SITE CHARACTERIZATION/ FOCUSED FEASIBILITY STUDY REPORT

EXXONMOBIL/ADC PROPERTY, ECOLOGY SITE ID 2728
EVERETT, WASHINGTON

PROJECT # 6103180009

EXXONMOBIL OIL CORPORATION/AMERICAN DISTRIBUTING COMPANY

Prepared for:

EXXONMOBIL OIL CORPORATION

Oakland, California

AMERICAN DISTRIBUTING COMPANY

Marysville, Washington

MAY 12, 2023

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Prepared for:

ExxonMobil Oil Corporation
Oakland, California

American Distributing Company
Marysville, Washington

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May 12, 2023

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	microgram per liter
1996 Order	Agreed Order DE-95TC-N402
1998 Order	Agreed Order DE-98TCP-N223
2010 Order	Agreed Order DE-6184
ADC	American Distributing Company
AGRA	AGRA Earth & Environmental, Inc.
AMEC	AMEC Environment & Infrastructure, Inc.
AMEC Earth & Environmental	AMEC Earth & Environmental, Inc.
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
AO	Agreed Order
ARAR	applicable or relevant and appropriate requirement
Aspect	Aspect Consulting
AST	aboveground storage tank
bgs	below ground surface
BNSF	BNSF Railway Company
BTEX	benzene, toluene, ethylbenzene, and xylenes
CFR	Code of Federal Regulations
Chevron	Chevron Corporation
cm/sec	centimeter per second
COC	constituent of concern
CLARC	Cleanup Levels and Risk Calculation
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CPOC	conditional point of compliance
CSM	conceptual site model
CSO	combined sewer overflow
CSTO	California Street/Terminal Avenue Overcrossing
CY	cubic yard
DCAP	Draft Cleanup Action Plan
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
EPA	Environmental Protection Agency
ESA	Endangered Species Act
Eurofins	Eurofins Calscience
ExxonMobil	ExxonMobil Oil Corporation
°F	degrees Fahrenheit
FFS	focused feasibility study
former KC property	former Kimberly-Clark property located north of the Property, currently owned by Port of Everett
FS	feasibility study
GAC	granular activated carbon
ISS	in situ soil stabilization
ITRC	Interstate Technology and Regulatory Council
KC	Kimberly-Clark Corporation
LNAPL	light nonaqueous-phase liquid
LPH	liquid-phase petroleum hydrocarbons
mg/kg	milligram per kilogram
MLLW	mean lower low water
MNA	monitored natural attenuation
Mobil	Mobil Oil Corporation
MTBE	methyl tertiary-butyl ether
MTCA	Model Toxics Control Act

NAVD88	North American Vertical datum of 1988
NPV	net present value
NRWQC	National Recommended Water Quality Criteria
ORP	oxidation-reduction potential
PAH	polycyclic aromatic hydrocarbon
PCL	preliminary cleanup level
POC	point of compliance
PRB	permeable reactive barrier
Premier	Premier Environmental Services, LLC
Property	two contiguous parcels located at 2717 and 2731 Federal Avenue, in Everett, Washington, owned by ExxonMobil and by ADC, respectively
PSI	Puget Sound Initiative
PTI	PTI Environmental Services
PVC	polyvinyl chloride
RAO	remedial action objective
RCW	Revised Code of Washington
RI	remedial investigation
RMP	risk management plan
RZA	Rittenhouse-Zeman & Associates, Inc.
SAP	sampling and analysis plan
SC	site characterization
SC/FFS	site characterization and focused feasibility study
SEPA	State Environmental Policy Act
Site	ExxonMobil and ADC Property and portions of neighboring parcels where releases of hydrocarbon contamination on the Property may have migrated
SPOC	standard point of compliance
Standard	Standard Oil Company of California
SVE	soil vapor extraction
SWCA	SWCA Environmental Consultants
Texaco	Texaco Refining and Marketing, Inc.
TPH	total petroleum hydrocarbons
TPH-D	total petroleum hydrocarbons as diesel
TPH-G	total petroleum hydrocarbons as gasoline
TPH-O	total petroleum hydrocarbons as oil
USC	United States Code
UST	underground storage tank
Vigor Marine	Vigor Marine LLC
VOC	volatile organic compound
WAC	Washington Administrative Code
Wood	Wood Environment & Infrastructure Solutions, Inc.
WRCC	Western Regional Climate Center
WSP	WSP USA Environment & Infrastructure Inc.

1 INTRODUCTION

Please be aware that, effective September 21, 2022, Wood Environment & Infrastructure Solutions, Inc., was acquired by WSP. Due to the acquisition, we have changed our name to WSP USA Environment & Infrastructure Inc. No other aspects of our legal entity or capabilities have changed.

WSP USA Environment & Infrastructure Inc. (WSP), prepared this Site Characterization/Focused Feasibility Study (SC/FFS) Report on behalf of ExxonMobil Oil Corporation (ExxonMobil) and the American Distributing Company (ADC) for the ExxonMobil/ADC Property (the Property) located at 2717 and 2731 Federal Avenue in Everett, Washington, owned by ADC and ExxonMobil, respectively. Historical releases of petroleum products have been documented due to former operation of bulk petroleum storage, transfer, and distribution facilities on the Property and operations of other companies on nearby parcels. Consistent with Agreed Order (AO) No. DE 6184 (2010 Order), entered into between ExxonMobil, ADC, and Ecology in March 2010, the Site is defined as the Property owned by ExxonMobil and ADC, plus those portions of neighboring properties where releases of hazardous substances at the Site may have migrated or otherwise come to be located. The Site has a Washington State Department of Ecology (Ecology) Facility ID of 2728. The extent of soil and groundwater contamination resulting from the historic operations on the Property has been sufficiently identified for purposes of this SC/FFS and for development of remediation alternatives. This SC-FFS Report will identify the recommended cleanup alternative for the Site. The final cleanup remedy for the Site will be documented in the Draft Cleanup Action Plan (DCAP), which will be completed after the SC/FFS Report has been finalized and approved by Ecology.

1.1 PURPOSE OF THE SC/FFS REPORT

This SC/FFS Report was prepared to meet the requirements of the 2010 Order and in accordance with Ecology's Model Toxics Control Act (MTCA) Cleanup Regulations (Washington Administrative Code [WAC] 173-340). This SC/FFS Report describes the nature and extent of Site soil and groundwater contamination, presents an evaluation of potentially applicable remediation alternatives to clean up Site contamination, and identifies a recommended final cleanup action to comprehensively address contamination in soil and groundwater at the Site. The recommended alternative will be developed more fully and described in detail in the DCAP. This SC/FFS will serve as the basis for preparing the DCAP to be developed for the Site, as specified by the 2010 Order. The DCAP will be prepared by Cardno.

The purposes of this SC/FFS are to:

- document the history of past Property ownership and operations conducted on the Property and surrounding properties;
- summarize past investigation and interim remedial activities conducted at the Site;
- identify constituents of concern (COCs) for the Site and present preliminary cleanup standards for the Site established pursuant to the MTCA regulations;
- document the nature and extent of Site contamination, based on investigations conducted to date at the Site;
- present a conceptual site model (CSM) describing the potential exposure pathways and potentially exposed receptors for Site contamination;
- establish remedial action objectives (RAOs) for the Site;
- identify preliminary cleanup levels (PCLs) for soil and groundwater;
- identify and evaluate alternative remedial actions to achieve the RAOs and PCLs at the Site in accordance with the MTCA regulations;
- select the recommended remedial action alternative; and
- provide information necessary to complete the DCAP.

1.2 ORGANIZATION OF THE REPORT

This SC/FFS Report is organized into the following sections:

- Section 1, Introduction: Presents the report purpose and outlines the organization of the SC/FFS Report.
- Section 2, Site description: Describes the physical setting and regulatory background for the Site.
- Section 3, Previous environmental characterization/sampling investigations: Presents a brief overview of previous environmental investigations conducted for the Site.
- Section 4, Summary of past remediation activities: Presents a brief overview of previous interim remedial measures implemented at the Site.
- Section 5, Constituents of concern and preliminary cleanup standards: Presents the COCs and discusses PCLs and the point of compliance (POC) for the Site.
- Section 6, Nature and extent of contamination: Summarizes locations and degree of contamination in soil and groundwater.
- Section 7, Aquifer and tidal studies: Presents an overview of studies conducted at the Site to evaluate groundwater conditions and tidal influence on groundwater flow patterns.
- Section 8, Conceptual site model: Presents the CSM for the Site and an evaluation of potential receptors and exposure pathways.
- Section 9, Remedial action objectives: Defines RAOs for the Site.
- Section 10, Remediation considerations: Outlines key considerations to be taken into account for the development and evaluation of remedial alternatives and for subsequent design of the preferred cleanup action.
- Section 11, Remediation technologies: Presents a focused evaluation of potential remedial technologies that may be appropriate for soil and groundwater at the Site.
- Section 12, Development of remediation alternatives: Describes the remedial alternatives considered for soil and groundwater remediation at the Site.
- Section 13, Evaluation of alternatives: Evaluates and compares the remedial alternatives described in Section 12.
- Section 14, Preferred alternative: Describes the recommended remedial alternative.
- Section 15, References: Provides a list of references cited in this report.

2 SITE DESCRIPTION

This section describes the historical, physical, and environmental setting of the Property and surrounding area, and presents the regulatory and compliance history relevant to the SC/FFS Report. As defined in the 2010 Order, the Site is defined as the property owned by ExxonMobil and ADC, plus those portions of neighboring properties where releases of hazardous substances due to ExxonMobil or ADC operations may have migrated or otherwise come to be located. In addition to historic operations by ExxonMobil and ADC, another source of contamination at the Site includes releases from former train car loading racks located east of the Property, under the current Terminal Avenue Overpass. The ExxonMobil–ADC Property occupies 0.86 acre of land and consists of two parcels (Figure 2-1). The northern parcel at 2717 Federal Avenue occupies approximately two-thirds of the Property (0.65 acre) and will be referred to as the ADC Parcel. The southern parcel at 2731 Federal Avenue occupies approximately one-third of the Property (0.21 acre) and will be referred to as the ExxonMobil Parcel. The extent of the site and the parcel boundaries are shown on Figure 2-2.

2.1 DESCRIPTION OF PROPERTY AND VICINITY

The Property is located east of Federal Avenue, west of the Terminal Avenue Overpass, and immediately south of the former Kimberly-Clark Corporation (KC) property and former Everett Avenue in the northwest portion of Everett, Snohomish County, Washington (Figures 2-1 and 2-2). The former KC property is presently owned by the Port of Everett, but will be referred to in this report as the “former KC property” or the “KC property.”

2.1.1 PROPERTY OWNERSHIP

The ADC parcel is owned by the Miller Trust (Cecilia Beverly Miller, beneficiary), and the ExxonMobil parcel is owned by ExxonMobil.

2.1.2 CURRENT LAND USE

The Property is an asphalt-paved empty parking lot. No structures are present on the Property. The Property and other parcels in the immediate vicinity are shown on Figure 2-2. In addition to the Property, the Site includes portions of the surrounding properties, including portions of former Everett Avenue, Federal Avenue, and the Port of Everett properties just west of Federal Avenue. It also includes portions of the City of Everett right-of-way east and south of the Property, the BNSF Railway Company (BNSF) parcel, the BNSF railway corridor right-of-way east of the Property, and the land under the Terminal Avenue overpass (Figure 2-2). Current land use for these properties is described in Section 2.1.3.

2.1.3 SURROUNDING PROPERTIES

The Property is adjoined by the following properties (Figure 2-2):

- The former KC property is located immediately north of the ADC Parcel, at 2600 Federal Avenue. The KC property was used for several decades for wood and paper products manufacturing. It housed former bulk petroleum storage tanks and currently includes a warehouse near the southern end adjacent to the ExxonMobil/ADC Property. Most of the former paper manufacturing facility was demolished in 2012. The former KC property also includes a portion of the former Everett Avenue, north of the ADC Parcel. The former KC property is currently owned by the Port of Everett.
- A City of Everett right-of-way is located immediately east of the Property. The City of Everett right-of-way is currently paved with asphalt and is otherwise unoccupied.
- Another City of Everett right-of-way is located immediately south of the Property. This right-of-way was formerly part of the ExxonMobil Parcel but was transferred to the City of Everett as part of the Terminal Avenue Overpass project. This right-of-way is currently paved with asphalt and is otherwise unoccupied.
- Federal Avenue is located immediately west of the Property. Federal Avenue is a public street and City of Everett utility corridor.

An active BNSF rail line and adjoining BNSF-owned parcels are located east and south of the Property, beyond the City of Everett rights-of-way. The Terminal Avenue Overpass crosses the BNSF railway corridor and the City of Everett right-of-way, and then joins Federal Avenue at grade near the southwest corner of the ExxonMobil Parcel. The properties to the west, beyond Federal Avenue, are owned by the Port of Everett, and several properties are occupied by various lessees, including Dunlap Towing. The shoreline of Port Gardner Bay is approximately 300 feet northwest of the Property.

2.2 LAND USE AND OPERATIONAL HISTORY OF THE PROPERTY AND SURROUNDING PROPERTIES

This section briefly summarizes historical land use and operations at the Property and the surrounding area. Selected historical maps and other documentation for these parcels are provided in Appendix A. Additional historical documentation is available in the FFS Work Plan (AMEC Earth & Environmental, 2010a).

Native Americans were living along the shoreline of Port Gardner Bay as it existed at the time of initial European contact. Extensive development began in the late 19th century, when the shoreline was located in the general vicinity of the present-day Federal Avenue. The Property and surrounding properties were used for storage and transfer of petroleum and petroleum products beginning as early as 1920. Additional property development, including infilling of the bay west of the Property, continued until the present-day shoreline was established by 1976.

Figures 2-3 through 2-6 illustrate the recent history of the Property and its surroundings, as reconstructed using historical aerial photographs. Aerial photographs from 1947, 1967, and 1993 showing multiple aboveground storage tanks (ASTs) and extensive infrastructure are presented on Figures 2-3 through 2-5. Figure 2-6 shows the former features of the Property and neighboring parcels visible on historical maps and aerial photographs of the immediate vicinity, superimposed over a more recent aerial photograph from May 2013. This figure gives an indication of the types and locations of facilities that have been present on and near the Property. Additional historical maps and aerial photographs are presented in Appendix A.

2.2.1 EXXONMOBIL/ADC PROPERTY

A search of records at the Washington State Department of Archaeology and Historic Preservation in Olympia and at the Everett Public Library's Northwest History Room failed to identify any evidence of previously recorded archaeological sites, historic buildings, or traditional cultural properties located on the Property.

Based on the 1902 Sanborn Fire Insurance map (Appendix A), the earliest known development of the Property consisted of wooden residential dwellings that lined the shoreline of Port Gardner Bay near present-day Federal Avenue. The map labels the Property as “marsh,” suggesting that these dwellings were likely constructed on native soils. The 1914 Sanborn map (Appendix A) indicates that the entire Property had become vacant. In 1915, the City of Everett passed Ordinance No. 1674 granting the Standard Oil Company of California (Standard), now known as Chevron Corporation (Chevron), permission to construct a tank farm consisting of three ASTs on Lot 1 of Block 619 (the northern portion of the ADC Parcel), with piping leading to Standard’s dock on the waterfront (Appendix A). However, it is not certain that the tank farm was actually built.

Historical documents show that a majority of the Property and surrounding properties were covered by a garbage dump in 1917 (Appendix A). A 1946 plot plan of the former ADC facility shows the toe-of-slope of the former garbage dump as of February 15, 1917, and references a City of Everett Engineering department drawing. Extensive background research failed to identify any further evidence that the dump was a formal sanitary landfill that accepted refuse from a City agency or wider geography.

Beginning as early as the 1920s, the Property was used for petroleum bulk storage, transfer, and distribution operations; marine offloading; truck loading; and rail loading and/or unloading of petroleum products that included fuel oils, stove oil, Bunker C fuel oil, diesel, and gasoline. Property use included handling a blend of synthetic and petroleum-based fluids (PS300) specially designed for compressor applications (AGRA 1996a); however, only small quantities (55-gallon drums or smaller) of PS300 were likely used and/or stored at the Property, as lubricating oils were not typically processed in bulk form at the Property.

In 1922, Gilmore Oil Co. Ltd. (predecessor to General Petroleum and later acquired by Mobil Oil Corporation [Mobil]) first leased the Property from the Great Northern Railway of Minnesota (a predecessor to BNSF) for bulk petroleum operations. In 1927, Gilmore Oil Co. Ltd. became an owner of the Property (AMEC Earth & Environmental, 2010a); General Petroleum and successors to the property, which included Mobil and ADC, continued bulk petroleum handling operations. An historical Great Northern Railway map dated 1930 (Appendix A) shows two large ASTs and several structures on the Property. By that time, the shoreline west of the Property had been extended farther into Port Gardner Bay, and several new developments were present on what is now the Port of Everett property across Federal Avenue.

In 1974, Mobil sold the northern two-thirds of the Property (the current ADC Parcel) to Mr. A.P. Miller for use by ADC. Mobil continued to operate a small bulk plant on the southern one-third of the Property (the ExxonMobil Parcel) until 1987. ADC operated a terminal on the ADC Parcel until 1990.

In 1985, recorded structures on the ADC Parcel consisted of two warehouse buildings, a pump house, and two diked fuel storage areas, each of which included two ASTs. In addition, fuel storage tanks were present in the northwest corner of the ExxonMobil Parcel. A 1985 environmental investigation conducted by Rittenhouse-Zeman & Associates, Inc. (RZA), identified evidence of surface spillage on the ExxonMobil Parcel at several locations, including the unloading racks, pump house, and near the outdoor drum storage area, and reported that a number of unintentional releases of petroleum products had occurred in the past due to tank leakage, tank overfills, and surface spills associated with the four ASTs (RZA, 1985). The tanks and other structures on the ExxonMobil Parcel were demolished in approximately 1987. The ExxonMobil Parcel appears to be covered with asphalt with no above-grade structures in the 1993 aerial photograph; several tanks and structures were present on the ADC Parcel in 1993 (Figure 2-5).

By 1990, four large ASTs and five small ASTs, surrounded by the concrete firewall, occupied the northern half of the ADC Parcel. An office building, a warehouse, a boiler room, an oil pump house, loading racks, and overhang canopies were located within the southern portion of the ADC Parcel. In addition, an AST, aboveground piping, and a concrete wall were located within the southern portion of the ADC Parcel. Locations of these former tanks are shown on Figure 2-6.

Peak operations at the bulk fuel tank farm on the Property occurred from the 1920s through early 1980s. ExxonMobil ceased operations in the mid-1980s, and ADC ceased operations in the early 1990s. Any releases of higher range petroleum hydrocarbons to the subsurface would be expected to have occurred during that time period. Thus, releases may have occurred as far back as 90 years ago, and at a minimum 25 years ago. Thus, contaminants that may be present in the subsurface and attributed to these business activities would consist of older, weathered petroleum products.

All structures on the ADC Parcel were demolished in 1998, and in 1999 the Property was capped with asphalt to meet the requirements of AO DE-98TCP-N223 (1998 Order) (Section 4.6). Since then, the Property has been used intermittently as a parking lot by neighboring businesses.

ExxonMobil was formed in 1999 by the merger of Exxon and Mobil. Ownership of the ExxonMobil Parcel passed to the newly formed corporation. Ownership of the southernmost portion of the historical ExxonMobil Parcel was transferred to the City of Everett as part of the Terminal Avenue Overpass project in the early 2000s.

2.2.2 HISTORY OF SURROUNDING PROPERTIES

Several other facilities located north and northeast of the Property also had historical bulk petroleum operations. Additionally, beginning as early as the 1880s several wood and paper products manufacturing facilities lined the shoreline of Port Gardner Bay. Infrastructure at these properties included fuel pipelines, pumping facilities, storage facilities, railroad spurs, hog fuel burners, log and wood waste storage and disposal sites, and railroad and maritime loading facilities. In 1996, AGRA Earth and Environmental, Inc. (AGRA), identified various corporations in the vicinity with operations that could have resulted in releases of contaminants in the vicinity of the Property. These corporations included BNSF, Chevron, KC, Scott Paper Company, and Texaco Refining and Marketing, Inc. (Texaco). Historical features and operations of properties that surround the Property are shown on Figures 2-3 through 2-6. A brief summary of operations and activities at the properties is presented in Sections 2.2.2.1 through 2.2.2.4.

2.2.2.1 North, northeast, and northwest

The 1930 Great Northern Railway real estate map (Appendix A) shows that the southern portion of the former KC property was occupied by the Associated Oil Company (predecessor to Texaco) and Standard. Two railroad spurs located east of the Property and extending north are labeled “Associated Oil Co.” and “General Petroleum Corp” on the map. Three small oil ASTs were then located at the eastern boundary of the Standard property adjacent to a railroad spur labeled “Standard Oil Co.” (Figure 2-6).

In a 1947 aerial photograph, four small and two large ASTs are evident on the Associated Oil Company property approximately 400 feet north of the ADC Parcel, and three small ASTs remained next to the railroad spur on the Standard property (Figures 2-3 and 2-6). An industrial facility is evident on the photo farther north, beyond the Associated Oil Company property. This facility is the former paper mill, which operated originally as Puget Sound Pulp & Timber Company, later as Soundview Pulp Company, and eventually as Scott Paper Company in 1951.

Four small ASTs are evident half-way between the Associated Oil Company tank farm and the General Petroleum tank farm on a 1955 aerial photograph (Appendix A and Figure 2-6). Standard issued a quit claim for the Standard parcel to Scott Paper Company in 1958. In 1963, Standard sold its remaining property to Scott Paper Company.

Two additional large fuel oil ASTs are visible on the Associated Oil Company property in the 1967 aerial photograph (Figure 2-4), bringing the total number of ASTs on that property to eight. The four small fuel oil ASTs located just south of Associated Oil Company’s fuel farm are still present on the 1967 aerial photograph. By that time, KC’s warehouse had been built, and the footprint covered the location of the three former Standard ASTs (Figures 2-4 and 2-6).

Five ASTs on the Associated Oil Company fuel farm, and the KC building expanded to its current configuration, are shown in a 1976 aerial photograph (Appendix A). In addition, two large ASTs located northeast of the Associated Oil Company fuel farm and north of the KC warehouse appear on the 1976 aerial photograph. After purchasing the property from Chevron and successors to the Associated Oil Company, KC continued to use the former Associated Oil Company ASTs on the north side of the warehouse building to store bunker fuel for its boilers, and at least two of these tanks remained in place until 1997 (AECOM, 2011; Aspect, 2013a). According to the Polk City directories, “Scott Paper Co.” was listed as occupying the area to the north from 1958 to 1995. KC acquired Scott Paper Company in 1995, and KC was listed as the owner of this property from 1995 until the property was acquired by the Port of Everett in November 2019.

Two of the Associated Oil Company ASTs, the two ASTs associated with the KC mill, and the southern portion of the active mill are visible in the 1993 aerial photograph (Figure 2-5). The KC warehouse is also visible in the 1993 photograph. A reconnaissance of the Property and vicinity conducted in 1996 (AGRA, 1996a) indicated that one of the larger ASTs in the former Standard fuel farm was labeled as containing #3 Fuel Oil, and one of the smaller ASTs was labeled “caustic.” One of the ASTs just north of the KC warehouse was reported to have contained diesel fuel or fuel oil (Ecology, 2013a). The other tank is labeled TREX on recent reports (Aspect, 2013a,b), but was not identified as a recognized or potential environmental concern in a Phase I Environmental Site Assessment prepared in 2011 (AECOM, 2011).

The former KC paper mill and the former ASTs visible in the historical aerial photographs were demolished in 2012–2013, although the warehouse building has been left intact (Aspect 2013a). Extensive contamination of soil and groundwater has been documented at the former KC property. The Port of Everett purchased the former KC property in 2019 and is actively engaged in a cleanup process (Aspect, 2013a) (see Section 3.2.1).

2.2.2.2 South

In the late 1980s to early 1990s, Mr. Jack Johnston (part-owner of Johnston Petroleum) purchased the property immediately south of the current City of Everett right-of-way (just south of the ExxonMobil Parcel) from BNSF. At the time of the purchase, the Johnston parcel and ExxonMobil Parcel were adjoining. The Johnston property has been used for parking vehicles, storing packaged goods and oils, and receiving containers (e.g., 55-gallon drums) to be shipped to a recycling facility. Ownership of the former BNSF parcel passed to the Johnston Estate. In 2003, the southernmost portion of the ExxonMobil Parcel was severed and transferred to the City of Everett via a Consent Decree of Appropriation (No. 01-2-03480-2) as part of the Terminal Avenue Overpass project. Construction of the Terminal Avenue Overpass ramp was completed in 2003. The overpass crosses the Johnston Estate parcel and the southeast corner of the ExxonMobil Parcel.

2.2.2.3 West

As of 1915, the pre-development shoreline for Port Gardner Bay was located approximately along the present Federal Avenue (Appendix A). Over time, the shoreline was extended westward by filling the bay. A small warehouse is apparent across Federal Avenue from the Property and between 26th Street and California Street on the 1930 Great Northern Railway real estate map, and on aerial photographs through at least 1967 (Figures 2-3, 2-4, and 2-6; Appendix A). This warehouse was located directly on the waterfront of Port Gardner Bay as recently as 1967 (Figure 2-4). By 1947, the shoreline extended 100 to 200 feet west of the Property. A service garage for ADC was built along the 1947 shoreline, which was armored by a bulkhead, as seen in historical photographs. By 1967, additional dredge infilling had occurred immediately to the west of the former KC property, where the eastern portion of the current Dunlop Towing parcel is located. Between 1967 and 1976, a much larger portion of Port Gardner Bay was filled in, resulting in the current sheet-pile bulkhead shoreline. The properties west of Federal Avenue belong to the Port of Everett and have been leased to various third parties, including ADC, for industrial use as the shoreline was extended westward over time.

According to Sanborn maps and a lease document, ADC leased the warehouse building from Great Northern Railway from 1937 until 1971. General Petroleum (predecessor of ExxonMobil) subleased the building from ADC between 1951 and 1971. General Petroleum and ADC stored oil, grease, and trucks in the warehouse and oil in steel drums adjacent to the warehouse. A wash rack and boiler room were located in the southern end of the building, as shown on the 1957 Sanborn map (Appendix A). Based on historical aerial photographs, the warehouse was removed sometime prior to 1976. In addition, a fuel pier extending westward into Port Gardner Bay was present adjacent to the warehouse from at least 1947 through 1967. The pier was leased by ADC and subleased to General Petroleum.

In 1973, the shoreline west of the Property was infilled to its current configuration by the Port of Everett. The 1976 aerial photograph shows the area used for log storage. The Port of Everett formerly leased the property west of Federal Avenue to Vigor Marine LLC (Vigor Marine). Vigor Marine used this property for ship repair and as a storage yard. Office trailers and a warehouse are also located on that property. The Port currently leases land northwest of the Property to Dunlap Towing, who operates a fleet of marine tugs and transports. Additional discussion of the progression of development and alteration of the shoreline adjacent to the Property is presented as part of the CSM in Section 8.

2.2.2.4 East

An alley belonging to the City of Everett as a right-of-way lies immediately to the east of the Property. This alley separates the Property from a larger parcel owned by BNSF and the active rail line farther to the east. Based on historic Sanborn maps and other historical maps and photographs, the rail line has existed at that location and appears to have been actively used since at least 1902 (Appendix A). According to the 1930 Great Northern Railway real estate map and Sanborn maps, the property directly east of the City of Everett right-of-way has belonged to BNSF since 1930.

