -509
RR Crossing:	Impact by rail at Lincoln and Taylor and at Taylor and SR-509 is possible if evacuation to the North of Alexander Ave. is necessary

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TOTE – 500 Alexander Avenue

Primary Route:	Taylor Way
Secondary Route:	Alexander Avenue (upon coordination w/PCT Traffic Control)
RR Crossing:	Lincoln at Taylor

US OIL – 3001 Marshall Avenue

Primary Route:	Exit thru the main gate travel down Marshall Rd. to Port of Tacoma Rd and end at the Fabulich Center.
Secondary Route:	Marshall to Milwaukee to end at Fabulich Center US Oil Dock: Port of Tacoma Road, Dockers will utilize the same primary route
RR Crossing:	Marshall at Milwaukee

Husky – 1101 Port of Tacoma Road

Primary Route:	Port of Tacoma Road
Secondary Route:	East 11th Street and Milwaukee
RR Crossing :	Secondary route possible impact by rail at 11th Street & Thorne

OCT – 710 Port of Tacoma Road, Pier 7D

Primary Route:	Port of Tacoma Road
Secondary Route:	Port of Tacoma Road thru Port Administrative building thru Milwaukee, down 11th Street to Port of Tacoma Road and down Portland Ave
Third Route:	Sitcum down Milwaukee
RR Crossing:	Milwaukee at Lincoln

Port of Tacoma Administration Building – One Sitcum Plaza

Primary Route:	Maintenance Personnel Port of Tacoma Road to Fabulich Center for head count Admin Personnel will travel down 11th Street to Port of Tacoma Road
Secondary Route:	Admin & Maintenance = 11th Street to Portland Avenue
RR Crossing:	

Port of Tacoma Engineering Field Office Alexander Avenue

Primary Route:	Taylor Way via Alexander to Lincoln
Secondary Route:	Alexander Avenue (upon coordination w/PCT Traffic Control)
RR Crossing:	Lincoln at Taylor

APM – 1675 Lincoln Avenue

Three Egress Areas

1st Route:	Maintenance down Stewart Street out to Lincoln
2nd Route:	Horizon Lines & gate crew will travel Stewart Street to Lincoln or over the bridge to 99 or Lincoln to Milwaukee
3rd Route:	Admin. yard and Longshore will travel from Milwaukee branch off to 99…a few will try to hop on 11th Street and hook over

TEMCO - 11 Schuster Parkway

Primary Route: Foss Waterway and onto 705 (avoid entry into Tacoma)

Tacoma Rail – 2601 SR 509 N. Frontage Road

Crews are spread throughout the Tideflats. Crew members will travel back to building and back home. Supervisors will meet at the Fabulich Center.