Photographs and building plans showed a spur track to the east of the Property that appears to have been associated with a petroleum-loading rack that was used to pump oil into railroad tank cars. The 1930 Great Northern Railway map shows underground fuel lines running from the Property to the loading rack. Although no specific records were found documenting that these lines were decommissioned, the ADC Property owner believes all the piping was removed. The area appears to be unpaved with low-lying vegetation in the 1947 aerial photograph (Figure 2-3). The same area appears on historical aerial photographs to have been used predominantly as an open parking lot in 1947, 1955, 1967, 1985, and 1993 (Figures 2-3 through 2-5 and Appendix A). According to the City of Everett Tax Assessor records, the property to the east belongs to BNSF; this property was most recently used by KC as parking and storage prior to mill closure.

2.3 ANTICIPATED FUTURE PROPERTY USE AND SITE OPERATIONS

The Property and the immediately surrounding properties are zoned M-2 Heavy Manufacturing land use by the City of Everett (2017a). The City's comprehensive plan shows the Property and the same surrounding properties as E.5.1 Heavy Industrial land use (City of Everett, 2017b). The current owners of the Property have no plans to sell or transfer the Property. The Property is currently used for industrial purposes and foreseeable future use is heavy industrial/or commercial.

The City of Everett has modified the M-2 zoning in Ordinance No. 3312-13 (effective January 25, 2013) by allowing some uses that could qualify as commercial uses in the Central Waterfront Planning Area, which includes the Property (City of Everett, 2013) and the nearby properties. In Table 5.2 of the ordinance, titled “Non Residential Uses,” the M-2 zoning is modified to allow a mix of commercial and industrial uses. The allowed land uses specifically prohibit residential use and use for daycare facilities. Use of the area for parks is allowed. The City of Everett Comprehensive plan was updated in November 2020 and establishes that the Site will remain zoned for commercial and industrial uses through 2035; no changes to the Site’s zoning are planned or anticipated after 2035. In addition, the owners of the Property anticipate that institutional controls will be put in place that will limit use of the Property to industrial/commercial purposes and potentially require implementation of passive or active vapor intrusion measures in the event that redevelopment in the future requires installation of utilities or new structures.

2.4 ENVIRONMENTAL SETTING

This section presents a summary of general environmental conditions for the Property and the immediate vicinity. The Property is located in the southwest quarter of Section 19, Township 29 North, Range 5 East, Willamette Meridian. The nearest surface water is an inlet from Port Gardner Bay at Dunlap Towing, located approximately 300 feet northwest of the Property.

2.4.1 TOPOGRAPHY

The topography of the Property and immediate vicinity is relatively flat, with an elevation of approximately 12 to 15 feet relative to the North American Vertical Datum of 1988 (NAVD88). The area slopes gently to the west toward Port Gardner Bay. Higher elevations, up to 150 feet, exist to the east of the Property. The surrounding area consists of roadways and industrial buildings surrounded by parking and storage areas.

2.4.2 GEOLOGY AND HYDROGEOLOGY

Extensive explorations have been conducted on the Property and in the nearby vicinity to characterize subsurface conditions. These explorations have included soil borings, monitoring wells, test pits, and limited subsurface excavations. Locations of historical exploration points installed through August 2019 are presented on Figure 2-7. Lithologic logs collected from these explorations are compiled in Appendix B. These logs were used to construct representative stratigraphic cross sections of the Property and immediate vicinity. The locations of these cross sections (labeled A-A’ through E-E’) are illustrated on Figure 2-7, and the cross sections are presented on Figures 2-8 through 2-13. An investigation of soils on the Port of Everett property was performed by Cardno in 2020 and 2021 (Cardno 2021), as discussed in Section 3.2.4. Cardno’s (2021) explorations are not reflected on Figures 2-7 through 2-13 or the exploration logs in Appendix B.

Based on the 1914 Sanborn map, the Site consisted of low-lying mudflats shown as marshy areas, and the areas near these marshy areas were used by settlers for small residences and dwellings. The marshy areas were likely developed on top of the native near-surface geologic deposits. Settlers likely used the marsh for waste disposal. Near-surface geology in the area surrounding the Property is characterized by Vashon advance outwash deposits (Qva) and transitional beds (Qtb) (Minard, 1985). The outwash deposits are primarily granular and represent higher energy deposits that were deposited ahead of the Vashon glacier as the glacier melted. The transitional beds are composed of interbedded clayey, silty fine to medium sand, and the marsh was developed on top of these beds, so it is difficult to distinguish between fill and marsh deposits. The peat deposits noted in the cross sections likely represent the former marsh. The transitional beds are older than the advance outwash deposits and are the primary geologic unit mapped on the Property (Minard, 1985). The contact between the marsh deposits and the transitional beds occurs between 12 and 27 feet below ground surface (bgs).

Based on subsurface investigations conducted at the Property and surrounding vicinity, the near-surface soils at the Property consist of a heterogeneous mixture of fill materials. The fill materials consist of very loose to medium dense, brown, brownish gray, and gray silty sand and sand with areas of wood and brick debris extending to depths of approximately 5 to 10 feet bgs (corresponding to approximately 5 to 15 feet NAVD88).

The shoreline was gradually extended to the west as the Bay was infilled with sands and silty sands west of the Property and Federal Avenue. Among these typical shoreline silts and sands, significant quantities of organic substances are documented to be present, including wood waste and peat. The high organic content of native soil and fill materials present on the Property and in the immediate vicinity reduces mobility of the weathered petroleum hydrocarbons remaining in the subsurface from historic releases of diesel. Additional discussion concerning the fill history of the Site is presented in Sections 2.2.2 and 8.1.

Gray silty sand and silt and dark-brown to black peat mixed with wood debris are encountered beneath the shallow fill and extend up to 20 to 27 feet bgs. The transitional beds are dense, moist, brown, medium sand with various amounts of silt and discontinuous stiff, brown, organic-rich, clayey silt with some fine sand. The transitional beds were mapped at the land surface to the east of the Site.

Shallow unconfined groundwater occurs at the Site near the surface to 12 feet bgs, with shallower groundwater on the east side of the Site near the Terminal Avenue Overpass and deeper groundwater near the current shoreline. Groundwater is frequently observed to discharge from the base of the overpass and to the surface at the northeast corner of the Site on the former KC property near the former Everett Avenue.

Contour maps based on groundwater elevations measured during semiannual monitoring events are shown on Figure 2-14 for February 2016 and on Figure 2-15 for August 2016. Groundwater levels vary seasonally by approximately 2–3 feet. The groundwater elevation contour maps show the 25-hour mean groundwater level calculated from continuous water levels recorded by transducers in February and August 2016. Based on the groundwater elevation data shown on Figures 2-14 and 2-15, groundwater beneath the Property flows generally toward the west and northwest. Groundwater wells located closer to the current shoreline show larger response to tidal variations. Wells MW-A1, MW-A2, and MW-A3 showed the greatest tidal response of 1.1 feet, compared to an 8- to 9-foot tidal range in surface water of Port Gardner Bay measured at the Everett Pier.

2.4.3 SURFACE WATER HYDROLOGY

Because the Property and surrounding area are paved, surface water drainage is controlled largely by surface topography and engineered drainage structures. Surface water runoff at the Property follows existing topography. Stormwater generally flows to the west and northwest, following the surface slope, toward catch basins located on the Property and on Federal Avenue directly west of the Property. Storm sewers serving the Property and vicinity discharge to Port Gardner Bay via the storm sewer discharge located near the northwest corner of the Port of Everett property leased by Dunlap Towing.

The locations of known storm drains and catch basins are shown on Figure 2-16, based on a survey conducted in 2010 by TrueNorth Land Surveying, Inc. (Appendix C). Four catch basins are located on the Property, approximately 70 feet east of the western Property boundary. These catch basins are located in a linear group oriented north-south. The catch basins on the Property are connected via underground conveyances (AMEC Earth & Environmental, 2007) and discharge via a lateral that extends toward Federal Avenue.

Additional catch basins are present along Federal Avenue farther west, but it is unknown if the storm drains are interconnected.

Some surface water may flow north from the Property toward the former KC property and south from the Property to the City of Everett parcel. Surface water may also flow onto the Property from the BNSF property.

The combined stormwater and sanitary sewer line services the area. Sewage is pumped to and treated at the City of Everett sewage treatment plant except during periods of heavy rainfall, when overflow is routed directly to Port Gardner Bay.

2.4.4 METEOROLOGY

Everett has a moderate climate usually classified as Marine West Coast, typified by wet, cool winters and relatively dry, warm summers. Temperature extremes are moderated by proximity to the adjacent Puget Sound and the greater Pacific Ocean. The region lies in a partial rain shadow, partially protected from Pacific storms by the Olympic Mountains, and from Arctic air by the Cascade Range.

The Western Regional Climate Center provides a summary of climatological statistics for Everett Junior College, located approximately 0.6 mile from the Property (WRCC, 2013). The average annual temperature measured at Everett Junior College is 50.6 degrees Fahrenheit (°F). Average monthly temperature varies from about 39°F in January to about 63°F in July and August. Winters are cool and wet with average lows around 35°F on winter nights. Colder weather can occur, but seldom lasts more than a few days. Summers are dry and warm, with average daytime high temperatures around 73°F in July and August. Hotter weather usually occurs only during a few summer days. The hottest official recorded temperature was 98°F on June 9, 1955; the coldest recorded temperature was 1°F on January 18, 1955 (WRCC, 2013).

Total annual precipitation is about 35.7 inches, with about two-thirds of the rainfall occurring during the wet season from October through March. Monthly average rainfall varies from a maximum of 4.96 inches in December to 1.04 inch in July. Most of the precipitation falls as drizzle or light rain, with only occasional downpours (WRCC, 2013). The 10-year and 100-year recurrence interval, 24-hour precipitation events are approximately 2.25 inches and 3.25 inches, respectively (Miller et al., 1973).

2.4.5 ECOLOGICAL SETTING

The Property is located near the marine shoreline in the Snohomish River basin, in Washington Water Resources Inventory Area 7 (Ecology 2013b), in an area zoned for heavy industrial development (City of Everett, 2017a). The entire Property is paved, and no wetlands, streams, shorelines, floodplains, or functional wildlife habitat occur on the Property. Nearby environmentally sensitive areas include Port Gardner Bay and the Snohomish River.

Port Gardner Bay is located 300 feet west of the Property, immediately adjacent to the Port of Everett property, and contains the nearest wildlife area. Port Gardner Bay is classified as Dungeness crab (*Cancer magister*) habitat, according to the City of Everett Fish and Wildlife Habitat Conservation Areas Critical Areas Map (City of Everett, 2006). However, the shoreline near the Site consists largely of deepwater and limited subtidal and intertidal habitat that has been heavily modified by dredging, filling, and shoreline development (City of Everett, 2002).

Species listed under the Endangered Species Act (ESA) and Washington State Priority Species may be present in Port Gardner Bay and adjacent marine waters of Puget Sound. ESA-listed species present in Port Gardner Bay may include Chinook salmon (*Oncorhynchus tshawytscha*), bull trout (*Salvelinus confluentus*), coho salmon (*O. kisutch*), and steelhead (*O. mykiss*). Adult salmonid use of the area is limited to migration and possibly physiological transition. Juvenile use of the area is similar but may also include feeding/rearing and refuge from predation (City of Everett, 2002).

Common invertebrates present in Port Gardner Bay include snails (*Littorina* spp.), mussels (*Mytilus cf. edulis*), clams (*Macoma balthica, Macoma* spp., *Cryptomya* spp.), cockles (*Clinocardium* sp.), jingle shells (*Pododesmus macroschisma*), polychaetes (*Nereis* spp., *Notomastus* spp., *Nephtys* spp., *Glycera* spp.), barnacles (*Balanus glandula*), shore crabs (*Hemigrapsus* spp.), isopods (*Gnorimosphaeroma oregonesis*), ghost shrimp (*Callianassa* sp.), blue mud shrimp (*Upogebia pugettensis*), Dungeness crab (*Cancer magister*), red crab (*C. productus*), and anemones (*Mertridium senile*) (City of Everett, 2002).

Water quality in Port Gardner Bay meets Washington State water quality requirements for all parameters and is not listed on Ecology's 303d list of impaired waters (Ecology, 2014).

The Snohomish River is situated east and north of the Property, approximately 1.5 miles away. The East Waterway channel of the Snohomish River Estuary bends southward and empties into Port Gardner Bay adjacent to the Everett Naval Station. The East Waterway has been dredged and filled for development of deepwater port facilities. The Snohomish River and its estuary are separated from the Property by areas of industrial and other development, including the City of Everett's Central Business District, residential and commercial development, and areas of industrial and maritime services along the Snohomish River and East Waterway shoreline.

As noted previously, no wetlands, streams, shorelines, floodplains, or functional wildlife habitat occur on the Property or within the immediate vicinity (NWI, 2014; City of Everett, 2006 and 2012). Vegetation in the vicinity of the Property is sparse and generally limited to maintained landscaping, including ornamental shrubs and trees. The nearest stream habitat is Pigeon Creek #1 and its associated wetlands, located approximately 1 mile southwest of the Property.

2.4.6 TIDAL INFLUENCE

Studies to assess the influence of tidal cycles on groundwater flow were conducted at the Property by RZA AGRA in 1991 (as reported by Exponent, 1998) and by AMEC Earth & Environmental in 2008 (AMEC Earth & Environmental, 2008), February 2011 (AMEC Earth & Environmental, 2011a), and 2014.

As reported by Exponent (1998), AGRA monitored water levels in selected monitoring wells for a 48-hour period to measure recovery after a 24-hour aquifer test and to assess potential tidal influences in shallow groundwater. During the 48-hour period, no clear evidence of tidal fluctuations was noted. Based on the results of the recovery monitoring, the observed hydraulic gradient at the Property, and the distance from Port Gardner Bay, it was concluded that tidal influences on shallow groundwater at the Property would be expected to be negligible (Exponent, 1998).

In 2014, a set of seven transducer/loggers were installed in seven wells both on and downgradient of the Property. Results of the 2014 tidal study were consistent with the results from the earlier tidal study conducted in 2011 (AMEC Earth & Environmental, 2011a). Figures 2-17 through 2-20 show hydrographs of water levels in these seven wells measured from July 25, 2014, through September 29, 2014. Transducer readings for these wells have been corrected for barometric pressure readings, which were collected simultaneously, to yield water levels. The hydrographs show the actual water levels and the 25-hour moving average water level for each of the wells. The 25-hour moving average water level filters the daily tidal fluctuations to facilitate evaluation of mean groundwater levels and to evaluate groundwater flow directions (Serfes, 1991). The hourly precipitation records from Paine Field in Everett are also plotted on the hydrographs.

Groundwater levels at the Site are influenced by the tidal fluctuations in Port Gardner Bay. In areas where groundwater levels are influenced by tidal fluctuations, manual water level measurements can lead to under- or overestimates of the hydraulic gradients, with steeper gradients at low tides and flat or slightly reversed hydraulic gradients at high tide. In areas with tidally influenced groundwater, like the Site, the overall groundwater flow directions are determined by the mean hydraulic gradient (Serfes, 1991). The 25-hour average water level for each of the wells can be used to determine the mean or average groundwater flow direction and hydraulic gradient. The 25-hour average water level dampens or filters the tidal "signal" (Serfes, 1991). It should be noted that the amount of flow reversal during a given tidal cycle is minimal, since the peak high tides only last for approximately one hour before ebbing. Any mixing due to flow reversal would affect only the portion of the aquifer present near the shoreline.

There are two high and low tides in a day, and a complete tidal cycle takes 25 hours to complete. Of the two high tides in a cycle, one is generally higher than the other. In order to conservatively calculate the degree of mixing during the highest portion of the tidal cycle, Amec Foster Wheeler Environment & Infrastructure, Inc., (Amec Foster Wheeler) reviewed the tidal records for June 2016 (the highest and lowest tides of any year occur near the summer and winter solstices). The highest tide in June 2016 occurred on June 6, 2016, at 7:53 PM, with a height of 12.3 feet above mean lower low water (MLLW). Groundwater monitoring wells MW-A3, MW A4, and MW-A5 are all equipped with self-logging transducers that record water levels every 15 minutes. After correcting the measured water levels for barometric pressure, Amec Foster Wheeler calculated the tidal flux using the following steps:

- The mean water level for the 12.5-hour period prior to and after the highest high tide was determined using the vertical datum of NGVD88.
- The highest high tide water level of 12.3 feet MLLW was converted from MLLW to the NGVD88 datum by subtracting 1.8 feet, yielding a high-water elevation of 10.5 feet NGVD88.
- The groundwater seepage velocity equation $S_v = Ki/n_e$ (Fetter, 1994) was used to calculate tidal flux, where:
  - S_v is the seepage velocity in inches/hour;
  - K = the hydraulic conductivity of the aquifer materials expressed in inches/hour;
  - i = the hydraulic gradient (dimensionless); and
  - n_e = effective porosity

- The hydraulic conductivities used were determined by slug tests conducted in MW-A5 and MW-A6 (see Section 7.1).
- The hydraulic gradient was determined by dividing the difference between the highest high-water elevation and the 25-hour mean water level in MW-A3, MW-A4, and MW-A5 by the distance to Port Gardner Bay from each well.
- The effective porosity is the void space available for groundwater flow, and a value of 0.30 is typical for sands that comprise the aquifer material.

Assuming the highest high tide level was held constant for 6.25 hours, we calculated the distance the tidal flux would travel inland would range from approximately 0.17 to 0.56 feet. A copy of this calculation and the associated tidal graph and schematic cross-section are included in Appendix D. This estimate of the maximum tidal flux is very conservative and shows that the tidal exchange of surface water and groundwater is limited to the immediate vicinity of the shoreline.

Two of the seven wells (MW-40R and RW-2) are located on the Property and show a very minimal response (<0.05 foot) to tidal variations, but a strong response to infiltration of precipitation. The hydrographs for these two wells resemble one another, suggesting they are responding to the same influx of precipitation. After a spike in water levels caused by a rain event, groundwater levels gradually decrease until the next precipitation event.

Wells MW-A1, MW-A2, MW-A3, and MW-A5 respond in a limited way to infiltration of precipitation, with MW-A1 and MW-A5 showing the greatest precipitation response. Well MW-A3 shows very little response to precipitation. These same wells show tidal variations or “signals” ranging from 0.3 foot to 0.9 foot, with MW-A3 showing the strongest tidal signal, and MW-A1 the smallest tidal signal.

MW-A4 has a very minor response to the tides, and the mean water level in the well appears to vary in response to barometric pressure (Figure 2-21), with the general rise in water levels likely due to infiltration. Field observations indicate that MW-A4 has microbial growth on the surface of the water that coats the surface of the water level meter tape. The well log reports silty sands with wood noted at 15 and 20 feet bgs; at 20 feet bgs the sand becomes poorly graded with marine shells. It is not known why this well has a limited tidal response.

2.4.7 HISTORIC AND CULTURAL RESOURCES

Records were researched at the State of Washington Department of Archaeology and Historic Preservation in Olympia and at the Everett Public Library's Northwest History Room to identify potential historic or cultural resources in the immediate vicinity of the Site. There are no previously documented historic properties (e.g., archaeological sites or isolated finds, historic buildings/structures/objects, and traditional cultural properties) either listed or eligible for listing in the National Register of Historic Places located on the Property. One pre-contact isolate find (45SN629) was recently recorded on the KC parcel located immediately north of the Property (Undem, 2013). The isolate was discovered during archaeological monitoring for the KC Upland Area Project (No. 110207-004-01). The archaeological monitoring was needed for the upland area project based on the findings presented in an Archaeological Resources Assessment that was completed in 2013 by SWCA Environmental Consultants (SWCA, 2013a).

The Archaeological Resources Assessment categorized the former KC property upland area based on sensitivity for unknown and significant archaeological materials. Upland areas classified with a high sensitivity for buried cultural resources were addressed in a monitoring and discovery plan for use during interim remedial measures (“opportunistic cleanup”) to be implemented as part of demolition activities on the former KC parcel (SWCA, 2013b). During implementation of the remedial action, one pre-contact lithic artifact, an edge-altered cobble (45SN629), was recorded (Undem, 2013; Aspect, 2015). The Archaeological Resources Assessment was based on geomorphological and historical analyses of the Port Gardner Bay nearshore environment. This analysis is relevant to the Property, as the feasibility study (FS) addressed in this report includes the same subtidal delta deposits (low sensitivity); marsh and foreshore environment (moderate sensitivity); and beach, backshore, and upland areas (high sensitivity) addressed in the KC report.

Three historic property inventory forms are on file with the Washington State Department of Archaeology and Historic Preservation for buildings located on the former KC parcel. These buildings were formerly associated with the Puget Sound Pulp and Timber Mill that dates back to 1929 (Sharley, 2012; Artifacts, Inc., 2011;

Ravetz, 2005). No historic buildings, structures, or objects that require historic property inventory documentation are present on the Property.

Although no specific traditional cultural properties have been identified within the project area, the Everett waterfront in general has a long history of tribal use. A brief summary of tribal use associated with the Everett waterfront along with tribal engagement activities that have taken place was provided by Ecology and is set forth below.

Ecology is working with landowners/stakeholders, including local Native American tribes, to clean up contaminated sites and sediments in the vicinity of Port Gardner Bay and the Snohomish River Estuary. Port Gardner Bay is identified as a high-priority, “early-action” cleanup area under the Puget Sound Initiative (PSI). The Site has been identified as a cleanup site under the PSI. Local tribes that have been actively engaged by Ecology under the PSI at Port Gardner include the Tulalip, Suquamish, Swinomish, and Lummi. Ecology has worked with a tribal liaison to assist in developing contacts and early engagement activities with cultural and natural resource sections within each of the aforementioned tribes. Engagement with the tribes has consisted of meetings to discuss PSI cleanup sites and cultural resources, providing the tribes with draft work products for comment, and a monthly update summarizing the current status of each PSI site, near-term work products to be submitted for tribal review, project schedules, and a summary of tribal engagement activities for the Port Gardner PSI Sites.

Based on information obtained from Ecology’s discussions with the tribes and information provided in a 1973 Shoreline Historical Survey Report (Dilgard and Riddle, 1973), people have inhabited the Port Gardner Bay area for thousands of years. For centuries, the northwest point of the peninsula (i.e., Preston Point) was the location of Hebolb, the principal village of the Snohomish tribe. Its location near the mouth off the Snohomish River and next to Port Gardner Bay provided both abundant food and access to transportation routes. Native tribes used the Everett shoreline in part for subsistence activities, such as shellfish collection, hunting, plant gathering, and fishing. According to local tribes, native long houses were located up and down the Everett waterfront. Local tribes have communicated to Ecology that the Everett waterfront is a culturally sensitive area. Due to the cultural sensitivity of the project area and the potential to encounter cultural artifacts during cleanup activities, the cleanup action will include a monitoring and unanticipated cultural resources discovery plan outlining procedures to be used in the event cultural resources are encountered during remediation activities on the Property. The monitoring plan will address cleanup activities conducted in project areas that have a high sensitivity classification for cultural resources.

Historic maps and aerial photographs of the project area also were consulted. Sanborn Fire Insurance maps from the early part of the 20th century depict an emerging industrial area with a few wooden and temporary dwellings lining the historic shoreline of Port Gardner Bay. A 1946 plot plan of the former ADC facility shows the toe-of-slope of a former garbage dump on the property as of February 15, 1917 (Section 2.2.1). Extensive background research failed to identify any further evidence to suggest the Property was used as a formal dump/sanitary landfill accepting municipal refuse or trash from a wider geography. The BNSF excavation in 2011 encountered vintage bottles, old shoes, and lumber that were likely disposed in the old marsh area noted in the 1914 Sanborn map. Future cleanup planning will need to address cultural resources that may be encountered in this area. A building or artifact must generally be a minimum of 50 years old to be considered historically significant; however, not all objects more than 50 years old are considered significant cultural resources.

2.4.8 UTILITIES

Underground utilities in the vicinity of the Property are shown on Figure 2-16. Stormwater drainage lines are present beneath the Property. Underground stormwater, sanitary sewer, water, and telephone lines run beneath Federal Avenue and the adjoining former KC property. The City of Everett’s new 24-inch underground force main also runs beneath Federal Avenue and the former KC property. An overhead power line runs along Federal Avenue and the former KC property.

Any contractor conducting subsurface work at the Site must independently identify underground utilities prior to conducting the subsurface work.

2.5 REGULATORY AND COMPLIANCE HISTORY

Petroleum contamination has been found in soil and groundwater beneath the Site, as described in detail in Section 3 of this report. This contamination is the result of historic releases from the bulk petroleum facilities that operated on the Property and adjacent properties to the west (Port of Everett), north (Everett Avenue right-of-way and adjacent to the KC warehouse), and east (BNSF property and in the vicinity of the former loading racks). Due to the presence of petroleum contamination, the Site is subject to cleanup under the terms of the MTCA regulations (WAC 173-340). Cleanup activities and Site investigations have been conducted at the Site since the mid-1980s, and include several AOs issued under MTCA that direct cleanup actions.

In 1996, Mobil and ADC entered into AO No. DE-95TC-N402 (1996 Order) with Ecology to take necessary steps to clean up, eliminate, and/or contain petroleum releases at and near the City of Everett combined sewer overflow (CSO) discharge line and/or diffuser into Port Gardner Bay. The 1996 Order also required pilot testing of petroleum recovery technologies; characterization of the nature of contamination in the vicinity of the CSO line; and repair of the CSO line. In response to the 1996 Order, interim remedial actions were undertaken, and studies performed at the Site demonstrated that the exposure pathway to Port Gardner Bay had been removed through repair and replacement of portions of the CSO line that also included slip-lining of the sewer. Approximately 23,000 gallons of petroleum was recovered within the vicinity of the CSO line by various interim remedial measures. Section 4 presents a more detailed discussion of interim remedial measures implemented at the Site.

In December 1996, Ecology issued notice of potential liability letters to KC, Texaco, BNSF, Scott Paper Company, and Chevron. The letters stated that credible evidence of releases of hazardous substances from the properties owned or operated by each of these companies existed.

In 1998, Mobil and ADC entered into a new AO (the 1998 Order) with Ecology to complete a remedial investigation (RI) and FFS. RAOs were developed and approved by Ecology using existing analytical data, agreed-upon exposure pathway analyses, and a screening-level risk assessment. The cleanup approach selected to achieve RAOs included a liquid-phase petroleum hydrocarbons (LPH) interceptor trench along the western and northern boundaries of the Property and a low-permeability cap over the Property. The interceptor trench and cap were installed in 1999 (Section 4.6).

Periodic groundwater monitoring began at the Site in the early 1990s. Regular quarterly groundwater monitoring and monthly LPH gauging and removal commenced in 2002, as a requirement under the 1998 Order and in accordance with a monitoring program that was prepared by Premier Environmental Services, LLC (Premier, 2002) and submitted to Ecology.

In 2007, the groundwater monitoring frequency for the Site was reduced from quarterly to semiannually. This change in monitoring frequency was verbally accepted by Ecology in February 2007, and acceptance was again confirmed in a meeting with Ecology on August 8, 2007.

In 2010, Ecology, ADC, and ExxonMobil entered into a third AO, the 2010 Order. The 2010 Order specifies that an FFS and DCAP be prepared to identify the nature and extent of Site soil and groundwater contamination in order to select a preferred final cleanup action to address contamination in soil and groundwater at the Site in compliance with requirements under MTCA.

A draft FFS Work Plan was prepared and submitted to Ecology in February 2010, which identified further investigations needed to complete the FFS (AMEC Earth & Environmental, 2010a) (Section 3.1.1). Additional field sampling and analysis were conducted in June 2010 through February 2011 to fill these data gaps, and the results were reported to Ecology in April 2011 (AMEC Earth & Environmental, 2011b) (Section 3.1.2).

ExxonMobil/ADC conducted several investigations and implemented interim measures in 2010–2011 to assist the City of Everett during the installation of a new 24-inch force main along Federal Avenue and former Everett Avenue. In June 2010, AMEC Earth & Environmental decommissioned pipelines and removed areas of affected soil to the west of the Property to prepare for the force main installation (Section 4.9) (AMEC Earth & Environmental, 2011d). AMEC also conducted two rounds of soil sampling at various depths to characterize soils that were to be excavated as part of the force main installation for disposal purposes (AMEC, 2014a) (Section 3.1.3).

In 2011, seeps of LPH were observed from a section of the roadway on former Everett Avenue, and an exploratory test pit advanced at the location of one of the seeps confirmed the presence of LPH below the asphalt. An interim action was conducted from December 2011 to April 2012 to excavate and dispose of surface asphalt, affected soil, and recovered LPH and groundwater from the ExxonMobil/ADC, BNSF, and former KC properties that were contributing to these seeps (Section 4.10) (AMEC, 2012a). This interim action was undertaken independently by ExxonMobil/ADC and was not conducted under the 2010 Order. Ecology was notified in advance about the work and observed performance of the work on several occasions.

The information obtained while conducting the interim action indicated that the CSM presented in the 2011 Data Gaps Investigation Report (AMEC Earth & Environmental, 2011b) was incomplete. These observations indicated that further information was needed to refine the CSM and guide the development and evaluation of remedial measure alternatives in the SC/FFS report. Additional subsurface investigations were conducted at the Site during October–November 2013 and February 2014 to address remaining data gaps both on the Property and on separate properties adjacent to the Property. The investigations were conducted based on the final Data Investigation Work Plan (AMEC, 2013), and the results were reported to Ecology in April 2014 (AMEC, 2014a) (Section 3.1.7).

This SC/FFS report will serve as the basis for development of the DCAP, which will outline the final corrective measures for the Site, as specified in the 2010 Order.

3 PREVIOUS ENVIRONMENTAL CHARACTERIZATION/SAMPLING INVESTIGATIONS

Extensive characterization and sampling activities have been conducted at the Site since 1985. These investigations included drilling soil borings, installation of monitoring wells, excavation of test pits, and collection and analytical testing of soil and groundwater samples. Table 3-1 provides a chronology and brief summary of previous investigations conducted at the Property and vicinity. The FFS Work Plan (AMEC Earth & Environmental, 2010a) presented a detailed description of previous investigations conducted through 2009, which are all included in Table 3-1.

This section presents a brief summary of characterization and sampling work conducted to date and identifies the basis for the discussion of the overall nature and extent of Site contamination presented in Section 6. Figure 2-7 shows the locations of historical explorations conducted to date, and the tables in Appendix E show the historical data used to identify Site COCs. Summaries of investigations conducted since preparation of the FFS Work Plan are presented below. A synthesis of these and earlier investigations in the context of exceedances, locations where residual TPH is present, and contamination depths is presented in Section 6.

3.1 PREVIOUS INVESTIGATIONS FOR THE EXXONMOBIL/ADC SITE

This section summarizes investigation work conducted on the Property since the FFS Work Plan was completed in 2010.

3.1.1 FEBRUARY 2010 FOCUSED FEASIBILITY STUDY WORK PLAN

The FFS Work Plan presented a comprehensive summary of the history of past ownership and operations of the Property and its surroundings (the Site); summarized previous environmental investigations and interim remedial activities; presented a summary of known environmental conditions at the Site; presented a preliminary CSM; and identified remaining data gaps that needed to be filled in order to complete the FFS (AMEC Earth & Environmental, 2010a). The FFS Work Plan included a Sampling and Analysis Plan (SAP) outlining additional field investigations needed to fill those data gaps.

3.1.2 2011 DATA GAPS INVESTIGATION

The FFS Work Plan (AMEC Earth & Environmental, 2010a) identified certain data gaps that needed to be filled in order to complete the FFS. Additional field sampling and analysis were conducted in June 2010 through February 2011 to fill these data gaps, and the results were reported to Ecology in April 2011 (AMEC Earth & Environmental, 2011b). The 2011 Data Gaps Investigation included the following scope of work to fill the gaps:

- sampling and analysis from seven deep borings (AB-1 through AB-7ab) located on- and off-Property to evaluate lithologic conditions, determine if a silt confining layer is present beneath the Site, and test soils at locations where field evidence indicated the presence of petroleum hydrocarbons;
- installation and monitoring of five new groundwater monitoring wells (MW-A3 through MW-A7) to define the limit of dissolved-phase petroleum hydrocarbon contamination;
- sampling and analysis of soil and groundwater samples from five shallow borings (AP-2 through AP-5 and AP-7) on the BNSF parcel to define the vertical and horizontal extent of soil contamination near the former loading racks;

- sampling and analysis of soil and groundwater from one shallow boring (AP-1) to identify potential contamination near the former ADC garage and shop building on the Port of Everett property;
- sampling and analysis of soil and groundwater samples from soil borings and monitoring wells to further define the nature and extent of petroleum impacts and to assess geochemical conditions;
- measurement of groundwater levels to assess the groundwater potentiometric surface, surface gradient, and direction of groundwater flow;
- aquifer testing to assess hydraulic conductivity of off-Property soils; and
- a study of groundwater elevations to assess tidal influence on the groundwater flow regime at the Site (Section 3.1.4).

Small amounts of light nonaqueous-phase liquid (LNAPL) were observed in wells W-10R, MW-27, W-1, and MW-15R, while larger amounts were recovered from wells W-2 and MW-29. No continuous silt layer was identified beneath the Property. A plume of groundwater affected by petroleum hydrocarbons was identified to the west and northwest of the Property. Groundwater downgradient from the Property was not affected by volatile organic compounds (VOCs), benzene, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), lead, or total petroleum hydrocarbons (TPH) as gasoline (TPH-G). Monitoring well MW-A3, located southwest of the Property, had a concentration of TPH as diesel (TPH-D) greater than the preliminary screening level only in February 2011. Upgradient monitoring well MW-A7 did not have reportable concentrations of analytes. Spatial patterns in results for geochemical parameters at the Site were consistent with the development of an anaerobic environment in which petroleum biodegradation appears to be actively occurring. Additional details concerning the extent of hydrocarbons at the Site are discussed in Section 3.1.7 and Section 6.3.

As described in detail in the Section 6.5.2 of the Data Gaps Investigation report (AMEC Earth & Environmental, 2011b), the distribution of groundwater geochemical parameters (i.e., oxidation-reduction potential [ORP], dissolved oxygen [DO], dissolved iron and manganese, sulfate, methane, and alkalinity) across the Site supports natural biodegradation of hydrocarbons at the Site. Moving from upgradient well MW-11 (along the eastern border of the Property) downgradient toward Possession Sound, the ORP and DO decrease in concentration, indicating that biodegradation is utilizing oxygen and creating reducing conditions. Dissolved manganese and dissolved iron increase in concentration in the downgradient wells, which is consistent with biological use of these metals as electron acceptors. Sulfate concentrations decrease due to biological reduction to sulfide along the groundwater flow path. Biodegradation of hydrocarbons under anaerobic conditions contributes to the observed increases in methane concentrations along the groundwater flow path. Alkalinity is also observed to increase as groundwater migrates across the Site, due to dissolution of minerals caused by absorption of carbon dioxide generated from biodegradation (AMEC Earth & Environmental, 2011b).

3.1.3 FEBRUARY 2010 CITY OF EVERETT FORCE MAIN SAMPLING

AMEC Earth & Environmental conducted soil sampling and analysis along the planned alignment of the City of Everett's new 24-inch force main to characterize soils along the alignment route for disposal requirements. The investigations were conducted based on (1) a SAP for borings CE-1 thorough CE-5 included as Appendix E to the FFS Work Plan (AMEC Earth & Environmental, 2010a), and (2) a second SAP for borings CE-6 through CE-8, which included decommissioning two monitoring wells on BNSF property and collecting a grab sample (CE-9) during the decommissioning. The analyses from those samples were sent to the City of Everett (AMEC Earth & Environmental, 2011c). Soil samples were collected at several depths from eight borings advanced on Federal Avenue and the former Everett Avenue in the alignment of the planned force main. Samples from selected borings and depths were analyzed for TPH fractions; benzene, toluene, ethylbenzene, and xylenes (BTEX); polycyclic aromatic hydrocarbons (PAHs); VOCs; and selected metals. The analytical results were used by the City to classify soil to be excavated as part of the City's force main project for disposal purposes.

Soil samples were analyzed for the following metals: arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury. The analytical results are presented in Table 3-2 and compared against the MTCA cleanup levels. MTCA Method A cleanup levels were used for arsenic, cadmium, chromium, lead, and mercury because this value is the most conservative. MTCA Method B cleanup levels associated with direct contact were used for barium, selenium, and silver because MTCA Method A cleanup levels were not available for these analytes, and because the data were used for waste profiling. Soil samples were not analyzed for chromium speciation therefore the

MTCA Method A cleanup level for both trivalent chromium and hexavalent chromium are shown in Table 3-2. The MTCA Method A cleanup level for lead shown in Table 3-2 is the value for unrestricted land use. Detected metal concentrations in all samples were less than respective MTCA Method cleanup levels, except for chromium which exceeded the MTCA Method A cleanup level for hexavalent chromium; note that the chromium speciation is unknown.

3.1.4 2011 TIDAL STUDY

AMEC Earth & Environmental conducted a tidal influence study in February 2011 to determine whether fluctuations in groundwater levels were related to tidal fluctuations and, if so, to evaluate the extent of tidal influences. A stilling well equipped with a transducer was installed on the Everett Pier to automatically record tidal elevations, and pressure transducer/data loggers were installed in monitoring wells W-3, W-6, MW-11, MW-19, MW-28, MW-40R, and MW-A1 through MW-A7 to record groundwater levels every 6 minutes for a period of six days. In addition, a barometer was installed and programmed to collect barometric pressure readings throughout the tidal study period so that water level data collected in the monitoring wells and stilling well could be adjusted for barometric pressure.

Results showed that water levels in monitoring wells W-3, MW-11, MW-A1, MW-A2, MW-A3, MW-A5, and MW-A6 were tidally influenced, with tidal fluctuations ranging from 0.1 foot to 1.1 feet. MW-19, MW-28, MW-40R, and MW-A4 exhibited minimal tidal influence; water levels in these wells were most influenced by changes in barometric pressure. W-6 exhibited minimal response to tidal fluctuations, and water levels in monitoring well MW-A7 changed by less than 0.1 foot throughout the study period. These observations indicate that much of the Site groundwater is influenced by the tides in Port Gardner Bay, especially in areas filled after 1914. This finding indicates that tidal variation needs to be considered when establishing the groundwater gradient.

To evaluate tidal influence on the direction of groundwater flow, the mean groundwater elevation at each monitoring point was estimated using the method described by Serfes (1991). A potentiometric surface map derived from these mean groundwater elevations showed that the mean direction of groundwater flow at the Property on February 10, 2011, was toward the west (Figure 3-1) (AMEC Earth & Environmental, 2011a).

3.1.5 2011 OBSERVATIONS OF SEEPS ALONG FORMER EVERETT AVENUE

On several occasions in 2011, seeps of water with a visible sheen or the presence of LPH were reported along former Everett Avenue. AMEC Earth & Environmental documented the presence of these seeps by recording photographs in the field (Figure 3-2) (AMEC Earth & Environmental, 2011d,e).

3.1.6 2012 OBSERVATIONS DURING CITY OF EVERETT FORCE MAIN REPLACEMENT

AMEC was present on the Site in May 2012 when the City of Everett installed a new 24-inch sanitary sewer force main along Federal Avenue and the former Everett Avenue. Subsurface construction activities included excavation of trenches for the new sewer line and drilling of boreholes used for dewatering activities. AMEC observed excavation and drilling activities and recorded notable subsurface features when relevant, including the presence of LPH if encountered. AMEC documented the presence of LPH in borings and/or trenches along much of the alignment on former Everett Avenue, and at eight locations along Federal Avenue (AMEC, 2012b).

Dewatering for this project began May 15, 2012, and continued for a month. Dewatering progressed from east to west along former Everett Avenue, and then south along Federal Avenue. Dewatering for the project withdrew over 12 million gallons at an approximate rate of 300 gallons per minute. The dewatering lowered the water table along Federal Avenue to 12 feet bgs (a drop of 9–10 feet). The drawdown cone associated with the dewatering likely reached a diameter of 300 to 400 feet around dewatering points, which would have affected most of the Property.

During the 2012 force main replacement project, G-Logics reported material appearing to be LPH flowing into the trench from the northeast at Station 13+00; however, no samples were collected for analysis to confirm this observation. Material appearing to be LPH is often not recoverable and may be immobile due to high content of organic matter in subsurface soils at the Site. The presence of sheens in excavations can be attributed to residually saturated, immobile hydrocarbons in soil that are mobilized temporarily when the soil is disturbed.

3.1.7 2013/2014 DATA GAPS INVESTIGATION REPORT

AMEC conducted field investigations in October–November 2013 and February 2014 to fill data gaps regarding the nature and extent of soil and groundwater contamination in areas of the Site potentially affected by former petroleum releases. The investigation was implemented based on the Data Investigation Work Plan (AMEC, 2013). During these investigations a total of 33 soil borings were drilled on the Property and surrounding properties (Federal Avenue and the BNSF, former KC, Port of Everett, Dunlap Towing, and City of Everett properties). Soil samples were collected and analyzed to delineate areas of affected soil at the Site. Soil samples were analyzed for the following constituents:

- TPH-G;
- TPH-D and TPH as oil (TPH-O) (using silica gel cleanup procedure);
- BTEX and methyl tertiary-butyl ether (MTBE);
- 1,2-dichloroethane, 1,2-dibromoethane, and *n*-hexane (for selected samples based on field observations); and
- low-level PAHs.

In addition, analyses for extractable petroleum hydrocarbons and volatile petroleum hydrocarbons were conducted on selected soil samples with higher concentrations of petroleum hydrocarbons and benzene.

One of the borings was completed as a new monitoring well (MW-A8), and groundwater samples were collected from the well in November 2013. Groundwater samples were analyzed for TPH-G, TPH-D and TPH-O, BTEX, MTBE, 1,2-dichloroethane, *n*-hexane, 1,2-dibromoethane, low-level PAHs, and dissolved lead.

The results of the 2013/2014 data gaps investigation show that the area of soil affected by releases from the Property has been adequately characterized. Visible product and/or sheen were observed in borings conducted over much of the ADC and Exxon/Mobil Parcels, and in the vicinity of the former ADC garage on the Port of Everett property. In general, higher concentrations of COCs were found within the boundary of the Property and in the western portion of the former ADC garage. The boundary of contamination is defined to the east by borings on the BNSF property, where concentrations of COCs were either below the MTCA Method A cleanup level or were not detected. To the west, the boundary of highly contaminated soil is defined by borings PE-SB08 and PE-SB10, where lower concentrations of TPH were detected that were either below or just slightly above the MTCA Method A cleanup level. Contamination west of Federal Avenue is highest at the location of the former ADC garage, and exceedances were observed to the north, south, and west of the former garage footprint. To the north, soil contamination from the Property extends to former Everett Avenue. Soil samples from borings FA-SB06 exceeded the PCLs for TPH-G, TPH-D, total cPAHs and 1-methylnaphthalene. Petroleum contamination on the former KC property farther to the north of former Everett Avenue likely originated from sources that were located on the former KC property.

3.1.8 GROUNDWATER MONITORING

Periodic groundwater monitoring began on the Property in the early 1990s. Regular quarterly groundwater monitoring and monthly LPH gauging and removal commenced in 2002 and continued through 2007, when the groundwater monitoring frequency for the Property was reduced from quarterly to semiannually. This change in monitoring frequency was verbally accepted by Ecology in February 2007, and the acceptance was confirmed in a meeting with Ecology on August 8, 2007.

The monitoring program at the Site currently consists of the following activities:

- monthly inspections of the Site;
- monthly measurements of LPH thickness and depth-to-water in LPH recovery wells (LPH-1, LPH-2, LPH-3, LPH-4, LPH-5, LPH-6, LPH-7, LPH-8, LPH-9, and RW-2), selected monitoring wells (W-1, W-2, W-3, W-6, MW-10, W-10R, MW-11, W-15R, W-17, MW-19, MW-40R, MW-A1, MW-A2), and Sumps 1 and 2;
- semiannual measurement of depth to water in monitoring wells MW-A3 through MW-A8; and

- sampling of designated monitoring wells and laboratory analysis of groundwater samples for TPH fractions, BTEX, MTBE, and selected PAHs.

In addition, LPH is removed from selected wells periodically (see Section 4.7).

The current groundwater monitoring network is shown on Figure 3-3. From 2002 to 2007, groundwater samples were collected from five monitoring wells: MW-11, MW-19, MW-40R, W-3, and W-6. Wells W-3 and W-6 have not been sampled since 2010. Eight additional off-Property monitoring wells (MW-A1 through MW-A8) have been installed since 2008 and are also included in the groundwater gauging and monitoring network.

Groundwater samples are collected using a peristaltic pump and dedicated disposable tubing. The purge water is monitored for field water quality parameters (temperature, pH, specific conductivity, turbidity, DO, and ORP) recorded at 5-minute intervals using a Horiba U-22 (or similar) water quality meter.

Regular groundwater monitoring has produced a comprehensive data set of groundwater elevations and groundwater quality dating back to as far as 1988 (Wood, 2018).

Groundwater samples were submitted to Test America Laboratories for chemical analysis until January 2015, when the laboratory was switched to Eurofins Calscience (Eurofins). All analytical data have been reviewed following requirements specified in U.S. Environmental Protection Agency (EPA) National Functional Guidelines for Superfund Organic Methods Data Review (EPA, 2008, 2017). Analytical data from all groundwater monitoring events are entered into the project database. Analytical results are discussed in detail in Section 6.2 for samples collected in January 2015 from a comprehensive set of groundwater monitoring wells.

3.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS ON NEARBY PROPERTIES

This section presents a brief summary of information gleaned from environmental investigations conducted for other properties in the vicinity of the Site.

3.2.1 KIMBERLY-CLARK

The former KC property has a long history of industrial use dating back to 1892 (AECOM, 2011; Aspect, 2013a), and has been the subject of extensive environmental investigations over the past 20 years. Aspect completed a Phase 2 Environmental Site Assessment, which included analysis of about 1,200 soil samples and 570 groundwater samples collected from 106 soil borings and 49 new monitoring wells (Aspect, 2013b). Results from the Phase 2 Environmental Site Assessment as well as results from earlier historical investigations were summarized in the RI/FS Work Plan for the former KC property (Aspect, 2013a). The RI/FS work plan documented widespread contamination on the former KC property with areas of TPH, PAHs, arsenic, copper, and nickel in soil and groundwater, and lead in soil, above the applicable screening levels.

Figure 2-6 shows the locations of former Standard and Associated Oil bulk fuel storage and distribution infrastructure on the north side of the warehouse building at the southern end of the former KC property. After purchasing the property from Chevron and successors to the Associated Oil Company, KC continued to use the former Associated Oil Company ASTs on the north side of the warehouse building to store bunker fuel for its boilers, and at least two of these tanks remained in place until 1997 (AECOM, 2011; Aspect, 2013a). ASTs just north of the northeast corner of the KC warehouse were used to store diesel fuel, and one of these tanks was also reported to have stored caustic soda (Aspect, 2013a).

The RI/FS Work Plan documents areas of soil affected by TPH and PAHs above the applicable screening levels on the north side of the existing warehouse building, which is at the southern end of the former KC property, where the former Associated Oil Company ASTs were located (Aspect, 2013a). An area of surface soil was excavated and disposed of prior to removal of the tanks, and KC concluded, based on hydrocarbon fingerprinting analysis, *"that the petroleum in the AST area is likely not the same material present at the ExxonMobil ADC site south of K-C's warehouse"* (Aspect, 2013a).

Soil samples with petroleum and related constituents exceeding applicable screening levels also have been documented beneath the warehouse building in the vicinity of the former Standard ASTs and piping, but the extent and distribution of potential contamination from this historic source has not been fully characterized.

AECOM (2011) identified the former Associated Oil Company gasoline/bunker fuel AST farm as a recognized environmental condition in their Environmental Site Assessment report, based on the presence of TPH at concentrations exceeding MTCA Method A cleanup levels in the vicinity of the former ASTs and associated underground piping.

Aspect completed an interim removal action beginning in August 2013 to address petroleum-contaminated soil and groundwater on the north side of the KC warehouse. Petroleum-contaminated soil and groundwater were left in place beneath the warehouse and below inaccessible concrete footings. The soils were sampled and found to exceed cleanup levels for TPH. The residual petroleum found in the soils is associated with historical ASTs on the former KC Property, according to the Interim Action Report (Aspect, 2015). Soils to the south of the warehouse on former Everett Avenue were not investigated as part of the interim action.

The RI Work Plan also called for soil vapor sampling to assess potential risk due to vapor intrusion in the event that KC intends to keep the warehouse building intact (Aspect, 2013a). Sampling was completed in March 2014, and results showed that indoor air concentrations were well below screening levels (Aspect, 2014).

A second interim removal action on the former KC property was performed in 2019 and 2020. Interim action activities included decommissioning inactive underground pipes, removing contaminated soil from nine areas within the site, and monitoring groundwater pH levels during the removal of crushed material from the site. The Port of Everett purchased the former KC property in 2019. A third interim action is planned in preparation for redevelopment of the property.

3.2.2 DUNLAP TOWING

Dunlap Towing leases a portion of the Port of Everett property (Aspect, 2013a) and uses it for operation of maritime tugboat vessels. Dunlap Towing maintains and operates a fleet of marine tug vessels at the facility. Marine shipping terminals typically are equipped or have been equipped historically with underground storage tanks (USTs) for storage of diesel fuel or other fuels for maritime vessels.

Ecology advised Amec Foster Wheeler that the Dunlap Towing property has been recognized as a former UST site (Gritsch, 2014). A search of standard regulatory databases conducted by Environmental Data Resources, Inc., on behalf of AECOM (2011) identified the Dunlap Towing property on the UST, ICR, and ALLSITES standard statewide database listings, indicating that the property is of interest to regulatory agencies due to past environmental issues.

Ecology sent Amec Foster Wheeler copies of their files concerning USTs and spill history for the Dunlap Towing property. A leaking 5,000-gallon waste oil UST was located next to the Dunlap Towing shop building, and a 12,000-gallon diesel UST was located next to the current fuel storage area. Both tanks were removed on January 1, 1991, and soil confirmation samples were collected from the bottom and sidewalls of both excavations. A soil sample from the southwest corner of the waste oil tank excavation contained “petroleum oil” at a concentration of 10,000 milligrams per kilogram (mg/kg), which exceeded the PCL. The affected soil was assumed to extend under the building and under an underground electric conduit that runs into the building (Kaldveer Associates, 1991). No soil contamination exceeding PCLs was detected in the soil samples collected next to the former diesel UST excavation. There was a reported spill of an estimated 15 gallons of diesel fuel from a Dunlap Towing tugboat to Port Gardner Bay on October 12, 2008. Based on this information, soil and groundwater contaminated by a waste oil release appear to be present at the Dunlap Towing location.

3.2.3 CALIFORNIA STREET OVERCROSSING PROJECT

Phase I and Phase II Environmental Site Assessments and geotechnical investigations were conducted as part of the California Street/Terminal Avenue Overcrossing (CSTO) Project in the early 2000s (URS, 2000a,b; 2001a,b). The CSTO alignment occupies portions of the neighboring BNSF and Johnston Petroleum properties, as well as public streets and rights-of-way. The southernmost portion of the Property was transferred to the City of Everett as part of the CSTO Project in the early 2000s.

Areas of soil containing concentrations of TPH-G, TPH-D, and/or TPH-O greater than the current MTCA Method A cleanup level were identified over an area of approximately 25,600 square feet within the CSTO Project footprint, mainly to the east and south of the Property (URS, 2000b). URS noted that these soils should be handled as a problem waste and be treated or removed and disposed of at an appropriate landfill as part of the CSTO Project (URS, 2000b, 2001a), but no documentation is readily available to confirm whether contaminated soils were excavated and disposed of, nor is any evidence available to show that record or confirmation samples were collected and analyzed as part of the CSTO Project. It is also expected that residual product is present in soils beneath the Terminal Avenue Overpass footprint.

The Phase I Environmental Site Assessment for the CSTO also identified various 55-gallon drums containing petroleum products on the neighboring Johnston Petroleum property, and minor staining of surface soils attributed to rail and track lubricants on the BNSF property, but these were not considered to be significant contamination sources (URS, 2000a).

3.2.4 PORT OF EVERETT EXCAVATION DELINEATION PROJECT

An investigation of soils on the Port of Everett property was performed by Cardno in 2020 and 2021 (Cardno 2021). The investigation was conducted to achieve two main objectives:

- Determine the vertical and lateral extent of contamination on the Port of Everett property; and
- Delineate the extent of LNAPL and residual saturation contamination to define the limits of remedial excavation on the Port of Everett property so that collection of sidewall and base soil samples during future excavation work is not necessary.

A total of 51 soil borings were advanced to delineate the extent of excavation on the Port of Everett property. Two geotechnical borings were also advanced. A report summarizing the soil investigation and delineating the area contaminated with LNAPL and residually saturated soils (Cardno 2021) is presented in Appendix F; this information will also be included in the DCAP. Analytical results for individual soil borings are not presented on any figures or tables in this report outside of those in Appendix F.

3.2.5 NEARBY CITY OF EVERETT AND PORT OF EVERETT PROJECTS

Other investigations that were undertaken in the Site vicinity included the following:

- In 1996, a CSO replacement project involved replacement of a collapsed section of CSO piping that ran north of the Property along the former Everett Avenue owned by KC. This project is more fully described in Section 4.4.
- In 2004, the Port of Everett was replacing fence posts along the western side of Federal Avenue directly west of the Property. According to a 2011 phone record (Ecology, 2011), a Port representative reported an observation of oil-affected soil in two to three of the fence postholes, which were reported to be 3 feet deep. The Port representative did not collect a sample but was reporting this observation seven years after the observation was made. Soil sampling data results for MW-33, which is the closest sample to the fence line, show a single PCL exceedance for TPH-G. This exceedance is only slightly above the MTCA Method A cleanup level. AMEC installed two borings in 2013 and 2014 (FA-SB05 and PE-SB-09, respectively) in the approximate area of the fence project, as shown in the phone record documentation. These borings did not encounter soils affected by TPH-O above the PCLs, suggesting that any TPH-O contamination is not widespread (Ecology, 2011). Soil sampling results are discussed in further detail in Section 6.1.
- In 2012, the City of Everett installed a force main from the City's pump station located northeast of the Property along former Everett Avenue, and then south along Federal Avenue. This work involved extensive dewatering and disposal of TPH-affected soil from the excavation. Additional details and relevant observations are discussed in Section 3.1.6.
- As part of the force main replacement project in 2012, the City of Everett's environmental consultant, G-Logics, collected soil samples for analysis at Stations 12+72 and 12+87, as well as two stockpile samples. Samples from the stockpile and 12+87 did not contain TPH-D or TPH-O above the reporting limit. Sample 12+72 contained TPH-O at 258 mg/kg, well below the respective PCL for TPH-O. Material appearing to

be LPH was reportedly observed by G-Logics to be flowing into the trench from the northeast at Station 13+00; however, no samples were collected for analysis to confirm this observation. See Section 6.1 for additional discussion.

4 SUMMARY OF PAST REMEDIATION ACTIVITIES

Interim remedial actions conducted at and near the Property have included groundwater extraction and treatment, recovery trench installation, soil vapor extraction (SVE), excavation and disposal of affected soil on the Property and neighboring properties, manual LPH recovery, LPH vacuum recovery, excavation dewatering, interceptor trench installation, installation of a low permeability cap over the entire Property, and removal of abandoned piping.

Several attempts at LNAPL recovery have met with limited success. LNAPL has been observed in and recovered from wells, excavations, and recovery trenches installed specifically to recover free product. LNAPL has also been observed in monitoring wells after dewatering activities due to the induced flow of groundwater through the pore spaces. Recoverable quantities of LNAPL have been removed in the immediate vicinity of disturbed soils, but recovery rates typically decrease rapidly once the free product mobilized by soil disturbance has been recovered. High organic content in subsurface soils and the high viscosity and weathered nature of the petroleum hydrocarbons present result in low mobility of the petroleum hydrocarbons that are present. While the decreased mobility of hydrocarbons generally reduces the risk to the environment, recovery of LPH is greatly limited by this immobility.

This section provides a brief description of each of the interim remedial actions. Table 4-1 summarizes major interim actions implemented at the Property and lists the historical documents from which the information was taken. Figure 4-1 shows the general, approximate locations of the key interim remedial measures conducted at the Site.

4.1 1988 RECOVERY TRENCH AND INFILTRATION GALLERY IN VICINITY OF MW-14

LPH was observed at a depth of 1.29 feet during installation of monitoring well MW 14 in April 1988. At that time, RZA evaluated the feasibility of extracting LPH beneath the ExxonMobil Parcel by installing a recovery trench, vapor extraction system, and groundwater treatment system consisting of an oil/water separator coupled with an air stripper. In May 1988, an infiltration gallery was installed in the vicinity of MW 14. The infiltration gallery was T shaped and approximately 45 feet long. Construction activities consisted of trench excavation and installation of two modified 55-gallon drums as sumps. The trench was subsequently filled with 1.5–inch-diameter, washed gravel. On May 12, 1988, a vacuum truck pumped subsurface fluids from the sumps and 1,400 gallons of liquid was removed from the sumps, approximately 50 gallons of which was LPH. As a result of this interim remedial action, the LPH thickness in MW 14 decreased to 0.40 foot in August 1988. The recovery trench and infiltration gallery were decommissioned and removed in 1998 (Section 4.6).

4.2 1989 GROUNDWATER EXTRACTION AND TREATMENT

In March 1989, an automated groundwater extraction and treatment system was installed by RZA in the location of the May 1988 infiltration gallery. The system consisted of a fluid extraction sump situated in RW 1 (formerly MW 14), an oil–water separator, an air stripper, and a re-infiltration gallery. The re-infiltration gallery, which was approximately 100 feet long, was constructed parallel to the north side of the ExxonMobil Parcel. It consisted of a perforated, 4-inch-diameter polyvinyl chloride (PVC) pipe surrounded by pea gravel within the excavated trench. The groundwater extraction and treatment system operated at a pumping rate of approximately 2 to 3 gallons per minute. However, no measurable quantities of LPH were removed, and no LPH was observed in recovery well RW 1. In August 1989, 0.68 and 0.73 foot of LPH was measured in MW 8 and MW 18, respectively (RZA, 1989). Approximately 7 gallons of free product and oily water were hand-bailed from both wells and disposed of in the oil–water separator of the groundwater treatment system at the Property. The groundwater extraction and treatment system was shut down in March 1990 because of flooding of the re-infiltration gallery, and has not been restarted.

4.3 1993 RECOVERY TRENCH INSTALLATION IN THE VICINITY OF SIDE SEWER

In December 1993, an LPH recovery trench was installed on the southwest corner of the ExxonMobil Parcel. The trench was installed in a north-south orientation to a depth of approximately 4 feet bgs. Two recovery wells that consisted of 8-inch-diameter Schedule 40 PVC screens were placed to a depth of approximately 7 feet in the trench. The trench was backfilled with 7/8-inch-diameter rock to a depth of approximately 3 feet. The rock was overlain by a filter fabric and covered with compacted pit run soil, followed by approximately 6 inches of crushed rock over the pit run to bring the excavation to grade. Concrete vaults were then placed over the recovery wells. Underground PVC piping was extended from the vaults to the remediation equipment compound located on the ExxonMobil Parcel for future access to LPH recovery equipment. Soil excavated during construction was temporarily stockpiled on the Property, covered with visqueen, and later disposed of at an off-Property commercial disposal facility.

No LPH accumulated in the recovery trench, and no LPH was recovered from the trench following installation. The trench was inspected in August 1996, and no LPH accumulation was noted. Subsequent inspections since at least 2002 have not identified recoverable LPH in the trench.

4.4 1996 COMBINED SEWER OVERFLOW LINE REPAIR

In October 1995, discharge of petroleum product into Everett Harbor from a CSO line prompted an investigation by the U.S. Coast Guard Puget Sound Marine Safety Office and the City of Everett to assess the source of the hydrocarbons (AGRA 1996b). The outfall is located on the west side of the 2700 block of Federal Avenue, approximately 175 yards northwest of the ADC Parcel (Figure 2-6). Camera surveys of the sewer lines that flow to the outfall reportedly revealed LPH seepage into the section of the CSO line that runs approximately 40 feet north of the northern boundary of the ADC Parcel (AMEC Earth & Environmental, 2010a). The section of pipe in which the infiltration was observed during the camera survey was discovered to be made of clay tiles that had settled and cracked. In April 1996, Ecology entered into the 1996 Order with Mobil Oil Corporation, ADC, and A.P. Miller requiring cleanup and elimination and/or containment of petroleum releases at and near the City of Everett's CSO discharge line into Port Gardner Bay (Section 2.5). On April 16, 1996, a meeting was held at the City of Everett to discuss options for repairing the broken section of the CSO line. The repair option selected at the meeting consisted of replacement of the settled portion of the line and slip lining of the remaining portions.

In June 1996, AGRA began repair activities on the CSO line (AGRA, 1996b,c). The settled portion of the pipe, approximately 25 feet long, was excavated and replaced. Another section of pipe, which was approximately 20 feet long and made of metal, was found to be corroded and out of round. This section of pipe was also excavated and replaced. The excavation to repair the CSO line in this area was approximately 125 feet long. The remaining portions of the CSO line were slip-lined to eliminate the potential for leakage of LPH through the joints of the intact sections of the existing line. During the excavation activities, LPH was observed entering the excavation from a layer of wood waste where this layer intercepted both the north and south sidewalls.

Three 36-inch-diameter, 22-foot-deep dewatering wells (DW-1 through DW-3) were installed prior to excavation of the CSO line. Dewatering was performed throughout the excavation to allow for repair of the CSO line. Throughout construction, pumps operated alternately, both within the CSO line excavation and within the three dewatering wells. The recovered liquid was transferred to an 18,000-gallon baffled tank, then to two 21,000-gallon settling tanks, and finally to an 18,000-gallon baffled tank. Reportedly, 1,450,800 gallons of groundwater and 23,050 gallons of LPH were removed during CSO line excavation dewatering activities (AGRA, 1996b). During repair of the CSO line, daily LPH recovery volumes varied from 0 to 7,550 gallons. Approximately 80% of the total LPH recovered was removed in the first 6 days of CSO line excavation dewatering.

During CSO excavation and repair activities, oleophilic sorbent booms were installed to absorb and contain LPH discharging into Port Gardner Bay. Sorbent pads, oil sweeps and/or soil snares, sorbent booms, and a mechanical skimmer were used to contain and recover the floating petroleum to the extent practicable.

4.5 1996 LPH VACUUM RECOVERY PILOT TEST

In May and June 1996, AGRA conducted a vacuum LPH recovery pilot test at the Property (AGRA, 1996a,d,e,f; PTI, 1997). The recovery system consisted of SVE and groundwater/LPH pumping systems installed on the newly installed 4-inch vacuum recovery well (VRW 1) located in the northeast corner of the ADC Parcel. The SVE exhaust discharged directly to the atmosphere, while the groundwater/LPH pumping system transferred the extracted liquid to a 500-gallon LPH separation tank, then to a 6,900-gallon groundwater storage tank. The test was performed for 14 days, and LPH thickness and water levels varied significantly throughout the 14 days of testing.

LPH was also removed from a test pit (TP 6 96) with a vacuum truck in May 1996. LPH did not recharge into test pit TP 6 96 during a 2-week period, and no additional LPH was removed.

A 1997 technical memorandum by PTI Environmental Services (PTI, 1997) stated the following conclusions following a review of various LPH recovery efforts:

> *"Active (LPH and groundwater) recovery performed to date indicates that it is effective in short durations but recovery structures do not continue to recover LPH for extended periods of time when active recovery is performed.*
>
> *In summary, the complexity of the hydrogeology underlying the area and variable viscosity of the LPH will make future recovery of the LPH from the site difficult. Since there does not appear to be any evidence indicating that migration of the LPH is a threat to human health or the environment and since the site is located in a controlled industrial area, active LPH control does not appear to be warranted. … It is clear that if subsurface recovery structures (e.g., well, trench) penetrate the wood waste and debris layer, and the LPH has a lower viscosity, a passive LPH recovery program could be effective."*

It should be noted that, in nearly 20 years of LPH recovery operations, LPH has not been mobile and passive recovery has not been effective under static conditions (no dewatering). (See Section 6.3 for additional details.)

4.6 1998–2000 INTERIM REMEDIAL ACTIONS

Remedial actions implemented at the Property from the end of 1998 through 1999 included demolition of structures and the aboveground portion of the AST firewall on the ADC Parcel, asbestos abatement, monitoring well abandonment, clearing and grubbing of the ExxonMobil Parcel, construction of an interceptor trench, abandonment of underground utilities, installation of a downgradient liner and LPH collection piping, installation of a low-permeability cap, and installation of a storm drain system (Exponent, 2000). Documented details of the interim remedial measures, based on the Exponent report, are summarized below.

Demolition activities at the Property were completed in January 1999. Prior to demolition activities, Kleinfelder, Inc., performed an asbestos survey. Asbestos was found to be present in buildings on the Property, and asbestos abatement was conducted by Performance Abatement Services between November 12 and 17, 1998.

Structures on the ADC Parcel that were demolished included four buildings (an office building, oil pump house building, a warehouse, and boiler room), aboveground piping, loading racks, the firewall surrounding the former ADC ASTs (including 40 feet of foundation of the wall in the northeast corner of the Property), and the AST pads. In addition, the trench that was installed in 1988 in the vicinity of MW-14/RW-1 was demolished. The two modified 55-gallon drums that had been used as sumps were filled with concrete and left in place. In addition, 22 groundwater monitoring wells were abandoned. Approximately 162 tons of contaminated shallow soil and vegetation were removed from within the ADC firewall area on the northern portion of the ADC Parcel. The soil was disposed of at TPS Technologies in Lakewood, Washington. Approximately 3.5 tons of Class 3 petroleum-affected soil was taken to CRS Associated located in Everett, Washington. Marine Services, Inc., removed 110 gallons of purge water for recycling at a commercial disposal facility.

A water management and treatment system was constructed at the Property in 1998 to manage fluids collected from the interceptor trench and generated during interim measure construction. The treatment system consisted of an oil–water separator, a settling tank, and a carbon polishing unit. Between December 1998 and September 1999, the system treated approximately 2.5 million gallons of water. The treated water was discharged via the storm sewer system to the Everett Water Pollution Control Facility, in accordance with project-specific City of Everett Industrial Waste Discharge Permit No. 154. Approximately 19,900 gallons of oily water and 450 gallons of sludge were collected at the Property between December 1998 and September 1999. Sources of oily water included product recovered from underground pipes prior to removal; water from tank washing prior to removal; water skimmed from excavated areas during interceptor trench construction; and water skimmed from the water treatment system product overflow and flow equalization tanks.

In January 1999, the interceptor trench was constructed along the western and northern Property boundaries. The trench was installed to a depth of 4 to 5 feet below the water table along the northern and western Property boundaries. The trench penetrated the existing wood waste and debris layer. An impermeable liner placed over the downgradient side of the trench, contiguous with an existing footing, was used on the downgradient side of the trench to enhance LPH recovery. The trench was backfilled with uniform washed gravel and was constructed to the current grade. Lateral piping and vaults were also installed during construction of the Property cap construction activities in September 1999. Nine 4-inch-diameter LPH recovery wells (LPH 1 through LPH 9) were installed in the trench.

The LPH recovery trench was explicitly designed to capture LPH passively (PTI, 1997), with the trench installed into the wood waste and debris layer (Exponent, 2000). Only minimal amounts of LPH have ever been recovered from the LPH trench since installation was completed, and although the trench is still present at the Site, no LPH has been recovered by the trench since 2010.

From August to September 1999, cap construction activities were performed, including complete grading of the Property, installation of stormwater catch basins, installation of two layers of geotextile fabric along the entire trench, installation of asphalt-treated base material and paving fabric, installation of the asphalt cap, and abandonment of monitoring wells. Additional minor grading and asphalt paving were completed in December 1999.

4.7 2002–PRESENT LPH BAILING AND GROUNDWATER MONITORING

Manual bailing of LPH from wells that contain a measurable amount of LPH has been performed on a daily, weekly, and eventually on a monthly basis beginning in December 1991. LPH recovery activities currently conducted at the Property are based on the groundwater monitoring program included in the 1998 Order.

The current monthly LPH gauging program consists of the following activities:

- monthly measurement of LPH thickness and depth-to-water in 10 LPH recovery wells (LPH 1 through LPH 9 and RW-2), 13 monitoring wells (W 1, W 2, W 3, W 6, MW 10, W 10R, MW 11, W 15R, W 17, MW 19, MW 40R, MW-A1, and MW-A2), and Sumps 1 and 2;
- removal of LPH from monitoring wells in which more than 0.05 foot of LPH is detected; and
- placement/replacement of oleophilic socks as needed in wells with measurable accumulations of LPH.

From August 2014 through March 2018, LPH was observed in the following locations:

- Monitoring wells W-1, W-2, W-10R, W-15R, and MW-A1; and
- Sump 2.

4.8 2008 PUGET SOUND OUTFALL 5 OVERFLOW STRUCTURE PROJECT

In July 2008, on behalf of the City of Everett Utilities Department, Floyd|Snider collected soil and water samples from an excavation at the CSO Puget Sound Outfall 5 Overflow Structure. The overflow structure was built to control overflows from the CSO into Puget Sound. The project was located north-northeast of the Property. Water samples were analyzed during excavation dewatering to verify that water discharged to the City sewer system met the requirements of the City's industrial pretreatment requirements. Soil samples were collected to characterize soils for disposal. Soil samples were screened in the field. Soil samples that exhibited signs of contamination were not sampled, but instead disposed of under a Class III soil profile. Apparently clean soil samples were sampled per disposal specifications and disposed of as Class II soils. The locations and depths of contaminated soil were not identified by Floyd|Snider or the City of Everett, and no report has been available documenting this work.

4.9 2010 REMOVAL OF ABANDONED PIPES AND AFFECTED SOIL

In 2010, AMEC Earth & Environmental decommissioned several pipelines beneath Federal Avenue to the west of the Property to prepare for upgrades to the storm sewer line planned by the City of Everett. Former underground fuel lines crossing Federal Avenue were excavated and removed, along with surrounding soil (AMEC Earth & Environmental, 2011d). A short segment of piping that extended onto the Port of Everett property also was removed (Figure 4-1).

AMEC Earth & Environmental oversaw pipe removal, off-Site shipment of excavated soil and other materials, and Site restoration performed by Clearcreek Contractors of Everett, Washington, and their subcontractors. Work was performed from June through November 2010. Pipes were evacuated under vacuum prior to removal, and the removed liquids were captured and disposed of along with excavated soil and removed piping material. Samples of excavated soil were analyzed, and results showed that all excavated soil and recovered water could be managed as non-hazardous waste. A total of 76.55 tons of construction debris, 243 tons of soil, 487 linear feet of piping, 65,669 gallons of non-regulated liquid, four 55-gallon product/water drums, and four 55-gallon solid waste drums were removed in general accordance with the Underground Pipeline Decommissioning Work Plan dated May 17, 2010 (AMEC Earth & Environmental, 2010b).

Two soil samples were collected from the base of the excavation and analyzed to characterize the soils left in place. B-POE was collected on the Port of Everett property, and B-WROW was collected on the west side of Federal Avenue. Results from these samples were uploaded to Ecology's Environmental Information Management database and are included in the discussion in Section 6.1. Both samples contained concentrations of TPH-G and undifferentiated TPH greater than the MTCA Method A unrestricted cleanup level; the sample from the Federal Avenue right-of-way also contained concentrations of total cPAHs and TPH-O greater than the MTCA Method A cleanup level (AMEC Earth & Environmental, 2011d).

Five samples were collected from soil stockpiles and analyzed for the following metals: arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury. In addition, one soil sample was collected from a 55-gallon solid waste drum and analyzed for the same metals. MTCA Method A cleanup levels were used for arsenic, cadmium, chromium, lead, and mercury because this value is the most conservative. MTCA Method B cleanup levels associated with direct contact were used for barium, selenium, and silver because MTCA Method A cleanup levels were not available for these analytes, and because the data were used for waste profiling. Soil samples were not analyzed for chromium speciation therefore the MTCA Method A cleanup level for both trivalent chromium and hexavalent chromium are shown in Table 4-2. The MTCA Method A cleanup level for lead shown in Table 4-2 is the value for unrestricted land use. Detected metal concentrations in all samples were less than their respective MTCA cleanup levels, except for chromium which exceeded the MTCA Method A cleanup level for hexavalent chromium; note that the chromium speciation is unknown.

4.10 2011–2012 EXCAVATION

An interim action was conducted from December 2011 to April 2012 to mitigate seeps of free hydrocarbon product observed along former Everett Avenue (see Section 3.1.5). Work was conducted based on the Excavation Work Plan (AMEC Earth & Environmental, 2011e). The interim action consisted of excavation and off-site disposal of surface asphalt, affected soil, and recovered LPH, and treatment of the recovered groundwater from the secondary source areas on the BNSF and former KC properties (AMEC, 2012a).

The extent of the excavation is shown on Figure 4-1. Excavation work was sequenced beginning on the BNSF property. Approximately 3,060 tons of material was excavated from the BNSF property and disposed of at a permitted landfill, and approximately 2,530 gallons of LPH was removed using a vactor truck. Monitoring wells MW-27 through MW-30 were abandoned as part of the excavation work. Figure 4-2 presents photographs of the excavation on the BNSF property.

The excavation on the BNSF property was extended to the limit of available access, as shown on Figure 4-1. The vertical limit of excavation was extended until a visually clean bottom was exposed, which in most areas was between 8 and 10 feet bgs. LPH and petroleum hydrocarbon contamination was encountered at 3 to 4 feet bgs and extended to 8 to 10 feet bgs. Underlying the upper 2.5 to 3.5 feet of soil cover on the BNSF property was a layer 5 to 7 feet thick (extending to a total excavation depth of 8 to 10 feet bgs) of refuse and debris, consisting primarily of wood, soil, rocks, bottles, and other debris. This fill layer was impacted with petroleum hydrocarbons, including LPH. Figure 4-3 presents photographs of the soil and debris that were removed during the excavation.

Affected material was evident at all sidewall areas of the completed excavation on the BNSF property, and therefore no side wall samples were collected. A low-permeability barrier wall constructed of controlled density fill approximately 3 feet wide by 4 feet deep was placed in an east/west-trending strip running the approximate length of the excavation along the BNSF property boundary, as shown on Figure 4-1. This barrier wall was installed to limit further product migration from the BNSF property. Figure 4-4 presents photographs of the barrier wall installation.

The depths of the excavation on the former KC property were limited by utilities and varied from 3 to 5 feet bgs. The extent of the excavation was limited on the north side in order to maintain a free corridor of 12 feet between the excavation and the KC building. Approximately 725 tons of soil and debris were excavated from the former KC property (on the former Everett Avenue) and disposed of at a permitted off-Site landfill. Affected sidewalls were encountered to the north and east on the former KC property and left in place. Only LPH-affected soils were removed from the former KC property. Photographs from the excavation on the former KC property around the utility corridor are presented on Figure 4-5.

A total of 1,489,246 gallons of petroleum-affected groundwater was removed from the BNSF property. The affected groundwater was treated at the Site and discharged to the Everett publicly owned treatment works. Approximately 12,500 square feet of asphalt was removed from the KC and BNSF properties and disposed of off Site.

The excavation on BNSF property was backfilled using quarry spalls, gravel borrow, and crushed rock. The excavation on the former KC property was backfilled using gravel borrow and crushed rock. The excavations were backfilled in lifts when placing the gravel borrow and crushed rock. Removed asphalt was replaced with asphalt in accordance with local roads standards. Photographs during backfill activities are presented on Figure 4-6.

The excavation on the former KC property was not intended to restore Site soil or groundwater to levels consistent with MTCA Method A cleanup levels, but rather to eliminate seeps of LPH on Everett Avenue to the extent practicable (Section 3.1.5). During this interim action (excavation on the BNSF and former KC properties), LPH was encountered over a greater area and at greater depths than had been anticipated based on previous investigations at the Site.

The excavation extended to the maximum limits that would maintain structural integrity of the neighboring buildings and infrastructure. The excavation was effective in removing COC mass within the accessible portions of the excavation area at the northern and eastern extent of the site, and no LPH seeps have been observed since the excavation was completed. LPH has since returned to a portion of the excavation from adjacent areas, including the inaccessible area, as evidenced by the presence of LPH at Sump 2.

5 CONSTITUENTS OF CONCERN AND PRELIMINARY CLEANUP STANDARDS

As described in Section 3, multiple investigations have been conducted to characterize Site soil and groundwater contamination. Analyses conducted include VOCs; semivolatile organic compounds; TPH-G, TPH-D, and TPH-O; and select metals. The Site has been delineated based on the results of these investigations—the Site includes the Property and extends onto adjacent areas owned by the City of Everett, BNSF, and the Port of Everett to the west and north (former KC property). The delineation of the Site and the Property boundaries are shown on Figure 2-2. This section identifies the Site COCs in groundwater and soil and presents the preliminary cleanup levels (PCLs) that will be used in the FFS.

5.1 CONSTITUENTS OF CONCERN

This section defines the COCs for groundwater and soil at the Site.

5.1.1 CONSTITUENTS OF CONCERN FOR GROUNDWATER

Groundwater monitoring data have been collected at the Site since 1988. Quarterly monitoring of several wells was conducted from 2002 through mid-2007. The monitoring wells have been sampled semiannually since 2007, with the most recent sampling event completed in August 2018 (and latest available validated results from February 2018). These data provide a substantial basis for assessing the nature of Site groundwater contamination and identifying COCs to be addressed in the FFS. A copy of a map showing the analytical results from the four semiannual groundwater sampling events conducted from August 2016 through February 2018 for the 11 wells monitored during each event can be found in Appendix G.

The groundwater COCs to be addressed for the Site are:

- benzene;
- ethylbenzene;
- xylenes,
- 1-methylnaphthalene;
- TPH-G;
- TPH-D;
- TPH-O; and
- cPAHs.

These COCs will be addressed in this SC/FFS. Toluene was not present above the PCL.

5.1.2 CONSTITUENTS OF CONCERN FOR SOIL

Analytical data for Site soil are available from 1988 through February 2014. More recent sampling on the Port of Everett property was conducted in 2020-2021 by Cardno (Appendix F and figures in the DCAP). The COCs in soil are:

- benzene;
- ethylbenzene;

- total xylenes;
- 1-methylnaphthalene;
- TPH-G;
- TPH-D and undifferentiated TPH;
- TPH-O; and
- total cPAHs.

These soil COCs will be addressed by the alternatives evaluated in this SC/FFS.

5.2 PRELIMINARY CLEANUP STANDARDS

This section outlines the proposed preliminary cleanup standards to be used for the Site FFS. The preliminary cleanup standards must be established for affected media and must be appropriate for the anticipated land uses, groundwater uses, and relevant potential exposure pathways identified in the CSM. The affected media identified through previous Site investigations are soil and groundwater.

MTCA regulations require evaluation of remedial action alternatives that are capable of achieving cleanup standards. MTCA regulations establish three components for cleanup standards:

- cleanup levels for COCs that are protective of human health and the environment,
- the point of compliance (POC) where these cleanup levels must be met, and
- other regulatory requirements that apply.

Cleanup levels specified in MTCA can be established using Methods A, B, and/or C; these cleanup levels are required by the Revised Code of Washington (RCW) 70.105D.030 (2)(d) to be *"at least as stringent as all applicable state and federal laws."* These requirements are similar to the applicable, relevant, and appropriate requirements (ARARs) approach of the federal Superfund law and are described in WAC 173-340-710. The immediate Site area is expected to remain under industrial and commercial use for the foreseeable future. Therefore, the remedial alternatives evaluated in the FFS will include institutional controls requiring the Site to remain under industrial and commercial use. As noted in Section 2.3, residential use of the area is not allowed under the current zoning.

Site-specific PCLs developed in accordance with the MTCA regulatory requirements for cleanup levels are proposed for the FFS. The PCLs must be protective of the relevant potential exposure pathways identified in the CSM, which include the following:

- groundwater—the groundwater-to-surface water pathway (the groundwater discharges to Port Gardner Bay), consumption of marine organisms, direct contact with contaminated shallow groundwater by utility or construction workers, and protection of indoor air quality due to volatilization;
- soil—direct human exposure pathways (ingestion, inhalation of volatile constituents, dermal absorption); and
- soil—groundwater pathway (soil must be protective of groundwater that may be in contact with the soil).

PCLs used in the FFS must be established for the soil and groundwater COCs identified in Section 5.1. Development of the PCLs is discussed in Section 5.2.2.

5.2.1 POINT OF COMPLIANCE

To develop and evaluate a reasonable range of cleanup alternatives in the FS, a POC must be defined for contaminated sites. As defined in the MTCA regulations, the POC is the point or points at which cleanup levels must be attained. As stated previously, the POC, cleanup levels, and other applicable standards, taken together, define the cleanup standard. Sites that achieve the cleanup standards at the POC and comply with applicable state and federal laws, as approved by Ecology, are presumed to be protective of human health and the environment. A POC or multiple POCs will be used in the FFS to design and evaluate potential remedial alternatives. The basis for selecting the POC(s) for the FFS is described in Sections 5.2.1.1 and 5.2.1.2. The final POC(s) to be used for implementing the cleanup action will be determined after Ecology approves the DCAP and after completing the requirements specified in the MTCA regulations for approval by other agencies, other property owners, and the public. The final POCs will be approved by Ecology as part of the DCAP approval.

5.2.1.1 Point of compliance for soil

The regulatory requirements for the soil POC are presented in the MTCA regulations [WAC 173-340-740(6)]. The requirements for the soil POC depend on the relevant exposure pathways. Therefore, MTCA may require different soil POCs for different COCs. The requirements specified by MTCA are as follows.

- For soil COCs whose cleanup level is based on protection of groundwater, the soil POC shall be established in the soils throughout the Site.
- For soil COCs whose cleanup level is based on human exposure, the POC must include the soils throughout the Site from the ground surface to a depth of 15 feet bgs.

Not all of the remedies considered in the FFS assume that cleanup levels will be attained at a standard POC. The remedies considered will comply with WAC 173-340-740(6)(f), which states that the cleanup action may be determined to comply with the cleanup standards, provided that:

- The selected remedy is permanent to the maximum extent practicable using the procedures in WAC 173-340-360.
- The cleanup action is protective of human health.
- The cleanup action is demonstrated to be protective of terrestrial ecological receptors.
- Institutional controls are put in place.
- Compliance monitoring and periodic reviews are designed to ensure the long-term integrity of the containment system.
- The types, levels, and amount of hazardous substances remaining on the Site and the measures that will be used to prevent migration and contact with those substances are specified in the DCAP.

The remedial alternatives developed and evaluated in the FFS have been designed to achieve these requirements. The preferred remediation alternative is presented in Section 14.

5.2.1.2 Conditional point of compliance for groundwater

MTCA regulations favor a permanent solution that achieves groundwater cleanup at the standard point of compliance (SPOC), which is essentially the volume of groundwater extending beneath a site from the water table to an appropriate depth, as determined by Ecology. If a permanent cleanup action (e.g., a cleanup action capable of attaining groundwater cleanup levels at the SPOC) is not selected for a site or is infeasible, MTCA rules specify additional requirements for a conditional POC (CPOC), as described in WAC 173-340-360(2)(c)(ii).

The groundwater SPOC, as described in WAC 173-340-720(8)(b), would include all groundwater within the saturated zone beneath the Site. Under WAC 173-340-720(8)(c), Ecology may approve use of a CPOC if the responsible person demonstrates that it is not practicable to attain the SPOC within a reasonable restoration time frame and that all practicable methods of treatment have been used. A CPOC is essentially a vertical surface extending downward from the water table and laterally so that it spans the vertical area affected by the release (e.g., the affected groundwater extending beyond the boundary of the Property, across Federal Avenue to the west onto the Port of Everett property). Groundwater cleanup levels would apply everywhere at and downgradient of the CPOC; groundwater cleanup levels could be exceeded upgradient of the CPOC.

MTCA rules specify that a groundwater CPOC may be located either within the boundary of the source property or beyond the source property boundary. The requirements for establishing a groundwater CPOC beyond the property boundary for facilities that are near, but not abutting, surface water are set forth in WAC 173-340-720(8)(d)(ii) and include:

- The CPOC must be located as close as practicable to the source of the release.

- The CPOC must not be located beyond the point or points where groundwater flows into surface water.
- The conditions specified in WAC 173-340-720(8)(d)(i) must be met.
- All affected property owners between the source of contamination and the CPOC agree in writing to the CPOC location.

It is anticipated that a CPOC located on the Port of Everett property, downgradient of the Property, will be established for groundwater. Historically ADC conducted operations on the Port of Everett property, resulting in releases of petroleum products. The specific regulatory requirements (WAC 173-340-720[8][c]) that will apply for establishing a groundwater CPOC for the Site are:

- demonstration that it is not practicable to attain the cleanup standard at the SPOC within a reasonable restoration time frame;
- demonstration that the CPOC is as close as practicable to the source of the release; and
- demonstration that treatment or removal of highly mobile LNAPL source areas are used to the extent practicable in the Site cleanup.

The remedial alternatives developed and evaluated in the FFS will be designed to achieve these requirements.

5.2.2 PRELIMINARY CLEANUP LEVELS

This section describes the PCLs for groundwater and soil.

5.2.2.1 Beneficial use of groundwater

Because of the industrial and commercial zoning classification for the Site properties, Site groundwater is not currently recovered for potable use. Site groundwater will not likely be suitable for potable use in the future, even if the zoning changes, due to the proximity of the Site to marine water in Port Gardner Bay. Site groundwater meets the provisions of WAC 173-340-720(2)(a) through (c) to be defined as non-potable. This means that:

- Groundwater does not serve as a current source of drinking water.
- The groundwater is not a potential future source of drinking water because of the Site's proximity to marine waters in Port Gardner Bay.
- Groundwater is sufficiently connected to the surface water body to render the groundwater not practicable for use as drinking water.

In addition, a portion of the Site was historically used for disposal of refuse prior to 1917. The presence of refuse in the subsurface precludes use of the aquifer as a source of potable water.

The relevant complete potential exposure pathways for groundwater are discharge to the marine surface waters of Port Gardner Bay, contact with contaminated shallow groundwater by utility or construction workers, and exposure to workers within buildings via the inhalation pathway. Currently, there are no buildings over or in the vicinity of the affected soil and groundwater; however, the vapor intrusion pathway is a pathway of concern because it is possible that buildings could be constructed in the future.

5.2.2.2 Preliminary cleanup levels for groundwater

Under the MTCA regulations, groundwater cleanup levels are established based on the current complete potential pathways for exposure to groundwater, which at this Site is discharge to surface water, potential human exposure through consumption of marine organisms, contact with contaminated shallow groundwater by utility or construction workers, and inhalation of indoor air in industrial buildings. Though the groundwater-to-vapor pathway is not currently a complete pathway, this pathway could potentially be complete in the future if buildings are constructed within the Site. The PCLs will be established to be protective of these current and potential future exposure pathways.

PCLs for groundwater are presented in Table 5-1 and were selected by choosing the minimum of the following, in accordance with WAC 173-340-720:

- **MTCA Groundwater Table Values (from Cleanup Levels and Risk Calculation [CLARC] website)**
    - MTCA Method A: The MTCA Method A values were only used for TPH compounds because there is not an applicable federal standard for these compounds. MTCA Method A values for Site COCs other than TPH are based on the minimum screening levels based on protection of surface water and protection of indoor air.
- **Surface Water ARARs**
    - Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A): Acute and Chronic effects, Aquatic Life, Marine Water and Human Health Criteria for Consumption of Organisms only.
    - National Recommended Water Quality Criteria (Clean Water Act §304): Marine Water, Acute and Chronic effects; aquatic life; and Protection of Human Health, Consumption of Organisms Only.
    - Federally Promulgated Water Quality Standards (Code of Federal Regulations [CFR] Title 40, Part 131.45): Revision of certain Federal water quality criteria applicable to Washington; Human Health Criteria, Marine Water.
- **Protection of Indoor Air**
    - MTCA Method B groundwater to vapor inhalation screening levels, obtained from a revised Vapor Intrusion Screening table issued by Ecology in April 2015 (Ecology, 2015).

Numerical values for the criteria described above are presented in Table 5-1. The PCLs shown in Table 5-1 for each groundwater COC were selected as the minimum criterion value from the surface water or indoor air ARARs. If no applicable ARAR was available, the MTCA Method A cleanup levels were selected as the PCL. For cPAHs, the lowest criterion was the surface water ARAR for Human Health (0.0021 microgram per liter [µg/L]). The PCL for cPAHs was revised in accordance with the MTCA regulations (WAC 173-340-705[6]) so that the PCL was not lower than the practical quantitation limit for the project laboratory. The PCL for cPAHs was set equal to the practical quantitation limit, which is also numerically equal to the MTCA Method A cleanup level.

The MTCA Method A cleanup levels for TPH-G, TPH-D, and TPH-O are based on noncarcinogenic health effects for drinking water use; these values were used as the PCLs for these constituents. Therefore, the groundwater PCLs presented in Table 5-1 are protective of the current and potential future uses of the Site.

5.2.2.3 Preliminary cleanup levels for soil

The Site is located in an area zoned for heavy industrial and commercial use; therefore, MTCA Method A Unrestricted or Method B standard soil cleanup levels are appropriate for use at the Site. Additionally, soil cleanup levels must be protective of groundwater, as specified in WAC 173-340-745(5)(A). Using the groundwater PCLs of Table 5-1 and Method A groundwater cleanup levels for ethylbenzene and total xylenes, soil cleanup levels protective of groundwater were calculated in accordance with WAC 173-340-747(4), and the resulting calculated soil cleanup levels are presented in Table 5-2. The calculations are summarized in Table 5-3; the calculated soil cleanup levels protective of groundwater were considered when selecting the soil PCLs shown in Table 5-2.

PCLs for soil were selected by choosing the minimum of the following MTCA cleanup levels:

- MTCA Method A Soil Cleanup Levels for unrestricted use (MTCA Table 740-1). For Site COCs other than TPH, the Method A cleanup levels are based on potable groundwater use and are not applicable to the Site.
- MTCA Method B cleanup level based on direct contact/ingestion for workers obtained from the CLARC website.
- Soil cleanup levels protective of groundwater resulting from the calculations shown in Table 5-3.

The soil PCLs for non-TPH COCs are based on protection of groundwater and the TPH PCLs are based on MTCA Method A cleanup levels for unrestricted land use (Table 5-2). The PCLs for benzene and 1-methylnaphthalene were revised in accordance with the MTCA regulations (WAC 173-340-705[6]) so that the PCL was not lower than the practical quantitation limit for the project laboratory (Table 5-3). As a conservative measure, the PCLs for saturated soils will generally be applied for site characterization, since shallow groundwater is present throughout the Site and the PCLs for saturated soil are lower (more conservative) than the PCLs for unsaturated soils.

5.3 TERRESTRIAL ECOLOGICAL EVALUATION

Soil concentrations considered protective of terrestrial receptors (plants and animals) were assessed using a simplified terrestrial ecological evaluation following the procedures outlined in WAC 173-340-7492. A copy of the evaluation is presented in Appendix H. The Site qualifies for an exclusion from performing a terrestrial ecological evaluation, based on meeting the requirements of WAC 173-340-7492.

6 NATURE AND EXTENT OF CONTAMINATION

This section discusses the nature and extent of COCs in soil and groundwater at the Site. Many soil and groundwater samples have been collected at the Site since field investigations began in 1991. These investigations are discussed in Section 3. Site soil characterization data based on results from sampling conducted through 2019 are shown on Figures 6-1 through 6-8. The soil sample data shown in these figures represent the highest concentration at a given sample location; these figures do not include data for soil that has been excavated for off-Site disposal. Additional soil characterization results from Cardno's (2021) investigation described in Section 3.2.4 are presented in Appendix F and figures in the DCAP but are not included on these figures. Groundwater characterization for the Site is presented on Figures 6-9 through 6-14. Figures 6-9 through 6-14 are based on groundwater sampling data for samples collected in January 2015. The data used to prepare Figures 6-1 through 6-14 are presented in Appendix E. The extent of affected groundwater defines the boundaries of the Site, as defined in the MTCA regulations at WAC 173-340-200. The Site extent is shown on Figures 6-1 through 6-14; note that the Site boundary does not reflect data from Cardno's investigation presented in Appendix F and figures in the DCAP. The Site boundary is based on the areal extent of soil and groundwater samples that exceeded the PCLs. As shown on these figures, the Site boundary extends onto the former KC property. However, other known sources of Site COCs are present on the former KC property that are being addressed as part of the environmental response under the MTCA program on the former KC property.

6.1 SOIL

The nature and extent of soil contamination at the Site is defined for the following Site COCs:

- benzene;
- ethylbenzene;
- total xylenes;
- 1-methylnaphthalene;
- TPH-G;
- TPH-D and undifferentiated TPH;
- TPH-O; and
- total cPAHs, expressed as benzo(a)pyrene toxicity equivalents.

Undifferentiated TPH results generally represent older samples analyzed using EPA Method 8015M, in which the hydrocarbon classification was not determined. For the purposes of this discussion, undifferentiated TPH is combined with TPH-D. The discussion focuses on those areas of the Site where soil samples exceeded the PCLs discussed in Section 5.2.2.3 for each respective COC. As a conservative measure, analytical results for soil are compared to the PCLs for saturated soils, since shallow groundwater is present throughout the Site and the PCLs for saturated soil are lower (more conservative) than the PCLs for unsaturated soils.

In general, the source areas for the Site COCs are associated with past petroleum product storage and handling areas, including the Property, the former loading racks and underground fuel lines under and near the railroad tracks east of the Property, and the former ADC garage. Secondary soil source areas under the former Everett Avenue and BNSF parcels, the Terminal Avenue Overpass, and Federal Avenue were created through migration of LNAPL from the primary source areas, especially under the influence of dewatering.

The benzene distribution in soil is shown on Figure 6-1; soil samples with benzene concentrations exceeding the PCL of 0.005 mg/kg are scattered along the east side of the ADC Parcel and throughout the ExxonMobil Parcel, with isolated occurrences in samples collected on the former KC property to the north and Federal Avenue just east of the former ADC garage location. Figures 6-2 and 6-3 show the soil samples with ethylbenzene and total xylenes, respectively, that exceed the applicable PCLs. These two COCs are generally found in the same general area as the benzene exceedances.

The locations where 1-methylnaphthalene concentrations in soil exceed the PCL of 0.5 mg/kg are shown on Figure 6-4. The distribution extends east, north, and west of the properties formerly used by ADC, including the former ADC garage property west of Federal Avenue.

The TPH-G distribution in soil is shown on Figure 6-5; soil samples with TPH-G exceeding the PCL of 30 mg/kg were located across the Site, with samples collected from locations under the Terminal Avenue Overpass, extending west through the Property, and north and west of the Property onto the location of the former ADC garage. (The more conservative standard of 30 mg/kg was selected as the PCL for TPH-G since benzene was commonly detected in the same samples as TPH-G.)

The TPH-D and undifferentiated TPH distribution in soil is shown on Figure 6-6. Points on Figure 6-6 are treated as an exceedance if the sum of the TPH-D plus TPH-O concentrations is greater than the PCL of 2,000 mg/kg. Soil samples with TPH-D concentrations exceeding the PCL of 2,000 mg/kg extend from under the Terminal Avenue Overpass through the center of the Property and to the west onto the location of the former ADC garage. Exceedances also occur to the north of the Property on the former Everett Avenue.

Borings CE-6 and FA-SB06 were installed south and west of the remaining warehouse building on the former KC property, respectively (Figures 6-1 through 6-8). Both were installed after completion of the CSO replacement project in 1996, where extensive dewatering was required during repair and replacement of the CSO line. During completion of the CSO repairs, nearly 1.5 million gallons of groundwater was recovered, along with approximately 23,000 gallons of LNAPL. (See Section 6.3 for details.)

Both borings contained 5 to 6 feet of silty sand over well-graded sand with silt. Samples for analysis were collected from both the upper finer soil layer and the lower coarser layer in both borings. The samples from the lower layer contained TPH-D at concentrations of 5,390 mg/kg in CE-06 and 3,130 mg/kg in FA-SB06. A minor exceedance for TPH-G in CE-06 (381 mg/kg) was also noted. None of the shallower soil samples for these two borings contained COCs above the PCLs. This pattern suggests that dewatering for construction may have caused lateral movement of COCs and LNAPL through the higher permeability fill materials, likely from the north and northwest of these two locations rather than from the Property. The dewatering proceeded from east to west then south; if surface spills or releases had been responsible for the observed soil contamination then the shallow soils should also have been contaminated.

The TPH-O distribution in soil is shown on Figure 6-7. Points on Figure 6-7 are treated as an exceedance if the sum of the TPH-D plus TPH-O concentrations is greater than the PCL of 2,000 mg/kg. Soil samples with TPH-O concentrations exceeding the PCL are more scattered in distribution than TPH-G or TPH-D, with isolated occurrences near the location of the former ADC garage. While TPH-O was detected in a discrete soil sample collected from the Everett Force Main project in 2012, the sample collected from Station 12+72 only contained TPH-O at 258 mg/kg, well below the MTCA Method A TPH-O PCL of 2,000 mg/kg (G-Logics, 2012). This sample was reportedly collected from an area where G-Logics reported a sheen; however, the analytical result does not reflect the concentration expected where free product is observed.

The cPAH distribution in soil is shown on Figure 6-8. The cPAH concentrations are expressed as the toxicity equivalents of benzo(a)pyrene, and concentrations of cPAHs exceeding the toxicity equivalent PCL of 0.1 mg/kg can be found from the northeast portion of the Site to the west, scattered across the property, and on the former ADC lease area on the west side of Federal Avenue. Two isolated exceedances located to the south are attributed to the presence of cPAHs along a former BNSF Spur line and the associated creosote-tainted railroad ties.

As shown on the geologic cross-sections (Figures 2-8 to 2-13), the vertical distribution of benzene, other aromatic hydrocarbons, and TPH (all hydrocarbon classes) generally occurs in the upper 10 feet of soil. Note that the soil characterization results from Cardno's (2021) investigation described in Section 3.2.4 are not included in these cross sections; cross sections for the results from Cardno's investigation are presented in Appendix F and figures in the DCAP. These COCs are also found below the water table, where smear zones and rising groundwater levels have trapped the COCs in the soil. As discussed in Section 6.3, some of the TPH analytical results are high enough in concentration to suggest that the hydrocarbons are present in residual saturation or as LNAPL. Hydrocarbons in residual saturation can be mobilized if the soils are dewatered. Under current conditions, however, most hydrocarbons are immobile and are likely trapped in residual saturation below the water table.

6.2 GROUNDWATER

The nature and extent of groundwater contamination at the Site is defined for following Site COCs:

- benzene;
- ethylbenzene;
- xylenes
- TPH-G;
- TPH-D;
- TPH-O;
- cPAHs, expressed as benzo(a)pyrene toxicity equivalents; and
- 1-methylnaphthalene.

The areas with the highest concentrations of COCs are associated with the primary and secondary source areas discussed in Section 6.1.

Table 6-1 presents the results of semiannual groundwater sampling from an expanded network of wells in 2015. Only the January 2015 groundwater monitoring data are used to discuss the nature and extent of affected groundwater, as this data set included samples from several wells that are not routinely sampled and is, therefore, more comprehensive than the other semiannual data sets. Based on a review of 17 years of semiannual groundwater data, the Site exhibits only a limited seasonal variation in groundwater quality. The January 2015 groundwater data were reviewed in accordance with the project-specific data validation standards for the Site requirements, and the data review memorandum and laboratory reports are included in Appendix E.

As discussed in detail in the letter report in Appendix I, and as shown in Tables 4 and 5 of that report, it appears that the Test America laboratory's silica gel cleanup methodology for the TPH-D and TPH-O groundwater samples was insufficient to remove polar compounds, which silica gel cleanup is intended to accomplish. The corresponding Eurofins split-sample analytical data are much lower in reported TPH-D and TPH-O concentrations than the corresponding Test America samples. Comparisons of TPH-G, benzene, and cPAH analytical results are comparable between the two laboratories. The primary difference between the Test America and Eurofins split-sample analytical data is the effectiveness of the silica gel cleanup of the TPH-D and TPH-O samples. The most recent Eurofins laboratory TPH-D and TPH-O analytical results will be used when discussing the nature and extent of TPH-D and TPH-O in groundwater samples.

The benzene distribution in groundwater is shown on Figure 6-9; there were two exceedances of the groundwater benzene PCL of 1.6 µg/L during the January 2015 sampling event in a sample collected from LPH-1, located at the southern end of the LPH recovery trench, and W-15R, located in the southeast quadrant of the ADC parcel. Since 2014, additional exceedances of the benzene PCL for groundwater samples have been observed for samples collected at LPH-1, MW-15R, and MW-40R. It should be noted that wells MW-15R and MW-40R also contain LPH.

The TPH-G distribution in groundwater is shown on Figure 6-10; TPH-G exceeded the PCL of 800 µg/L in groundwater from two monitoring wells located east of the Property—monitoring well W-17 and Sump 2. Both of these locations border the former BNSF excavation. TPH-G was also detected above the PCL in two groundwater samples collected from W-2 and W-15R, both located on the Property. It should be noted that both of these wells often contain LPH, which might have influenced these analytical results. TPH-G was not detected above the PCL in any of the other groundwater samples collected from the Property or the Port of Everett property, and was not detected in the groundwater from wells installed on Federal Avenue.

The TPH-D distribution in groundwater samples is shown on Figure 6-11. Groundwater samples with TPH-D concentrations exceeding the PCL of 500 µg/L occur throughout the Property and extend west into and beyond Federal Avenue, and also occur in samples previously collected on the former KC property, the former BNSF property, and underneath the Terminal Avenue Overpass. The most recent TPH-D analytical results from Eurofins show that the groundwater samples collected from MW-A5 and MW-A6 on Dunlap Towing property were below the Method A groundwater cleanup level for TPH-D (Appendix G). A single exceedance was recorded in February

2016 at MW-A5 with an estimated concentration of 540 µg/L (denoted by a “J” quality assurance flag). Dunlap Towing is known to use diesel fuel in its business operations. All TPH-D results for MW-A5 since August 2016 have been below the PCL (Appendix G).

The TPH-O distribution in groundwater is shown on Figure 6-12. TPH-O concentrations in groundwater exceeding the PCL of 500 µg/L occurred in samples collected from LPH-4 on the Property and from Sump 2, located east of the ExxonMobil Parcel on the BNSF property.

The cPAH distribution in groundwater samples is shown on Figure 6-13. Concentrations of cPAHs, expressed as benzo(a)pyrene toxicity equivalents, exceeded the PCL of 0.1 µg/L in groundwater samples from only two locations. One location, monitoring well W-1, is located on the ExxonMobil Parcel, and the other location, Sump 2, is located east of the ExxonMobil Parcel on the BNSF property.

1-Methylnaphthalene exceeded the PCL of 1.5 µg/L in multiple wells located on or near the ADC and ExxonMobil parcels, but not west of Federal Avenue (Figure 6-14).

Concentrations of ethylbenzene and total xylenes were both below detection limits for all wells sampled in January 2015.

6.3 LIQUID-PHASE PETROLEUM HYDROCARBONS

LPH has been observed in wells, trenches, sumps, and excavations at the Site since environmental investigations began. The LPH varies in nature from TPH-G to TPH-D to heavier TPH-O fractions, and all of the LPH is generally characterized as “weathered” in various laboratory reports.

The viscosity and weathering of the LPH limit mobility of LPH at the Site. The original releases occurred between 25 and 90 years ago. Weathering, including volatilization of lighter hydrocarbons and microbial degradation, works to increase the viscosity of the LPH and limit the ability of the LPH to flow and accumulate in the subsurface. This increased viscosity contributes to the limited effectiveness of the LPH recovery trench. The weathered LPH preferentially adsorbs to peat, wood waste, and other organic constituents present in the subsurface, further limiting the mobility of LPH.

LPH has been observed on the BNSF parcel, on the Property, seeping through damaged asphalt along former Everett Avenue during periods of elevated groundwater, and across Federal Avenue in groundwater monitoring well MW-A1. Many of the observations describe the LPH as being viscous. Comingling of the various types of products that have been handled on the Properties—diesel fuel, stove oil, heavy fuel oil, Bunker C, and gasoline, among others (AGRA 1996a)—can change the viscosity of the LPH. Viscosity can also increase due to weathering in the subsurface, which typically results in degradation of the light hydrocarbons, making the overall LPH thicker and more difficult to recover. Since 2010, limited amounts of LPH (< 40 gallons) have been recovered from five monitoring wells and/or sumps at the Site.

Table 6-2 outlines the various attempts at recovering LPH from wells, excavations, sumps, recovery wells, and the LPH trench. LPH has been recovered from the Site using active methods (groundwater pumping and vacuum-induced skimming) as well as passive methods (oleophilic absorbents and LPH pumping). However, as shown in Table 6-2, passive LPH recovery yields very small volumes of hydrocarbon over time: over the past six years of LPH monitoring and recovery, no LPH was recovered from the LPH recovery trench despite it being designed for that purpose (Exponent, 2000). Approximately 34 gallons of LPH has been captured from recovery and groundwater monitoring wells (W-1, W-2, W-10R, W-15R, and MW-A1) using passive recovery techniques, bailing, peristaltic pumps, and/or oleophilic socks since March 2010. Oleophilic socks are the preferred recovery method since the field sampling personnel can quickly extract and contain the socks while minimizing chances for contamination.

The largest quantities of LPH have been recovered as a by-product of dewatering, such as the dewatering events that occurred during the 1996 CSO replacement project and the 2011–2012 BNSF excavation. While the volume of LPH recovered during dewatering is not insignificant, the volume of water requiring handling, disposal, and treatment as a result of these dewatering events is many times greater than the LPH volume. During the CSO replacement project in 1996, LPH accounted for only 1.6% of the recovered water volume; during the BNSF excavation, LPH accounted for only 0.4% of the recovered groundwater volume.

The behavior of LPH under both active and passive recovery techniques suggests that most of the LPH is in residual saturation and can be mobilized only under the extreme hydraulic gradients induced by dewatering. Soil with concentrations of TPH-G, TPH-D, TPH-O, or undifferentiated TPH potentially high enough to indicate the presence of immobile, residual LNAPL or floating, potentially mobile LNAPL is found both on and upgradient of the Property, on the recently cleaned up BNSF property, underneath Federal Avenue and the former Everett Avenue, and on the former ADC garage area on property owned by the Port of Everett (Figure 6-15). Note that the soil characterization results from Cardno's (2021) investigation described in Section 3.2.4 are not included on Figure 6-15; results from Cardno's investigation are presented in Appendix F and figures in the DCAP. *Residual saturation* is defined as fluid distributed within a porous medium and held in place by capillary action. Under these conditions, the fluid is not connected between pores; therefore, it does not flow. The quantity of LNAPL in a soil under residual saturation conditions depends on the fluid properties of the LNAPL, the specific soil properties, and the percentage of water saturation. The fluid properties of LNAPL can vary widely, depending on the composition and viscosity of the liquid.

The distinction between residual LNAPL and potentially mobile LNAPL is based on research into how much LNAPL is expected to be retained by saturated soils of various textures for different LNAPL viscosities. In general, LNAPL with higher viscosity has a correspondingly higher residual saturation. Table 747-5 in the MTCA regulations (WAC 173-340-900) presents a generic screening level for residual saturation of 2,000 mg/kg for TPH-D; however, the actual residual saturation concentration for a given soil type depends on the soil grain size and the specific properties of the LNAPL.

In preparing Figure 6-15, potential residual saturation levels for TPH fractions were selected based on the sand and silty sand soils typically present at the Site and TPH concentrations observed historically in soil samples collected at the Site. Residual saturation levels for TPH-D, TPH-G, and TPH-O were determined for site-specific data using guidance from *Non-Aqueous Phase Liquid (NAPL) Mobility Limits in Soil* (Brost and DeVaull, 2000). Residual saturation levels for TPH-G in soils at the Site range from 2,470 to 3,410 mg/kg. Residual saturation levels for TPH-D in soils at the Site range from 4,800 to 8,840 mg/kg. Similarly, residual saturation of TPH-O is based on residual saturation concentrations for fuel oil in soils similar to Site soils, yielding concentrations ranging from 5,810 to 11,000 mg/kg. LNAPL was assumed to be present when concentrations exceeded the upper limit of the residual saturation concentrations. The residual saturation levels for TPH-G were used for historical undifferentiated TPH analyses, as those concentrations were most conservative. Therefore, LNAPL present at the locations shown on Figure 6-15 was identified as representing potentially mobile LNAPL, based on field observation of LNAPL in the wells, or residual saturation, based on soil analytical results and these residual saturation concentrations. Note that the soil characterization results from Cardno's (2021) investigation described in Section 3.2.4 were not used in this analysis; the results from Cardno's investigation are presented in Appendix F and figures in the DCAP.

Starting in January 2012 and extending through June 2014, AMEC Earth & Environmental conducted a study to assess LPH behavior in five Site monitoring wells: W-1, W-2, W-10R, W-15R, and MW A1. For this study, the oleophilic (or sorbent) socks normally deployed in these wells were removed because the sorbent socks preclude LPH accumulation in the well. Figures 6-16 through 6-20 show groundwater elevations graphed against measured LPH thicknesses in the five wells that contained greater than 0.2 foot of LPH during the study period. The primary observations that can be drawn from the plotted data are:

- For four out of five wells, rising groundwater elevation causes a greater amount of LPH to gather in the wells.
- For MW-A1, no LPH was present until May 2013, approximately one year after the completion of the City of Everett Force Main Installation Project. MW-A1 has contained LPH since May 2013, and the amount of LPH measured in the well does not correlate to groundwater elevation.

The increase in LPH thickness with rising groundwater elevation indicates that LPH is being released from finer grained sediments and accumulating in coarser fill materials under the influence of buoyancy. The coarser grained sediments have a lower residual saturation concentration, so the LPH can accumulate in the more permeable filter pack around the well screen. As the groundwater elevation falls, the LPH in both the coarser fill and filter pack is re-absorbed into the finer grained fill materials that have a higher residual saturation, and the LPH is immobilized.

MW-A1 was installed before the force main installation. The excavation for the force main, which proceeded along the former Everett Avenue from the east to Federal Avenue, and then south along Federal Avenue to the intersection with Terminal Avenue, appears to have extended to within a few feet of the well. It would appear that the path of dewatering and the amount of dewatering was sufficient to mobilize LPH, and as the dewatering moved past MW-A1 to the south, the LPH was left in the more permeable excavation backfill. Data indicates that this LPH eventually seeped into the coarser sand pack surrounding well MW-A1. Because of the uniformity of the excavation backfill compared to the native silty sands, wood waste, and debris, the residual saturation of the sand pack and pipe bedding material is very similar. Therefore, there should be less correlation of LPH thickness with changes in groundwater elevation in MW-A1.

6.4 EVIDENCE FOR BIODEGRADATION

Figure 6-21 shows trend charts of total BTEX concentrations over time for selected wells based on ongoing groundwater monitoring. These wells represent locations upgradient, within the source areas, and downgradient of the Property. We chose total BTEX as representative of the decrease in dissolved-phase contamination over time, as BTEX compounds are more easily dissolved and transported with groundwater flow.

Wells shown on Figure 6-21 (MW-11, MW-19, MW-40R, W-3, and W-6) have the most extensive long-term groundwater monitoring history. Wells that were only sampled early in the monitoring program, and which have since been abandoned, and wells with limited detections of cumulative BTEX did not contain sufficient data to plot. All of these wells exhibit a decrease in total BTEX concentrations over time, supporting the idea that hydrocarbons in groundwater are being biodegraded either aerobically or anaerobically.

Figure 6-22 shows sulfate concentrations and ORP results for samples collected during the 2011 Data Gaps Investigation (AMEC Earth & Environmental, 2010a). The figure shows that both sulfate concentrations and ORP decrease downgradient of the source area, which suggests that sulfate reduction of contaminants is occurring as groundwater passes through the source area. These data further support the idea that hydrocarbons in groundwater are undergoing natural biodegradation under current conditions.

7 AQUIFER AND TIDAL STUDIES

A number of aquifer and tidal studies have been performed at the Site. This section summarizes the results of these studies. Tidal studies focus on assessing fluctuations in groundwater level induced by adjacent marine waters. Aquifer studies are focused on characterizing the hydrogeologic properties of the saturated zone. Two types of tests have been performed within groundwater wells at the Site to characterize the shallow groundwater zone: aquifer (or pump) tests and slug tests. In an aquifer test, a given well is pumped at a constant rate or a series of rates and the aquifer drawdown is measured in nearby observation well(s). Aquifer tests are expensive and time-consuming to perform but generally provide data that are more accurate than slug test data. A slug test involves rapidly introducing or removing a solid plug from a well, which creates a rapid rise or decrease in the water level in the well. The resulting change in water level within the test well is then measured as it returns to the initial water level. Slug tests are easily performed, but the data are generally considered to be lower in quality due to limitations on the size of the slug and the amount of water displaced during the test.

7.1 AQUIFER STUDIES

AGRA performed an aquifer pump test on three wells located on the Property (MW-10, MW-18, and RW-1) during the 1990s (Exponent, 1998). During the test, groundwater was extracted from RW-1 and the drawdown or response was measured in MW-10 and MW-18 along with the pumping well. Table 7-1 presents the hydraulic parameters calculated from different responses to pumping or recovery at these three wells. Hydraulic conductivity is a measurement of how the aquifer matrix transmits water in response to pumping from the test well (RW-1). As shown in Table 7-1, hydraulic conductivities measured during these tests ranged from approximately 1.4×10^{-3} centimeters per second (cm/sec) to 3.4×10^{-3} cm/sec, with an average of 2.1×10^{-3} cm/sec. This range of hydraulic conductivities is consistent with the silty to poorly graded sands that have been observed in the saturated zone located beneath the Property.

Slug tests were performed in three monitoring wells located on the Port of Everett property, which lies west and northwest of the Property. Typically, data from the “rising head” portion of the slug test, when the slug is suddenly removed from the well, is more accurate than the “falling head” portion. Three monitoring wells, MW-A1 (west of the Property) and MW-A5 and MW-A6 (northwest of the Property at Dunlop Towing) were tested five times each. The geometric mean of the five test results for each of the three wells are presented in Table 7-1. The mean hydraulic conductivities from these slug tests ranged from approximately 6.4×10^{-3} to 2.7×10^{-2} cm/sec (AMEC Earth & Environmental, 2010a). These measured hydraulic conductivities are consistent with values expected for the cleaner and slightly coarser fill materials that have been observed in the filled area west and northwest of the Property. The results shown in Table 7-1 indicate that the native soils underlying the Property have slightly lower hydraulic conductivities than the filled area west of Federal Avenue.

7.2 2011 TIDAL STUDY

The most extensive and complete tidal study was performed at the Site over a two-week period in February 2011. The purpose of the tidal study was to determine the extent of tidal influence and the mean groundwater level at the Site. Data were collected from 13 groundwater monitoring wells installed across the Site. Non-vented, self-logging transducers were installed in each of the groundwater monitoring wells and in a stilling well installed on the Everett Pier. Water levels were recorded at 6-minute intervals at the same time by each transducer. A separate barometric pressure-logging transducer was also used to record the barometric pressure at the Site.

Tidal influence was observed to be strongest in monitoring wells W-3, MW-11, MW-A1, MW-A2, MW-A3, MW-A5, and MW-A6, which indicates that water levels in these wells are influenced by tidal fluctuations in the adjacent Port Gardner Bay. The tidal fluctuations measured in wells ranged from 0.1 foot to 1.1 feet. It should be noted that the tidal fluctuations measured in the stilling well in Port Gardner Bay had a magnitude of approximately 9 feet, while the data recorded in the monitoring wells showed a significantly dampened response in even the most strongly influenced well (AMEC Earth & Environmental, 2011a). The most strongly influenced wells are located west of the Property, closer to Port Gardner Bay. Well MW-11, located on the east side of the Property, had a strong tidal response; this is likely due to a preferential flow conduit (probably a former stream channel) that transmits the tidal signal inland to MW-11. With the exception of MW-11, wells located on and east of the Property had minimal response to tidal fluctuations, and mainly responded to changes in barometric pressure (AMEC Earth & Environmental, 2011a).

7.3 2014 TIDAL STUDY

Since the 2011 tidal study, completed over a limited two-week period in February 2011, showed a significant tidal impact on groundwater levels, logging transducers were placed in several wells in July 2014 to collect groundwater level data to support the FFS and to better characterize Site groundwater flow. A total of seven self-logging, non-vented transducers were installed in RW-2, MW-40R, MW-A1, MW-A2, MW-A3, MW-A4, and MW-A5. In addition, a logging barometric transducer was placed on the Property. Water levels in each of the wells were logged simultaneously with barometric pressure every 15 minutes during this period. The data recorded by each well transducer and the barometric transducer are periodically downloaded and analyzed to assess groundwater elevations in these wells. Groundwater elevation data collected prior to October 2014, including hydrographs for the wells, are discussed in Section 2.4.6.

Figure 2-15 is a groundwater contour map based on the mean groundwater elevations measured in August 2016 using the transducers. The mean groundwater elevations were calculated using a 25-hour average of the recorded water levels to filter short-term tidal influence and show mean groundwater flow conditions (Serfes, 1991). Mean groundwater flow direction is generally to the west, with seasonal fluctuations. The hydraulic gradient is much steeper across the Property (at 0.037) compared to the area west of Federal Avenue, where the gradient decreases to 0.006. This change in gradient likely reflects changes in permeability, with the more permeable sands west of Federal Avenue allowing groundwater levels to equilibrate compared to the lower permeability, silty sands on the Property.

As discussed in Section 2.4.6, there is limited mixing of Site groundwater with surface water because the tidal response of the groundwater is limited and because groundwater flows in response to the mean or average hydraulic gradient in the groundwater. Mixing during any one tidal cycle is limited to the area immediately adjacent to the Port Gardner seawall, within the distance groundwater can travel during the “flood” portion of the twice-daily high tides.

8 CONCEPTUAL SITE MODEL

This section presents the CSM based on the geology, hydrogeology, and history of the Site and the nature and extent of soil and groundwater contamination. The purpose of the CSM is to document Site characteristics that affect the fate and transport of COCs and the relevant potential exposure pathways for the Site.

Section 8.1 summarizes Site geology and hydrogeology as determined through Site investigation data, data from interim remedial actions, tidal studies, and observations during historic dewatering activities conducted as part of interim remedial actions and construction activities. Section 8.2 presents the various potential exposure pathways for potential receptors. Section 8.3 summarizes the CSM and identifies data gaps and/or uncertainties that remain, if any.

8.1 GEOLOGY AND HYDROGEOLOGY

Figure 8-1 shows a plan view of the CSM, and Figure 8-2 shows a generalized cross-section adapted to show the features of the CSM. Figure 8-1 also shows the Site boundary based on the extent of soil and groundwater exceeding PCLs, as detailed in Section 6.0. Note that the soil characterization results from Cardno's (2021) investigation described in Section 3.2.4 are not shown in these figures and were not used to define the Site boundary; the results from Cardno's investigation are presented in Appendix F and figures in the DCAP.

The Property was developed over former nearshore marsh and mudflats that have generally been infilled to prepare the area for development. Aerial photographs show the pre-development shoreline near the west side of the present Federal Avenue. The surface soils (uppermost 5 to 10 feet) at the Site are characterized by heterogeneous mixtures of fill generally consisting of very loose to medium dense silty sand and sand with areas of peat. Occasional debris, such as wood, glass, lumber, and brick pieces, have been observed mixed into the peat. This debris likely originated from past residences that occupied the marshy grounds prior to regrading and filling, and some may possibly have been present in the material used to fill the site. The surface fill overlies native glacial advance outwash deposits and transitional beds (Section 2.4.2). The historical shoreline west of Federal Avenue was gradually extended to the west beginning sometime after 1917. By 1976, the shoreline had been extended to its current location, approximately 500 to 600 feet west of the 1917 shoreline. The source of the fill materials used to extend the shoreline to the west is unknown.

The hydrogeology at the Site has been significantly affected by the changes in topography and shoreline. The area near the Property was occupied by small residences in 1902, surrounding what was labeled "marsh" on an historical fire insurance map (Appendix A) The former marsh is likely represented by peat deposits that underlie much of the current land surface. The 1902 groundwater surface beneath the Property likely corresponded roughly to the surface water elevation in the former marsh. Over time, the groundwater table would have risen as the discharge area (i.e., the shoreline) was extended to the west. After the shifting of the shoreline, groundwater within the native fill deposits beneath the Property rose until the depth-to-groundwater along the eastern portion of the Property reached 2 to 3 feet. Surface seeps of groundwater have been observed at the base of the Terminal Avenue Overpass just east of the BNSF parcel and along the BNSF tracks and the City of Everett lift station. Shallow groundwater was also observed during the 2011–2012 excavation on the BNSF parcel. These observations suggest that the vadose zone on the east side of the Property is not very thick. The 2014 tidal study (Section 7.3) showed that the groundwater hydraulic gradient beneath the Property is six times steeper than the hydraulic gradient west of Federal Avenue. This steeper hydraulic gradient is an indication that native sediments are more restrictive to groundwater flow (lower permeability) than the sandy fill materials west of the Property, as also indicated by aquifer test results (Section 7.1).

Residual LNAPL is present in some areas of the Site, observed as either a floating layer in a well or sump or observed in soil based on measured concentrations at or above the expected residual saturation concentration (Section 6.3). The Property had been used as a petroleum product storage depot for approximately 50 years prior to the infilling that moved the shoreline to its current location. Historical releases of petroleum products would have pooled on the lower water table/capillary fringe elevation that existed at that time. As the groundwater surface beneath the Property rose after the shoreline was extended, the rising groundwater would have submerged and trapped petroleum product within the depth interval between the historic and new water table elevations. As shown by the LPH responses to rising groundwater elevations discussed in Section 6.3, LPH in some areas accumulates in the well casing. Most of the five wells that occasionally contain LPH are also adjacent to or upgradient of the LPH trench, yet LPH is not recovered from the trench. This observation suggests that the LPH is discontinuous and immobile, and does not flow into the LPH trench recovery sumps.

Under normal groundwater conditions (i.e., in the absence of construction dewatering), LNAPL at the Site is immobile, and historic attempts to recover LNAPL from the subsurface using standard hydrocarbon recovery techniques have not been successful. However, changes in the water saturation of soils can remobilize residually saturated LNAPL when relationships between LNAPL, water, the porous media, and air change. Such a change can occur when dewatering for construction or excavation lowers groundwater levels across a large area for an extended period of time, allowing the vadose zone to expand and the hydraulic gradient to steepen. These conditions appear to have mobilized LNAPL during excavation activities associated with the 2011-2012 interim action (Section 4.10) and the City of Everett force main project in 2012 (Section 3.1.6). AMEC began measuring LNAPL in Sump 2, which was installed in the former BNSF excavation in the quarry spall backfill, starting in mid-October 2013. Since then, LNAPL has continued to accumulate in Sump 2. LNAPL was also observed in MW-A1, located on Federal Avenue, in July 2013 after the City of Everett force main project. The dewatering cone of depression associated with the force main excavation would have pulled groundwater from the north as dewatering proceeded to the south. Therefore, the LNAPL observed in MW-A1 could potentially be attributable to either the Property or an off-Site source.

The LNAPL present at the Site originates from releases that occurred 30 to potentially 100 years ago. As such, the LNAPL is highly weathered, and has been generally depleted of the more soluble and mobile hydrocarbon components. Weathering of the releases has increased LNAPL viscosity and further decreased the mobility of the petroleum hydrocarbons remaining at the Site. The fine-grained sediments and organic matter identified beneath the Site (wood waste and peat) also limit migration and recovery of LNAPL, resulting in higher residual saturation concentrations for hydrocarbons in fine-grained soils and high levels of adsorption to organic materials. The limited downgradient extent of groundwater affected by dissolved COCs further demonstrates that migration of LNAPL constituents from the source areas is minimal.

8.2 EXPOSURE PATHWAYS

This section summarizes potential exposure pathways relevant to the Site.

8.2.1 SOIL

There are four potential exposure pathways for soil contamination at the Site: direct exposure, volatilization to subsurface vapor, dissolution into groundwater, and contact with COC-affected soil in stormwater, surface water, and sediment.

Direct exposure to soil contamination through dermal contact or incidental ingestion could potentially expose temporary construction workers during subsurface construction. Subsurface construction could be performed as part of remediation, as part of underground utility repair/replacement within the Site, or for property redevelopment. Direct exposure to soil COCs is a complete pathway. Existing surface cover limits the potential for direct exposure to other potential receptors.

Volatilization of constituents from soil within the source areas directly to subsurface vapor may allow contaminants to be transported to ambient air above ground. There are no buildings presently located on the Property, so vapor intrusion is not currently a complete exposure pathway on the Property. For the off-Property portions of the Site, the nearest structures are either above-grade modular offices or open structures. Therefore, volatilization from soil contamination and vapor intrusion in buildings is not presently a complete exposure pathway. However, future development in areas with elevated concentrations of volatile COCs could make this pathway complete. See Section 8.2.3 for additional discussion regarding the vapor inhalation pathway.

Dissolution of soil contamination may occur due to rainwater infiltration and dissolution into migrating groundwater. Since the Site is paved and surface water drains to stormwater catch basins and sewers, minimal infiltration occurs at the Site. However, groundwater originating off site that passes through affected soil can dissolve COCs that can then migrate with groundwater. Therefore, the soil to groundwater pathway is complete for the Site, and potential exposure pathways for groundwater are discussed in Section 8.2.2.

Surface water runoff can potentially transport COC-affected soil to stormwater, surface water, and sediment. Since the Site is paved and surface water drains to stormwater catch basins and sewers, these pathways are currently incomplete for the Site. While these represent potential exposure pathways should the on-Property cap or off-Property paving be damaged or removed, they are not considered likely under current or expected future Site conditions.

8.2.2 GROUNDWATER

Three potential mechanisms exist for transport of COCs from groundwater—volatilization from affected groundwater to subsurface vapors, transport of dissolved COCs in groundwater, and direct contact with or incidental ingestion of affected groundwater.

While volatilization is a possibility, especially in those areas with volatile aromatic hydrocarbons (such as the former ADC garage west of Federal Avenue), the only structures in these areas are above-grade modular offices or open structures. Benzene exceeds the groundwater screening level protective of indoor air of 2.4 µg/L at LPH-1. Therefore, volatilization of COCs from groundwater is a potentially complete Site pathway. See Section 8.2.3 for additional discussion.

As noted above, COCs can dissolve in groundwater and potentially migrate to Port Gardner Bay. In 1996, groundwater infiltrated the CSO line and flowed to Port Gardner Bay. Extensive repairs were made to the CSO line in 1996, so further direct infiltration into the CSO line is unlikely. The proposed CPOC is located downgradient of the source areas, between the source areas and the Port Gardner Bay shoreline. Therefore, although Site groundwater is discharging to marine surface water, the cleanup standard would be attained prior to discharge, thereby reducing potential risks to surface water and/or sediments to acceptable levels. Therefore, this is an incomplete pathway.

A third potential exposure pathway for affected groundwater is direct contact or incidental ingestion by construction workers. During subsurface excavations in areas of affected groundwater, workers may contact groundwater, resulting in the potential for dermal absorption or incidental ingestion. Temporary worker exposure to affected groundwater is a complete exposure pathway. Potential direct exposure to affected groundwater produced from wells is considered to be unlikely, as groundwater is neither potable nor suited for industrial or commercial use, due to the proximity of the Site to Port Gardner Bay. As discussed in Section 5.2.2.1, the highest beneficial use of groundwater at the Site is discharge to marine surface waters.

8.2.3 VAPOR

Subsurface vapors could potentially transport volatile COCs from LPH, soil, or groundwater to indoor air, ambient air, excavations, or utility line backfill. Groundwater contamination by volatile Site COCs (with the exception of benzene) is below PCLs that are protective of indoor air; soil contamination in the highly affected areas may be a source of indoor air contamination. Potential vapor exposure through inhalation can affect temporary construction workers during subgrade utility work. Subsurface vapors also can accumulate inside slab-on-grade or subgrade structures or utility corridors. Currently, all Site structures are temporary, modular, above-grade offices or open-air maintenance buildings where the potential accumulation of vapors is unlikely. Based on these considerations, only inhalation by construction workers during subsurface construction work is currently considered a complete and significant potential exposure pathway.

As noted above, there are currently no slab-on-grade or subgrade buildings present over or in the vicinity of affected Site soil. However, the vapor intrusion pathway is a pathway of concern because it is possible that buildings could be constructed in the future. As noted in Section 5, the groundwater PCLs were established to be protective of indoor air, and no volatile Site COCs except benzene (in samples collected at LPH-1 and W-15R) have been detected in groundwater at concentrations exceeding PCLs based on protection of indoor air. Soil contamination in the source areas may pose a potential risk to indoor air. To address this potential future pathway, institutional controls requiring the indoor air pathway to be evaluated and addressed as part of redevelopment will be established for those parcels that contain elevated soil concentrations.

8.2.4 LIGHT NONAQUEOUS-PHASE LIQUIDS

Since completion of the BNSF excavation in 2011 and dewatering activities associated with the City of Everett utility construction activities in 2011 and 2012, LNAPL has been accumulating in sumps and wells located on and upgradient of the Property. As shown on Figure 8-2, LNAPL is present at or above residual saturation levels in several locations. Note that the soil characterization results from Cardno's (2021) investigation described in Section 3.2.4 are not shown on Figure 8-2; the results from Cardno's investigation are presented in Appendix F and figures in the DCAP. Temporary construction workers could be exposed to LNAPL through ingestion or direct dermal contact when soils are removed during subsurface excavations, other excavation in affected areas, or repair or replacement of utilities or remedial activities. For these reasons, exposure to LNAPL by construction workers through direct exposure is a complete potential exposure pathway.

8.2.5 STORMWATER

The surface of the Property is capped, and the surface of the remaining portions of the Site is paved. Stormwater flows to the catch basins located on the Property and in other portions of the Site. The cap and surface pavement effectively prevent stormwater from contacting affected soil or groundwater. Management of stormwater in subsurface sewer lines significantly reduces the potential for human or ecological contact with stormwater runoff. For these reasons, there is no complete potential exposure pathway related to Site stormwater runoff.

8.2.6 SURFACE WATER

The only potentially complete exposure pathway to surface water is groundwater discharging to Port Gardner Bay. However, discharge of groundwater to surface water and/or associated impacts have not been observed. While there is likely discharge of groundwater to marine surface water, dissolved COCs may naturally attenuate prior to reaching surface water. Any COCs present in groundwater discharging to surface water may result in exposure to ecological receptors via direct contact or ingestion and to human receptors via direct contact (dermal absorption or incidental ingestion) or by ingestion of aquatic organisms. Since Site COCs are attenuating prior to groundwater discharge to surface water, this pathway is incomplete.

8.3 CONCEPTUAL SITE MODEL SUMMARY

The CSM is presented on Figure 8-1 and includes the site boundary based on the extent of soil or groundwater exceeding preliminary cleanup levels. Note that the soil characterization results from Cardno's (2021) investigation described in Section 3.2.4 are not shown on Figure 8-1 and were not used to determine the Site boundary; the results from Cardno's investigation are presented in Appendix F and figures in the DCAP. This section summarizes the information provided in the preceding sections to show how the Site geology, fill history, hydrogeology, and nature and extent of contamination in soil and groundwater will determine the design of remedial alternatives.

- The shallow saturated zone on the Property east of Federal Avenue generally consists of fine-grained soils and is characterized by silty sands, silts, peat, and minor amounts of coarser sand at depth. This portion of the Site was originally a marshy, low-lying area prior to development, accounting for the presence of subsurface peat.
- The area west of Federal Avenue consists primarily of filled materials; the fill materials emplaced to extend the shoreline to the west generally consist of silty sands and well-graded to poorly graded sands.
- Groundwater within the finer grained sediments east of Federal Avenue has a steeper hydraulic gradient than groundwater in the more permeable fill materials west of Federal Avenue.
- Groundwater flows from the east to the west across the Site. The groundwater surface approaches the land surface east and northeast of the Property, as shown by the presence of seeps along the base of the Terminal Avenue Overpass and near the railroad right-of-way. This surface discharge is partially due to the finer grained, lower permeability soils in this area that restrict groundwater flow and cause groundwater levels to rise until it starts discharging to the surface.

- The gradual filling and extension of the shoreline to the west of Federal Avenue has lengthened the groundwater flow path before it eventually discharges to Port Gardner Bay. The longer flow path has caused groundwater levels to rise in areas upgradient of the pre-development shoreline, which was located just west of Federal Avenue.
- TPH-D and TPH-O or oil hydrocarbons in soil dominate COCs on the Property and the area to the east, under the Terminal Avenue Overpass. These hydrocarbons are found at concentrations suggesting that they are present in the soil at residual saturation or as limited areas of LPH. This contamination beneath the Terminal Avenue Overpass may be an ongoing source for releases to groundwater and/or soil, and this area cannot be excavated or otherwise remediated due to the presence of the overpass structure and foundation.
- TPH-G in soil is primarily found near the former ADC garage area west of Federal Avenue.
- Residual concentrations of COCs in soil are also located beneath Former Everett Avenue and Federal Avenue.
- Hydrocarbons released to subsurface soils prior to extension of the predevelopment shoreline to its current location would have flowed downward through the soil to pool on the water table as it existed historically. As the water table rose due to extending the shoreline, at least a portion of these hydrocarbons would have been trapped below the rising water table in residual saturation.
- Groundwater flowing through the hydrocarbon-affected soils can dissolve the more soluble portions of the trapped hydrocarbons, causing these dissolved constituents to migrate downgradient, and resulting in increased average molecular weight of the hydrocarbons left behind.
- Dewatering for construction is meant to lower the water table to stabilize soils in an excavation. Lowering the water table can allow hydrocarbons trapped in the soil at concentrations exceeding residual saturation levels to pool and begin moving in the direction of the induced gradient toward the area being dewatered. This phenomenon was observed in the engineered fill in the former BNSF excavation, where LPH was observed a few months after dewatering by the City of Everett in 2012.
- The complete potential exposure pathways are:
  - **Soil:** direct exposure, volatilization to subsurface vapor, dissolution into groundwater, and contact with COC-affected soil in stormwater, surface water, and sediment;
  - **Groundwater:** volatilization from affected groundwater to subsurface vapors, transport of dissolved COCs in groundwater, and direct contact with or incidental ingestion of affected groundwater;
  - **Vapor**: inhalation by construction workers during subsurface construction work and potentially vapor intrusion into future buildings that may be constructed at the Site; and
  - **LNAPL:** ingestion or dermal contact.

Volatilization into soil vapor and then vapor intrusion into an occupied building is a potential route of exposure that may be applicable in the future. However, all existing buildings at the Site are above-grade buildings that are open or have well-ventilated crawlspaces, so at present there are no complete volatilization exposure routes. If new buildings are constructed within Site source areas, the possibility of future vapor intrusion would need to be considered and addressed.

Lastly, any remedial alternative that lowers the permeability of soil (through use of a barrier or low-permeability material such as controlled density fill) should account for the possibility of groundwater mounding on the upgradient side. This mounding could cause groundwater to flow onto the surface and may potentially cause LPH to seep to the surface, along with groundwater.

9 REMEDIAL ACTION OBJECTIVES

The RAOs are Site-specific goals established to protect human health and the environment and must be achieved by remedial alternatives considered for evaluation in the FFS. The RAOs provide a general framework, along with other requirements specified in the MTCA regulations, for developing and evaluating remedial action technologies and alternatives. The preliminary RAOs that have been identified for the FFS are:

- Prevent COCs from migrating off Site from source areas.
- Prevent contaminated soil containing concentrations of COCs above soil cleanup levels from becoming airborne or waterborne and impacting surface water or sediment in the East Waterway (via dust migration, leaching into soil, or stormwater runoff).
- Reduce the potential for COCs to leach from Site soil to groundwater.
- Remove LPH to the maximum extent practicable.
- Prevent future migration of residual LPH (after removal to the extent practicable) at the Site.
- Reduce the potential for the dissolved-phase groundwater plume to expand downgradient toward the East Waterway via diffuse groundwater flow or through utility corridors and discharge to surface water and sediment in the East Waterway.
- Prevent vapor intrusion into current or future buildings on the Site above indoor air cleanup levels from volatile COCs in soil and groundwater.
- Prevent direct human contact (dermal and incidental ingestion) and inhalation exposure to contaminated soil and groundwater above the cleanup levels.
- Attain cleanup standards in soil and groundwater by achieving cleanup levels at the applicable POCs within a reasonable restoration time frame and in accordance with MTCA regulations.

It is expected that cleanup levels for groundwater will be attained at an off-Property CPOC.

10 REMEDIATION CONSIDERATIONS

The remediation alternatives considered in the FFS must be designed to address applicable or relevant regulations and requirements as specified in the MTCA regulations. Additionally, there are several Site-specific factors that constrain and/or otherwise affect Site remediation. These considerations are described below.

10.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Several regulations will apply to Site remediation. The alternatives considered in the FFS must address these requirements. The applicable regulatory requirements are summarized in Sections 10.1.1 through 10.1.8.

10.1.1 MTCA REQUIREMENTS

The MTCA cleanup regulations provide that a cleanup action must comply with cleanup levels for identified COCs, POCs, and applicable or regulatory requirements, based on federal and state laws (WAC 173-340-710).

10.1.2 STATE ENVIRONMENTAL POLICY ACT

The Washington State Environmental Policy Act (SEPA) (RCW 43.21C), State implementing rules (WAC 197-11), and City of Everett regulations may apply to cleanup actions that may affect the environment. SEPA applies to cleanup actions that may affect the environment, and MTCA cleanup actions are not exempt from SEPA procedures. Ecology is required to complete a SEPA checklist to determine if a proposed cleanup action will or will not have a significant adverse impact on the environment. If Ecology determines that there is no significant impact, Ecology issues a Determination of Non-significance or a mitigated Determination of Non-significance with conditions.

10.1.3 CONSTRUCTION STORMWATER GENERAL PERMIT

A stormwater, grading, and drainage permit will be required prior to any earthwork that will result in excavation that is deeper than 3 feet and/or disturbs more than 100 cubic yards (CY) of soil. This permit will specify the excavation protection (shoring) methods and temporary erosion and sedimentation controls to be used during remedial actions.

10.1.4 OTHER POTENTIALLY APPLICABLE REGULATORY REQUIREMENTS

Other regulatory requirements must be considered in the selection and implementation of the cleanup action. MTCA requires the cleanup standards to be "at least as stringent as all applicable state and federal laws" (WAC 173-340-700[6][a]). Besides establishing minimum requirements for cleanup standards, applicable federal, state, and local laws and ordinances also may impose certain technical and procedural requirements for performing cleanup actions. These requirements are described in WAC 173-340-710.

10.1.4.1 National Recommended Water Quality Criteria

The National Recommended Water Quality Criteria (NRWQC) are federally promulgated water quality criteria. These standards are referenced in the MTCA regulations (WAC 173-340-730 [3][b]) as applicable federal standards and are based on human health. Of the Site COCs, NRWQC are listed only for benzene and total cPAHs. The NRWQC for these two COCs were considered for establishing the PCLs for groundwater at this Site. Other ARARs applicable to protection of surface water were identified in Section 5.2.2.2.

10.1.4.2 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act is codified at 25 United States Code (USC) 3001 through 3113 (43 CFR 10) and Washington's Indian Graves and Records Law (RCW 27.44). These statutes, or local variations, prohibit the destruction or removal of Native American cultural items and require written notification of inadvertent discovery to the appropriate agencies and Native American tribes. Because the general waterfront area has been occupied, or otherwise used, by Native American tribes, remediation activities could uncover artifacts. Requirements for these laws and regulations must be addressed as part of design and implementation of the selected Site remedy.

10.1.4.3 Archaeological Resources Protection Act

The Archaeological Resources Protection Act (16 USC 470aa et seq.) and the federal regulations issued pursuant to this law (43 CFR 7) are potentially applicable requirements. This federal program, and any similar state and/or local programs, set forth requirements that are triggered when archaeological resources are discovered. These requirements will apply only if archaeological items are discovered during implementation of the selected remedy.

10.1.4.4 Washington Dangerous Waste Regulations

The dangerous waste requirements (WAC 173-303) potentially apply to the identification, generation, accumulation, and transport of hazardous/dangerous wastes at the Site during remediation and monitoring. These standards are applicable to any soil or monitoring wastes that are taken off Site for disposal that have concentrations of COCs that exceed Washington Dangerous Waste criteria.

10.1.4.5 Washington Solid Waste Handling Standards

The solid waste management regulations (WAC 173-350) establish minimum standards for handling and disposal of solid waste. They are applicable for Site activities, including remediation and monitoring, that generate solid waste, the definition of which includes affected soils, affected groundwater, investigation-derived waste, construction and demolition wastes, and garbage. The standards require that solid waste be handled in a manner that does not pose a threat to human health or the environment, and that complies with local solid waste management rules and applicable water and air pollution controls.

10.1.5 WASHINGTON INDUSTRIAL SAFETY AND HEALTH ACT REGULATIONS

Cleanup activities will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17), the federal Occupational Safety and Health Act (29 CFR 1910 and 1926), the Hazardous Waste Operations and Emergency Response (HAZWOPER) regulations (29 CFR 1901.120), and Washington General Occupational Health Standards (WAC 296-62). These applicable regulations include requirements for worker protection from physical hazards (such as improper shoring, confined space entry, and equipment hazards), and protection from exposure to hazardous substances or other deleterious materials.

10.1.6 MONITORING WELL CONSTRUCTION, MAINTENANCE, AND DECOMMISSIONING

Ecology enforces rules for the construction, maintenance, and abandonment of monitoring and other types of wells in Washington (WAC 173-160), excluding injection wells. To conduct soil remediation, several existing monitoring wells will be abandoned, and new monitoring wells may be installed to monitor the groundwater contamination levels after completion of the Site cleanup action.

10.1.7 AIR QUALITY

For Site grading or excavation work that could generate dust, controls would need to be in place during construction (e.g., wetting or covering exposed soils and stockpiles), as necessary, to meet the substantive restrictions for off-Site transport of airborne particulates by the local agency (the Puget Sound Clean Air Agency).

10.1.8 SHORELINE MANAGEMENT

The Washington State Shoreline Management Act and the federal Coastal Zone Management Act are implemented through the City of Everett's Shoreline Master Program. These acts establish requirements for substantial development occurring within the waters of the State of Washington or within 200 feet of a shoreline. These requirements may be relevant to Site remediation, although most work would be performed more than 200 feet from the Port Gardner Bay shoreline. The cleanup action will be designed to comply with any applicable and substantive requirements under the City of Everett's Shoreline Master Program.

10.2 SITE-SPECIFIC CONSTRAINTS

Remediation alternatives for the Site were developed while considering the following Site-specific remediation constraints:

- **Terminal Avenue Overpass:** This overpass is within a City of Everett right-of-way and provides access to the Port of Everett, former KC, and BNSF properties. The project is limited by the overpass because contamination beneath and immediately adjacent to the structural features associated with the overpass (e.g., pilings/supports) cannot be safely accessed for removal by excavation, as there is significant potential for damage to the overpass structural footings and this area cannot be practicably remediated by other means.
- **City of Everett Lift Station #3:** The lift station is located at the east end of former Everett Avenue and northeast of the ADC Parcel. This lift station provides combined sanitary and stormwater sewer capacity; however, during large storms overflow from the lift station flows directly into Port Gardner Bay. The City of Everett requires access to this lift station for inspection of equipment, such as telemetry monitors, levels, and pumps, and for maintenance on a daily basis. For this reason, potential for removal of contamination below the access road is limited.
- **Aboveground and underground utilities:** Numerous critical utilities are located along Federal Avenue and the former Everett Avenue alignments, located both above and below the area of concern. These utilities include a 24-inch force main, two sanitary sewer lines, storm drain line, underground telephone line, and overhead electrical lines (Figure 2-16). Remediation activities within these areas are substantially limited because these services are required to keep local businesses operable.
- **KC Maintenance Building:** This building is located on the former KC property adjacent to the former Everett Avenue. Remediation in areas adjacent to the building are limited by this structure because contamination beneath the structure is not safely accessible for removal by excavation, as there is potential for damage to the slab/footings and for building settlement.
- **Surrounding property access:** Ongoing operations are occurring at several properties within or adjacent to the Site. Ongoing access is currently required for the Port of Everett, Dunlap Towing, and former KC properties. Maintaining access to local businesses for daily industrial activities will limit remediation efforts in some areas. Depending on the extent of contamination, excavation or construction areas will be limited to areas where access by construction equipment and personnel can be maintained while avoiding significant disturbance of business operations. Also, the project is limited to areas that are legally permissible to access.
- **Site conditions:** Existing Site conditions, such as the known high groundwater table or groundwater seepage from upgradient areas, may affect the maximum feasible depth of excavation. The high groundwater table or excessive seepage can affect the stability of excavation sidewalls and limit the safe depth of excavation. The high water table limited the safe depth of excavation and increased the volume of petroleum-impacted groundwater collected during the 2011–2012 excavation conducted in the area to the east of the Property.
- **Non-potable groundwater:** As noted in Section 5.2.2.1, groundwater present beneath the Site is not suitable for use as a source of potable water due to the proximity to Port Gardner Bay and the hydraulic connection between the groundwater and marine surface waters. The historic use of the area for disposal of refuse and very high potential to capture marine water from Port Gardner Bay preclude use of Site groundwater as a potable water source.
- **Off-property constituents:** The Site consists of the Property owned by ExxonMobil and ADC as well as several properties owned by other parties. The processing area that was leased by ADC is located west of Federal Avenue on property owned by the Port of Everett. Since Site constituents are present in the inaccessible areas beyond the boundary of the properties owned by ExxonMobil and ADC, an off-property CPOC is necessary for the Site because it is not practicable to meet cleanup levels throughout the entire Site within a reasonable restoration time frame.

11 REMEDIATION TECHNOLOGIES

A reasonable number and type of potentially applicable remediation technologies were evaluated in a feasibility study for this Site, which was completed in 1998 (Exponent, 1998). Based on the previous work, potentially applicable technologies were considered and presented in the FFS Work Plan (AMEC, 2013). A limited number of additional remediation technologies have been considered for this FFS. Based on the technology evaluations completed to date and discussion with Ecology, this FFS will not repeat technology screening. Instead, this FFS will proceed directly to development and evaluation of feasible remediation alternatives. Consistent with discussions and meetings with Ecology, the FFS will focus on evaluating a select number of remediation alternatives that are considered potentially feasible to address petroleum hydrocarbon impacts in soil and groundwater at the Site. This section provides a general description of the remediation technologies that have been included in the remediation alternatives that are developed and evaluated in Sections 12 and 13.

11.1 INSTITUTIONAL CONTROLS

Institutional controls limit access or use of the Site to reduce the potential for applicable receptors to be exposed to Site COCs. Institutional controls applicable to the Site include requirements to provide basic information/notification and/or measures to inform the public and those performing work within the Site about potential risks from Site COCs. Institutional controls, such as restrictive covenants and/or security systems, will be incorporated into the remediation alternatives as appropriate to preclude Site uses or activities with the potential to expose receptors to Site COCs, to restrict inadvertent access by the general public, and to mitigate any potential for vapor intrusion into potential future buildings. The technologies considered for institutional controls include perimeter fencing, signage on the fence, and restrictive covenants.

11.2 EXCAVATION AND OFF-SITE DISPOSAL

This remediation technology includes excavation of contaminated soil, characterization for waste disposal, transportation, and off-Site disposal within a permitted landfill or other appropriate disposal or treatment facility. Excavated soil would be replaced by importing and placing clean fill or utilizing treated soil generated by in situ soil stabilization. Confirmation samples are typically collected from excavations to verify removal of affected soil. This technology can be implemented to remove all affected soil or to remove areas of LNAPL-impacted soils or the known source area. This remediation method is widely used and results in permanent removal of affected soil from the Site. Contaminated soil is typically placed within an engineered landfill; contaminants are not permanently destroyed by this remediation technology.

11.3 LNAPL RECOVERY

LNAPL recovery is a technology that removes mobile, free-phase petroleum hydrocarbons that float on the groundwater surface. Recovery typically utilizes a hydraulic recovery system (such as pumping) or a skimming system to remove the mobile LNAPL. LNAPL recovery systems can be implemented using wells or using recovery trenches. For both such systems, LNAPL must be removed either continuously or periodically, with either treatment or disposal of recovered fluids, which normally include water and petroleum hydrocarbons.

LNAPL recovery is not considered an applicable technology for this Site. As noted in Section 8, LNAPL present at the Site is immobile under existing conditions. The oil-recovery trench previously constructed has not been effective in recovering LNAPL. An aggressive dewatering program conducted by the City of Everett for repair of the combined sewer overflow line did recover some LNAPL, but the volume of LNAPL recovered was only 1.6% of the total volume of groundwater recovered, indicating that dewatering was a highly inefficient means to remove LNAPL. Aggressive dewatering was also performed by the City of Everett for installation of the sewer force main in 2012. Recovered groundwater did not require pretreatment prior to discharge to the publicly owned treatment works, indicating that LNAPL recovery was minimal. Our previous experience in the vicinity of the Site indicates that LNAPL recovery has been ineffective and inefficient; therefore, LNAPL recovery will not be included in the remediation alternatives considered in this FFS.

11.4 NATURAL ATTENUATION

Natural attenuation is a remediation technology that relies on natural processes—including biodegradation by indigenous organisms—to degrade contaminants that have been released to soil and groundwater. Monitored natural attenuation (MNA) has been proven at many petroleum hydrocarbon sites as an effective technology to retard, disperse, and/or degrade groundwater plume contaminants in combination with appropriate monitoring to verify its effectiveness (Ecology, 2005). Natural attenuation by indigenous organisms has also been found to be effective in remediating petroleum hydrocarbon source areas (ITRC, 2018). Ecology allows the use of natural attenuation when source removal or source control has been implemented to the extent practicable, contaminants left on Site do not pose an unacceptable threat to human health or the environment, there is evidence of natural or chemical biodegradation, and appropriate monitoring is conducted [WAC 173-340-370(7)]. Natural attenuation is considered an appropriate technology for potential implementation at the Site to address groundwater and source area remediation.

11.4.1 MONITORED NATURAL ATTENUATION

This technology is especially appropriate for petroleum hydrocarbon plumes. The depositional history of the shallow subsurface in the vicinity of the Property has resulted in a substantial level of natural organic materials in the subsurface. The high organic content of Site soils increases retardation of groundwater contaminants. The natural soil conditions at the Site are expected to provide a favorable environment for effective natural attenuation of organic constituents present in affected Site groundwater. The limited extent of the downgradient dissolved-phase plume indicates that natural attenuation is active at the Site. The Site will remain capped or covered following source area removal to limit infiltration and potential human or environmental exposures.

A groundwater monitoring well network and monitoring program are typically associated with MNA to ensure that COPC degradation is effective and that cleanup levels are attained. Ecology guidance provides technical recommendations regarding the types of monitoring parameters and analyses useful for evaluating the effectiveness of MNA (Ecology, 2005). These recommendations will be incorporated into remediation alternatives that incorporate MNA as a technology.

11.4.2 MONITORED NATURAL SOURCE ZONE ATTENUATION

Natural source zone attenuation is a relatively new remediation approach which relies upon naturally occurring processes, such as dissolution, biodegradation, and degradation by-product volatilization, to reduce the mass of LNAPL and Site COCs in subsurface source areas (ITRC, 2009, 2018). Recently developed techniques have been applied to LNAPL source areas to confirm attenuation and to assess attenuation rates. Historically, the rate of LNAPL attenuation within source zones was thought to be controlled solely by electron-acceptor-mediated biodegradation, with a degradation rate less than 50 gallons of hydrocarbon per acre per year. However, recent measurements of attenuation of source area LNAPL suggest that source area depletion also occurs by anaerobic biodegradation and vapor transport processes. Reported depletion rates for petroleum hydrocarbons range from 300 to 7,700 gallons per acre per year (Garg et al., 2017). It has also been found that the presence of groundwater in conjunction with LNAPL has a substantial role in natural attenuation processes (ITRC, 2009).

Depletion rates for source zone attenuation can be used to compare estimated remediation time frames for this technology. The depletion rate is generally determined by estimating the LNAPL flux associated with the following three mechanisms (Mackay et al., 2018):

1. *Dissolution*: Estimate the mass flux of dissolved hydrocarbon to groundwater downgradient of the source area.
2. *Biodegradation*: Estimate the LNAPL depletion associated with both aerobic (i.e., electron-acceptor-mediated) and anaerobic (i.e., electron-donor-mediated) biodegradation using appropriate characterization data, stoichiometry, and local groundwater chemistry data.

3. *Vapor transport*: Estimate LNAPL depletion due to volatilization by monitoring the release of gaseous biodegradation by-products (e.g., carbon dioxide and methane) within or above the source zone and estimating various properties of the media to estimate the volatilization rate for the entire source zone.

Regulatory policies regarding source zone attenuation have been changing in many states. Natural source zone attenuation has been used as an acceptable remedial approach at sites in several states, such as the Guadalupe Oil Field in California (ITRC, 2009), the Bemidji site in Minnesota (Essaid et al., 2011), and the BNSF Midland Market Railyard in Oregon (Oregon DEQ, 2014).

Natural source zone attenuation is considered an appropriate remedial technology for the Site for several reasons. As discussed previously, much of the LNAPL and affected soil within the Site source areas is below the water table, a condition that supports natural source zone attenuation. The potential rate of LNAPL removal associated with natural source zone attenuation reported in previous studies (up to thousands of gallons per acre per year) exceeds the volume of LNAPL recovered historically from remediation activities conducted at the Site, as noted in Table 6-2. Higher removal rates were only achieved during the CSO dewatering work conducted in 1996. Site TPH and LNAPL have been highly weathered, likely due to natural attenuation processes that are active at the site (Section 6.4). Additionally, a substantial portion of the Site LNAPL source area is inaccessible and cannot be addressed by other remediation technologies. Natural source zone attenuation is a newly recognized remediation technology that may be effective for remediation of Site contaminants from impacted areas, including the inaccessible areas. A monitoring program is typically associated with natural source zone attenuation to verify that natural source zone remediation is effective. This technology is considered an essential tool for Site remediation and will be incorporated into remediation alternatives as appropriate.

11.5 SUBSURFACE BARRIER WALL

Low-permeability barrier walls can be used to completely or partially contain source areas or areas with high levels of contamination. These barriers have been proven to be highly effective for isolating and containing both contaminated soil and contaminated groundwater. Shallow barrier walls, which would most likely be applicable to the Site, are typically constructed of a soil-bentonite mixture using the slurry wall technique. The slurry wall technique involves excavation of a trench and filling the trench with bentonite and water slurry to maintain an open excavation. The excavated soil is stockpiled alongside the trench, where it is mixed with bentonite to achieve the desired permeability. The amended backfill is then placed back into the trench as backfill, displacing the bentonite slurry and forming the barrier wall. Conventional soil-bentonite slurry walls can be readily completed to depths of about 50 feet bgs and are capable of achieving a hydraulic conductivity on the order of 10^{-7} cm/sec, which is approximately two orders of magnitude lower than the hydraulic conductivity of Site soils. Barrier walls may be keyed into a lower confining soil layer, or they may be constructed as a “hanging” wall when no lower confining unit is present. Both types of barrier walls can be effective for containing contaminated soil and/or groundwater.

11.6 PERMEABLE REACTIVE BARRIER

Permeable reactive barriers (PRBs) are used to remediate dissolved groundwater contaminants as groundwater flows through the reactive medium. They are typically constructed using reactive media that interact with groundwater contaminants that flow through the barrier wall, with the PRB medium selected to address the specific contaminants present at a given site. For TPH, an activated carbon or amended organoclay medium may be used, as these materials will adsorb dissolved TPH. The PRB medium must have a permeability higher than the surrounding saturated soils. A PRB may be used in conjunction with a low-permeability barrier wall in a “funnel-and-gate” arrangement to direct groundwater flow through the PRB. Funnel-and-gate designs require proper design to control excessive mounding on the upgradient side. PRBs are designed to provide a minimum contact time and adsorption capacity for the contaminants being addressed. Depending on the design of the PRB and the mass flux of the contaminants into the PRB, the medium may need to be replaced to address all of the dissolved-phase contamination. The medium in the PRB could also support biological activity, which would degrade adsorbed TPH over time.

11.7 IN SITU SOIL STABILIZATION

In situ soil stabilization (ISS) is accomplished by mixing a stabilization additive (typically Portland cement) to stabilize the soil and bind contaminants. Portland cement, and/or other pozzolanic materials, tightly bind to most inorganic contaminants and effectively immobilize them, thereby eliminating migration and direct exposure risks. The stabilized soil is usually friable after stabilization but has good bearing capacity and reduced permeability. For organic contaminants, such as TPH or creosote, this technology can be effective in reducing mobility if an additive, such as bentonite or organophilic clay, is added. Mixing the additives with the soil results in a volume increase (which may be in the range of 20–30%); the excess soil is typically removed from the Site to maintain the existing grade. If this technology is combined with excavation of affected soil, the stabilized soil may be used to backfill portions of the Site that have been excavated.

Soil mixing can be accomplished in situ by several methods, including use of modified augers, proprietary soil mixing heads, or conventional excavator buckets. Augers and mixing heads provide more thorough mixing than can be accomplished using a conventional excavator bucket. Thorough mixing also homogenizes the treated soil column, distributing COCs throughout the treated volume. Treatability testing is required to determine the appropriate amendment ratios. Stabilized materials are usually covered with clean soil or pavement to limit infiltration and erosion. This technology has been demonstrated to be effective for hydrocarbon sites. If treated soil is removed in the future to support development after remediation is complete, the excavated soil would not require management or disposal as dangerous waste but would require management and disposal as solid waste.

Advantages of ISS include decreased mobility of COCs due to binding of stabilized soils, decreased concentrations of COCs in treated soil due to mixing into the soil column, and slightly reduced permeability of treated soils, thus reducing the potential for migration. Additionally, site-specific admixtures can be developed and evaluated to achieve desired results. For example, increasing bentonite along the perimeter could further reduce permeability, resulting in decreased groundwater flow through the treated area. The mixing and stabilization of affected soils would also make it unlikely that vapor intrusion barriers would be necessary for future development over treated soils.

Disadvantages of ISS include the potential for excessive reduction in the permeability of treated soils (increasing the likelihood of surface seepage under some conditions) and the presence of residual COCs that remain in place after treatment. In addition, the stabilized soils would be considered solid waste by Ecology if they are excavated in the future, such as for utility or redevelopment work, requiring additional costs for handling and disposal. ISS would also hinder or inhibit the natural biodegradation of Site contaminants within the stabilized areas that is occurring under current site conditions (ITRC, 2011). This inhibition of natural biodegradation would reduce the degradation rate of COCs at the Site and extend the restoration time frame. Another disadvantage is that implementation of ISS requires a second mobilization for construction activities using specialized equipment to perform the work.

12 DEVELOPMENT OF REMEDIATION ALTERNATIVES

The objective of the FFS is to provide sufficient information to identify a preferred, comprehensive Site remediation alternative that adequately addresses Site soil and groundwater contamination and the relevant exposure pathways identified in Section 8.3. The alternatives developed for the FFS have been designed such that they can be implemented within a reasonable time frame and within the existing Site constraints, including the presence of affected media in inaccessible areas beneath and adjacent to the Terminal Avenue Overpass and along the utility rights-of-way (Section 10.2). Two groups of remediation alternatives have been developed and evaluated.

The first group of alternatives has been designed to address affected soil and groundwater within the source areas (Figure 12-1). *Source areas* are defined as those areas where soils affected by the operations conducted by ExxonMobil and ADC significantly exceed PCLs. Within the source areas are more limited areas defined by the presence of LNAPL-affected soil, where LNAPL has been observed or where concentrations of petroleum hydrocarbons are high enough to suggest that the hydrocarbons are present in residual saturation (“LNAPL Areas”). The LNAPL Areas occur in two portions of the Site: one includes the majority of the Property, and the other is located west of Federal Avenue on property owned by the Port of Everett in the vicinity of the former ADC garage (Figure 12-1). Figure 12-1 shows the approximate footprint of the LNAPL Area on the Port of Everett property as delineated by Cardno’s (2021) investigation, as described in Section 3.2.4. Note, however, that the soil characterization results shown by symbols on Figure 12-1 do not show the sampling locations or incorporate the analytical results from Cardno’s (2021) investigation. The boring locations and detailed analytical results from Cardno’s investigation are presented in Appendix F and figures in the DCAP.

The *inaccessible source areas* (or inaccessible areas) are areas where soils affected by the operations conducted by ExxonMobil and ADC may exceed PCLs, but where access is not practicable for remediation construction activities. These areas include the areas beneath and adjacent to the Terminal Avenue Overpass, adjacent to the neighboring KC building, and along the utility rights of way on Federal Avenue and former Everett Avenue (Figure 12-1).

The second group of alternatives has been designed to address the areas of affected groundwater extending downgradient from the source areas, with dissolved-phase COC concentrations that are significantly lower than the COC concentrations found within the source areas. As noted in Section 6, concentrations of most of the COCs in groundwater west of Federal Avenue are lower than the PCLs. Both groups of remediation alternatives were developed and evaluated separately to provide the information necessary to identify the preferred alternative from each of the two groups (source area and affected groundwater).

The final, comprehensive Site alternative will combine the preferred alternative from each of the two groups so that both the source areas and affected groundwater are addressed effectively. All alternatives being evaluated meet both the MTCA requirements and ARARs. The recommended Site remediation alternative is presented in Section 14.

Using the remediation technologies identified in Section 11, three remediation alternatives were developed to address affected soil and groundwater within the source areas, and two alternatives were developed to address dissolved-phase COCs in downgradient groundwater.

The FFS will evaluate the following three source area remediation alternatives:

- **Source Area Alternative 1: LNAPL Area Excavation and Natural Source Zone Attenuation.** Excavation of accessible source area soils impacted by LNAPL and/or residual LNAPL saturation would occur to the maximum extent practicable under this alternative. Remaining source area soil exceeding PCLs and impacted portions of the inaccessible areas would be addressed by natural source zone attenuation.
- **Source Area Alternative 2: LNAPL Area Excavation and Source Area Stabilization.** This alternative would combine excavation of accessible source area soils impacted by LNAPL and/or residual LNAPL saturation to the maximum extent practicable, as described for Source Area Alternative 1, with in situ soil stabilization of affected soils exceeding PCLs within the source areas. Affected soils within the source areas would be treated

using an admixture of Portland cement and bentonite to immobilize remaining COCs and limit potential migration risks. Impacted areas within inaccessible areas would be addressed by natural source zone attenuation.

- **Source Area Alternative 3: Source Area Excavation.** This alternative consists of comprehensive excavation of accessible affected soils exceeding PCLs in the source areas to the maximum extent practicable. As noted for Alternatives 1 and 2, impacted portions of the inaccessible areas would be addressed by natural source zone attenuation.

The three remediation alternatives for the source areas all include institutional controls as appropriate to achieve remediation objectives, particularly for the inaccessible areas. In these areas, it is impracticable to treat or remove affected soil and groundwater, which would remain in place for some time. In addition, isolated exceedances of certain COCs outside the source areas and inaccessible areas do not pose unreasonable risk as they are only slightly above the PCLs and are already contained beneath existing pavement. The source area remediation alternatives are described in more detail in Section 12.1.

The FFS evaluated two remediation alternatives that focus on remediation of the dissolved groundwater plume downgradient of the source areas:

- **Groundwater Alternative 1: Monitored Natural Attenuation.** Groundwater remediation based on monitoring attenuation of groundwater COCs by intrinsic, natural processes.
- **Groundwater Alternative 2: Funnel and Gate.** Groundwater remediation using a PRB and monitoring the attenuation of groundwater COCs.

The two groundwater alternatives would address dissolved COCs and would include institutional controls and a groundwater monitoring program to fully achieve remediation objectives. The two groundwater alternatives are described in more detail in Section 12.2.

12.1 SOURCE AREA REMEDIATION ALTERNATIVES

The three remediation alternatives developed for the source areas at the Site are described in Sections 12.1.1 through 12.1.3. The two defined source areas for the Site described above are generally located (1) on the Property and (2) in the vicinity of the former ADC garage on Port of Everett property immediately west of Federal Avenue. The two source areas include areas where free LNAPL or LNAPL at concentrations at or above residual saturation is present. These areas are referred to as *LNAPL areas* and are shown on Figure 12-1. Figure 12-1 also shows the soil sampling locations where each of the Site COCs has exceeded the PCLs and demonstrates that the source areas and the LNAPL areas effectively cover the areas impacted by these constituents. Figures 12-2 through 12-4 show schematic drawings of the three source area alternatives. The areas to be addressed by each of the source area remedial alternatives effectively cover the areas with soils affected by petroleum hydrocarbons.

The source area and excavation areas shown on Figures 12-1 through 12-4 incorporate the footprint of the LNAPL Area on the Port of Everett property delineated by Cardno (2021), as described in Section 3.2.4. Note, however, that the soil characterization results shown by symbols on Figures 12-1 through 12-4 do not show the sampling locations or incorporate the analytical results from Cardno's (2021) investigation. The boring locations and detailed analytical results from Cardno's investigation are presented in Appendix F and figures in the DCAP.

The two defined source areas can be practicably remediated and include most of the areas with the highest concentrations of COCs and/or LNAPL. The inaccessible areas cannot be feasibly remediated by active measures, as any remediation would significantly impact existing infrastructure and vehicular traffic while creating undue health and safety risks for workers involved in the remediation effort, as well as the general public. In addition, serious and expansive structural concerns would have to be addressed prior to performing work adjacent to structures in these areas.

For conceptual design of the source area alternatives, it was assumed that any excavation must be set back from the base of the Terminal Avenue overpass a sufficient distance to achieve a one-to-one horizontal-to-vertical (1H:1V) ratio to minimize the potential for adverse impacts to the overpass. For example, if the excavation on the southeast side of the property adjacent to the overpass is expected to be 10 feet deep, the edge of the excavation would be set back 10 feet from the overpass. The southeast edge of the excavation would also be protected using piling. Installation of protective measures such as shoring may allow for excavation closer to the overpass; however, further geotechnical investigation and testing would be necessary to determine an adequate approach to safely conduct the excavation. The contamination present beneath the utility corridors (former Everett Avenue and Federal Avenue) cannot be directly addressed due to the presence of utilities (both underground and overhead) and because it is the sole source of access for several active businesses. For all three alternatives, contamination remaining in these inaccessible areas would be remediated by natural source zone attenuation processes.

12.1.1 SOURCE AREA ALTERNATIVE 1: LNAPL AREA EXCAVATION AND NATURAL SOURCE ZONE ATTENUATION

This alternative entails removal of accessible soils contaminated with LNAPL or residual LNAPL saturation within the two defined source areas. Remaining COCs exceeding PCLs within source areas and inaccessible areas would be remediated by natural source zone attenuation. In this alternative, the most highly affected portions of the accessible source areas would be excavated for off-site disposal. The excavation areas shown on Figure 12-2 are based on currently available analytical data. The source area and excavation areas shown on Figure 12-2 incorporate the approximate footprint of the LNAPL area on the Port of Everett property delineated by Cardno (2021), as described in Section 3.2.4. Note, however, that the soil characterization results shown by symbols on Figure 12-2 do not show the sampling locations or incorporate the analytical results from Cardno's investigation. The results from Cardno's investigation are presented in Appendix F and figures in the DCAP.

Based on Site investigation data, five different excavation areas have been defined with different excavation depths. The excavation depths are based on Site investigation boring logs, which are included in Appendix B, and the delineation by Cardno (2021) presented in Appendix F and figures in the DCAP. For the excavations on the Property, additional site characterization data may be collected for final design if this alternative is selected for implementation. The areas beneath the Terminal Avenue Overpass and areas within a 1H:1V setback from the overpass are not included for excavation under this remedial alternative due to potential structural issues for the overpass. The excavation areas shown on Figure 12-2 on the Property may change during final design, based on additional design data collected and/or provisions to protect the structural integrity of the overpass and adjacent roadways; the excavation area shown on Figure 12-2 on the Port of Everett property has been delineated by Cardno (2021) and would not change during final design if this alternative is selected for implementation.

For conceptual design of this alternative, it was assumed that remedial activities would be conducted in the following sequence:

1. Excavate soils containing LNAPL and/or residual LNAPL saturation.
2. Backfill the excavation.
3. Pave/cap and restore the final surface.
4. Implement natural source zone attenuation monitoring for the remaining source area soils and the inaccessible areas.

For the FFS, it was assumed that the excavated soil would be disposed of off Site as impacted soil.

It was assumed that the LNAPL area excavation would be conducted as open excavations in the areas shown on Figure 12-2. To the maximum extent practicable, excavation would be performed without groundwater removal. Temporary shoring using sheet piling was assumed to allow excavation to the depths shown on Figure 12-2 and is necessary to protect the City of Everett Force Main sewer to the north, the Overpass to the east, and Federal Avenue to the west (i.e., the inaccessible areas). The temporary shoring would be removed upon completion to allow normal groundwater flow. For excavation areas not along public rights-of-way, the perimeter of the excavation would be sloped at an angle determined by a competent person based on results of soil testing and analysis. For conceptual design of this alternative, it was assumed that the side slopes would be sloped at a 1:1 ratio.

Figure 12-2 shows the approximate limits of the side-slope excavations and shoring used for conceptual design and cost estimates. Final shoring and sloping plans and requirements will be presented in the Engineering Design Report (EDR) to be prepared later. For this alternative, it was assumed that approximately 880 linear feet of shoring along public rights-of-way would be needed to the approximate depth of 30 feet, representing approximately 26,200 vertical square feet of sheet pile shoring. The temporary shoring would be removed upon completion to allow normal groundwater flow. Side-slope soils excavated along boundaries that are not expected to exceed PCLs were assumed to be reused as backfill. Side-slope soils excavated along boundaries expected to exceed PCLs were assumed to be disposed with LNAPL-impacted soil.

Excavation will be performed as dredging, with minimal groundwater removal. Groundwater will be removed if necessary to achieve the following objectives: (1) prevent groundwater from overtopping the excavation, and (2) remove LNAPL from groundwater within the excavation. LNAPL may be removed from the surface of the groundwater within the excavation as it is performed using methods such as skimming from the water surface using a vacuum truck or using absorbent booms/pads. Due to the depth to groundwater in the excavation areas (generally 2-5 feet bgs), groundwater recovery to prevent groundwater from overtopping the excavation will likely not be necessary. LNAPL will be removed from the surface of groundwater within the excavation prior to placement of backfill. Recovered groundwater will either be treated on site and discharged to the City of Everett publicly owned treatment works or temporarily stored in on-site tanks for off-site disposal. Final dewatering plans and requirements will be presented in the EDR.

The LNAPL Area excavation is expected to generate approximately 31,000 tons of impacted soil, which would be transported to an off-site landfill for disposal. Due to the potential for mobilization of LNAPL from inaccessible areas during excavation, provisions would be needed for LNAPL recovery and disposal during the excavation work. Based on past experience during the interim action to the east of the Property, it was assumed that approximately 1,000 gallons of LNAPL may be recovered during this excavation. It was assumed that the recovered LNAPL would be transported to a commercial facility for disposal.

It was assumed that the excavations would be left open and undisturbed for two to three days after completing excavation work to allow LNAPL that might have been mobilized due to excavation activities to collect and be recovered prior to commencing backfill. The conceptual design for this alternative assumes that the excavations would be backfilled with crushed rock. The backfill material placed below the water table was assumed to be similar to City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction ("Seattle Standard"; City of Seattle, 2017) Mineral Aggregate Type 13, and the backfill material placed above the water table to within 10 inches from the finish grade was assumed to be a finer crushed rock, such as Seattle Standard Mineral Aggregate Type 17. Although low concentrations of dissolved-phase COCs will remain in groundwater within the excavation areas, recent groundwater sampling of source area wells indicates that these low COC concentrations will not cause any significant contamination of backfill material. It was assumed that a 6-inch-thick layer of pavement subgrade would be placed above the crushed rock backfill, followed by 4 inches of asphalt pavement. The paved surface would be graded to restore current drainage patterns. The paved surface would also serve as a protective cap. These backfill specifications were used for costing purposes; the final backfill material and specifications will be presented in the EDR.

Under this alternative, impacted soils would remain in the inaccessible areas and in the source areas beyond where soils with LNAPL and/or residual LNAPL saturation were removed. The weathered LPH currently present at the Site preferentially adsorbs to peat, wood waste, and other organic constituents present in the subsurface, which limits the mobility of LPH during natural source zone attenuation. Therefore, the restoration time for this alternative is expected to be the time required for LNAPL within these areas to become sufficiently weathered so it is permanently immobile (i.e., so that LNAPL cannot be mobilized due to excavation or induced changes in the water table).

The inaccessible source areas would be remediated by natural source zone attenuation. The COC degradation rate would be determined by measuring the gaseous release of carbon dioxide, methane, and other biodegradation by-products from the vadose zone. The natural source zone attenuation rate would be monitored at four different locations (plus one duplicate at one location) to produce an average value for the entire site. It was assumed that the natural source zone attenuation rate would be monitored annually for the first 5 years after active remediation, and then biannually for the following 20 years. The natural source zone attenuation rate would be used to estimate the quantity of LNAPL remaining in inaccessible areas, and the restoration time for the site. Natural source zone attenuation monitoring methods would not involve significant ground disturbance, therefore would be feasible in most inaccessible areas.

Institutional controls would supplement active remediation performed under Source Area Alternative 1 so that the alternative is protective of human health and the environment. Environmental covenants would establish requirements for soil management, groundwater recovery or use, and building construction conducted over the source areas within the Site. The environmental covenants would address the Property and the portions of the Site located on the Port of Everett and KC properties where soil or groundwater exceeding PCLs would remain. Landowners for these properties will be consulted to obtain their consent to proposed environmental covenants on their properties as part of the DCAP. The City of Everett will also be consulted to ensure proposed environmental covenants are consistent with current and future land-use plans.

Additionally, risk management planning has been included in this alternative to mitigate potential future safety risks that Site COCs may present to workers (either public works or private contractors) conducting subsurface work within or adjacent to the inaccessible areas (Federal Avenue, former Everett Avenue, and the overpass) where COCs may remain in place. Work conducted within these areas also may result in recovery of impacted soil, impacted groundwater, or LNAPL. ExxonMobil/ADC would prepare and implement a Risk Management Plan (RMP) that would establish procedures and plans to maintain worker safety and establish protocols for proper management and disposal of media affected by LNAPL and other Site COCs in these areas. The RMP would establish a general framework for third parties performing work to mitigate risks in a manner appropriate for the specific work to be performed.

Institutional controls would be implemented to achieve the following objectives:

- Limit future use of the Property to industrial or commercial uses.
- Prohibit recovery and use of groundwater from the Site unless it is adequately treated.
- Require appropriate management of soils and groundwater recovered from the areas within the two defined Site source areas that were not excavated under this alternative. Excavated soils and groundwater from possible future subsurface construction work must be managed as waste and require treatment or disposal in accordance with solid and dangerous waste regulations.
- Require appropriate health and safety plans for any subsurface work and require appropriate training for construction workers conducting subsurface work within the two defined source areas and portions of the plume where cleanup levels are exceeded.
- Require permanent buildings constructed within the source areas to incorporate vapor barriers to limit potential migration of affected soil vapor into buildings.
- Require that soil vapor discharges not cause violations of applicable ambient air quality standards for Site COCs.

Institutional controls would also include access agreements with neighboring landowners as appropriate to allow access to and maintenance of monitoring wells included in the long-term monitoring program.

The restoration time frame for this alternative is expected to be determined by the COC degradation rate in the inaccessible areas resulting from natural source zone attenuation. The restoration time frame is estimated to be either the time required for inaccessible areas to be degraded to PCLs or the time required for residual COCs within inaccessible areas to become sufficiently degraded so that remaining Site constituents are permanently immobile (i.e., so that COCs cannot be mobilized due to induced changes in the water table or excavation at or near the impacted location). It is difficult to estimate how much time would be required to achieve this level of weathering or degradation. For this FFS, it has been assumed that it would occur within 50 years, considering that storage and transfer of petroleum and petroleum products began as early as 1920, and LNAPL is largely immobile under existing conditions.

12.1.2 SOURCE AREA ALTERNATIVE 2: LNAPL AREA EXCAVATION AND SOURCE AREA STABILIZATION

This alternative includes removal of soils impacted by LNAPL and/or residual LNAPL saturation within the LNAPL Areas combined with ISS for remaining accessible source area soils that exceed PCLs. The COCs remaining within the inaccessible areas would be remediated by natural source zone attenuation. The soil excavation areas in this alternative are identical to those for Alternative 1. The most highly affected portions of the source areas would be excavated, and COCs in remaining source area soils would be treated using ISS to reduce mobility under this alternative. As described for Alternative 1, there are five excavation areas with different excavation depths. The excavation depths are based on the boring logs from Site characterization, which are included in Appendix B, except for the excavation on the Port of Everett property, which is based on Cardno's (2021) excavation area delineation presented in Appendix F and figures in the DCAP. The excavation assumptions described for Alternative 1 in Section 12.1.1 were used for excavation design for this alternative. The remaining impacted soil within the defined source areas would be remediated using ISS.

The areas shown on Figure 12-3 were used for conceptual design of this alternative. The source area and excavation areas shown on Figure 12-3 incorporate the footprint of the LNAPL area on the Port of Everett property delineated by Cardno (2021), as described in Section 3.2.4. Note, however, that the soil characterization results shown by symbols on Figure 12-3 do not show the sampling locations or incorporate the analytical results from Cardno's investigation. The results from Cardno's investigation are presented in Appendix F and figures in the DCAP. Additional characterization data may be collected for final design on the ExxonMobil/ADC Property if this alternative is selected for implementation; the excavation area shown on Figure 12-3 for the Port of Everett property has been delineated by Cardno (2021) and would not change during final design if this alternative is selected for implementation. The areas beneath and within a 1H:1V setback from the Terminal Avenue Overpass were not included for excavation under this remedial alternative due to potential structural issues for the overpass, as described in Section 12.1.1.

For conceptual design of this alternative, it was assumed that remediation activities would be conducted in the following sequence:

1 excavation of LNAPL Areas;
2. ISS of impacted soil in the source area;
3. backfilling the excavation;
4. placement of surface pavement;
5. final work area restoration; and,
6. monitoring inaccessible areas for natural source zone attenuation.

For the FFS, it was assumed that LNAPL area soil would be excavated in open excavations. Figure 12-3 shows the approximate limits of the side slope excavations used for the conceptual design and cost estimate. Final shoring and sloping plans and requirements will be presented in the EDR. The conceptual design for excavation, soil disposal, groundwater management, and LNAPL recovery under this alternative is the same as described in Section 12.1.1 for Source Area Alternative 1.

During the two- to three-day period when the excavation would be open and left undisturbed, ISS of soil outside the source area excavations would occur. For conceptual design of ISS for this alternative, it was assumed that stabilization would extend to a depth of 10 feet bgs and that a stabilization recipe of 10% dry weight Portland cement and 1% dry weight bentonite mixed with the Site soils would be used. The total amount of bentonite to be added is estimated at 58 tons, and the quantity of Portland cement is estimated to be 580 tons for conceptual design of this alternative. For final design, treatability testing would be performed to determine the appropriate stabilization recipe to achieve effective stabilization and immobilization of COCs, the appropriate swell volume for Site soils, and the curing curve (for quality control purposes). It was also assumed that a specially designed, proprietary mixing head and admixture feed equipment would be used to inject and mix the amendments in situ.

Stabilization of the impacted source area soil is expected to cause soil expansion. For conceptual design, it was assumed that the stabilized soil volume would expand vertically by 3 feet, which corresponds to 1,000 CY of stabilized soil. It was assumed that any stabilized soil in excess of what is required to maintain the existing grade would be placed within the excavated LNAPL Areas, thereby reducing backfill requirements.

Following implementation and curing of soil stabilization, the excavations would be backfilled using the excess volume of stabilized soil and crushed rock. It was assumed that all of the 1,000 CY of the excess stabilized soil would be used as backfill, and 29,000 tons of imported crushed rock would be required to backfill the remaining excavation areas. Excavation backfill material, subgrade placement, and asphalt surface would be the same as described in Section 12.1.1 for Alternative 1. The final backfill material and specifications will be presented in the EDR. Areas remediated by ISS would be graded and paved as described for the excavation areas. The paved surface would also serve as a protective cap.

Inaccessible source areas would be remediated by natural source zone attenuation, as described in Section 12.1.1 for Alternative 1.

Institutional controls would supplement the active remediation performed under Source Area Alternative 2 so that the alternative is protective of human health and the environment. Environmental covenants would be used to establish requirements for soil management, groundwater recovery or use, and building construction conducted over the source areas within the Site. The environmental covenants would address the Property and the portions of the Site located on the Port of Everett and KC properties where soil or groundwater exceeding PCLs would remain, as described for Source Area Alternative 1 in Section 12.1.1. The RMP described in Section 12.1.1 for Alternative 1 would also be included in this alternative to ensure the alternative is protective of workers conducting subsurface work on the adjacent areas.

Institutional controls would be implemented to achieve the following objectives:

- Limit future use of the Property to industrial or commercial uses.
- Prohibit recovery and use of groundwater from the Site without adequate treatment.
- Require that soils and groundwater recovered from the two defined Site source areas during possible future subsurface construction would be managed as waste and require treatment or disposal in accordance with solid and dangerous waste regulations.
- Require appropriate health and safety plans for any subsurface work and require appropriate training for construction workers conducting subsurface work within the two defined source areas and portions of the plume where cleanup levels are exceeded.
- Require permanent buildings constructed within the source areas to incorporate vapor barriers to limit potential migration of affected soil vapor into buildings.
- Require soil vapor discharges not cause violations of applicable ambient air quality standards for Site COCs.

Institutional controls would also include access agreements with neighboring landowners as appropriate to allow access to and maintenance of monitoring wells included in the long-term monitoring program.

The restoration time frame for this alternative is expected to be determined by the COC degradation rate in the inaccessible areas under natural source zone attenuation. The restoration time frame is estimated to be either the time required for COCs in inaccessible areas and source areas to be degraded to PCLs or the time required for residual COCs within inaccessible areas to become sufficiently degraded so that remaining Site constituents are permanently immobile (i.e., so that COCs cannot be mobilized due to induced changes in the water table or excavation at or near the impacted location). It is expected that ISS of source area soil would inhibit and slow the natural degradation of Site COCs, potentially increasing restoration time. It is difficult to estimate how much time would be required to achieve this level of weathering or degradation. For this FFS, it has been assumed that it would occur within 50 years, considering that storage and transfer of petroleum and petroleum products began as early as 1920, and LNAPL is largely immobile under existing conditions. However, because of the uncertainty about the degree to which ISS could impede natural attenuation of stabilized COCs, a 15% contingency has been added to the operations and maintenance cost estimate for Alternative 2 versus a 10% contingency for Alternative 1.

12.1.3 SOURCE AREA ALTERNATIVE 3: SOURCE AREA EXCAVATION

This alternative is similar to Alternative 1, except that soils exceeding PCLs (including LNAPL Areas) within both source areas would be excavated for off Site disposal (Figure 12-4). The depths of the excavation vary across the site and are shown on Figure 12-4. The source area and excavation areas shown on Figure 12-4 incorporate the approximate footprint of the LNAPL area on the Port of Everett property delineated by Cardno (2021), as described in Section 3.2.4. Note, however, that the soil characterization results shown by symbols on Figure 12-2 do not show the sampling locations or incorporate the analytical results from Cardno's investigation. The results from Cardno's investigation are presented in Appendix F and figures in the DCAP. The excavation depths are based on the boring logs from Site characterization, which are presented in Appendix B. Additional characterization data may be collected for final design on the ExxonMobil/ADC Property if this alternative is selected for implementation. However, the extent of excavation on the Port of Everett property is based on

Cardno's (2021) excavation area delineation presented in Appendix F and figures in the DCAP and will not change in final design. The inaccessible areas are not included for excavation under this remedial alternative due to potential structural issues for existing infrastructure and access issues on public streets, as described in Section 12.1.1 for Alternative 1. Remaining COCs within inaccessible areas would be remediated by natural source zone attenuation.

For conceptual design of this alternative, it was assumed that the sequence of activities would be: excavation of the source area, backfilling the excavation, placement of surface pavement, final work area restoration, and natural source zone attenuation monitoring for inaccessible areas. It was assumed that the excavated soil would be disposed of off Site as impacted soil.

It was assumed that the excavations would be conducted as open excavations in the areas shown on Figure 12-4. To the maximum extent practicable, excavation would be performed without groundwater removal. Final dewatering plans and requirements will be presented in the EDR. Temporary shoring using sheet piling was assumed to allow excavation to the depths shown on Figure 12-4 and is necessary to protect the City of Everett Force Main sewer to the north, the Overpass to the east, and Federal Avenue to the west (i.e., the inaccessible areas). For excavation areas not along public rights-of-way, the perimeter of the excavation would be sloped to stabilize the side walls of the excavation. For conceptual design of this alternative, it was assumed that unshored sidewalls would be sloped at a ratio of 1:1 and that all soils excavated for side slopes would be reused as backfill. Figure 12-4 shows the approximate limits of the side-slope excavations and shoring used for conceptual design and cost estimates. Final shoring and sloping plans and requirements will be presented in the EDR. For the configuration shown in Figure 12-4, it was assumed that an estimated 1,200 linear feet of shoring would be needed to the approximate depth of 30 feet, or approximately 36,000 vertical square feet of shoring. The temporary shoring would be removed upon completion to allow normal groundwater flow. The conceptual design for soil disposal, groundwater management, and LNAPL recovery under this alternative is the same as described in Section 12.1.1 for Source Area Alternative 1.

Based on the conceptual design for this alternative, approximately 35,000 tons of soil would be excavated for off-Site disposal. Due to the subsurface disturbances during excavation work, LNAPL may be mobilized adjacent to the excavation. Provisions would be needed for LNAPL recovery and disposal during the excavation work. Based on past experience during the interim action to the east of the Property, an estimated 1,200 gallons of LNAPL may be recovered from the source area excavation. Backfill and surface restoration would be done as described in Section 12.1.1 for Source Area Alternative 1. The final backfill material and specifications will be presented in the EDR.

Inaccessible source areas would be remediated by natural source zone attenuation as described for Alternative 1 in Section 12.1.1.

Institutional controls would supplement the active remediation performed under Source Area Alternative 3 so that the alternative is protective of human health and the environment. Environmental covenants would be used to establish requirement for groundwater recovery or use within the Site. The environmental covenants would address the Property and the portions of the Site located on Port of Everett and KC properties where soil or groundwater above cleanup levels would remain, as described in Section 12.1.1 for Source Area Alternative 1. The RMP described in Section 12.1.1 for Alternative 1 would also be included in this alternative to ensure the alternative is protective of workers conducting subsurface work on the adjacent areas.

Institutional controls would:

- Limit future use of the Property to industrial or commercial uses.
- Prohibit recovery and use of groundwater from the Site unless it is adequately treated.
- Require inspection and maintenance of the surface pavement over the source areas.

Institutional controls would also include access agreements with landowners as appropriate to access and maintain monitoring wells included in the long-term monitoring program.

The restoration time frame for this alternative is expected to be similar to Alternative 1, as discussed in Section 12.1.1.

12.2 GROUNDWATER REMEDIATION ALTERNATIVES

Two remediation alternatives for groundwater have been identified, as illustrated on Figure 12-5. Groundwater Remediation Alternative 1 could be combined with any of the source area alternatives to provide a comprehensive remedy addressing the entire Site. Groundwater Alternative 1 utilizes MNA to achieve the cleanup standard for the groundwater plume downgradient of the source areas. Groundwater Alternative 2 includes active removal of the dissolved-phase contaminants passing through a PRB in addition to MNA for remediation of the groundwater plume. The selected groundwater remediation alternative would be implemented in conjunction with the selected source area remediation alternative. A description of the two groundwater remediation alternatives is provided in Sections 12.2.1 and 12.2.2.

12.2.1 GROUNDWATER ALTERNATIVE 1: MONITORED NATURAL ATTENUATION

Groundwater Alternative 1 incorporates MNA to address groundwater contamination within the plume downgradient of the source areas. Available data for groundwater indicate that Site COCs in groundwater are effectively attenuating under existing conditions as groundwater flows to the west, through the Port of Everett property (Section 6.4). Analytical results from three monitoring wells near the shoreline of Port Gardner Bay (MW-A5, MW-A6, and MW-A8) show that contaminant concentrations are either below the laboratory reporting limit or below cleanup levels. As discussed previously and shown on Figure 12-5, a CPOC would be established on Port of Everett property conditional on approval by the Port and Ecology. Existing monitoring well MW-A4 and potentially one or more new wells installed on Port of Everett property would serve as the CPOC for groundwater. The conceptual CPOC shown on Figure 12-5 is located on Port of Everett property, downgradient of the source areas; this conceptual CPOC was used for costing purposes. The final CPOC will be presented in the EDR upon approval by Ecology and the Port of Everett.

For conceptual design of this remediation alternative, the existing monitoring well network would potentially be supplemented with a new monitoring well north of monitoring well MW-A4. The actual number of CPOC monitoring wells will be specified in the EDR. As shown by the current plume extent on Figure 12-5, natural attenuation is currently reducing concentrations of Site constituents to below the PCLs upgradient of the proposed CPOC. Figure 6-21 demonstrates that concentrations of Site constituents have been trending downward over time. Figure 6-22 shows that measurements of MNA parameters suggest that active biodegradation is occurring within the source area. These findings provide additional evidence for the effectiveness of natural attenuation for remediation of the groundwater plume at the Site (Section 6-4).

In accordance with the current Ecology MNA guidance (Ecology, 2005), the conceptual monitoring program for this alternative area is designed to:

- Demonstrate that natural attenuation is occurring according to expectations.
- Verify that the plume is not expanding beyond the CPOC.
- Verify that cleanup levels are attained at the CPOC.
- Verify that there is no unacceptable impact to downgradient receptors.
- Detect any new releases of COCs that could impact the effectiveness of the natural attenuation remedy.
- Demonstrate the efficacy of institutional controls put in place to protect potential receptors.
- Verify attainment of remediation objectives.

The conceptual monitoring program for Groundwater Alternative 1 would include development of a detailed MA validation and long-term sampling work plan to describe the monitoring program. This work plan would identify the monitoring well network and monitoring analytes required for both characterization/validation sampling and long-term groundwater monitoring. Characterization/validation sampling would be used to demonstrate the effectiveness of MNA with respect to contaminant mass reduction, attenuation rates, and temporal trends. Long-term groundwater monitoring would be used after characterization/validation monitoring to confirm that the contaminant plume is progressing toward achievement of numerical cleanup goals.

For the conceptual design of Groundwater Alternative 1, it was assumed that characterization/validation sampling would consist of semiannual monitoring of seven monitoring wells for one year and that one or more new monitoring wells, screened from 5 to 15 feet bgs with a total depth of 15 feet, would be installed to monitor plume migration and groundwater quality at an off-Site CPOC located on Port of Everett property (Figure 12-5). Monitoring parameters and analytes included in the conceptual design include TPH-G, TPH-D, TPH-O, and BTEX, as well as the full suite of MNA geochemical parameters for the degradation of TPH (i.e., DO, nitrate/nitrite, orthophosphates, iron[II] oxide, sulfate, temperature, pH, specific conductance, total alkalinity, ORP, and total organic carbon). It is assumed that reporting for characterization/validation sampling would follow each semiannual monitoring event during the first year.

Groundwater monitoring would continue under Alternative 1 until monitoring results indicate that the cleanup standard for the Site has been attained. Ecology guidance documents indicate that the cleanup standard is typically considered attained if monitoring results from four consecutive quarters (i.e., one year) of monitoring data from the CPOC meet the cleanup levels. For Site groundwater monitoring, it has been assumed that the cleanup standard will have been attained when two consecutive years of monitoring results for a well are below cleanup levels. Since the Site groundwater monitoring program consists of semiannual monitoring, the cleanup standard evaluation will be based on results from four consecutive monitoring events. If four consecutive semiannual monitoring results (i.e., monitoring results for a two-year period) for a monitoring well are below the cleanup level, the well will be assumed to meet the cleanup standard and it will be removed from the monitoring program.

As requested by Ecology, a 50-year time period was used for estimating the cost for this alternative. For the purposes of the FFS, it was further assumed that long-term groundwater monitoring would follow characterization/validation sampling for an additional 20 years and include semiannual monitoring of the seven monitoring wells for TPH and a limited suite of geochemical parameters (DO, ORP, temperature, and pH) for a period of five years, followed by 15 years of annual monitoring. It was assumed that routine reporting for each monitoring event would be provided to Ecology for long-term groundwater monitoring, as is presently being done for the Site.

12.2.2 GROUNDWATER ALTERNATIVE 2: FUNNEL AND GATE

Groundwater Alternative 2 consists of a subsurface barrier wall arranged in a funnel and gate arrangement to provide active groundwater treatment along with MNA to achieve the cleanup standard. Redundant treatment with a PRB would remove COCs just downgradient of the western source area (Figure 12-5), and MNA (which is already achieving the PCLs at the CPOC under existing conditions), would further degrade Site COCs while groundwater flows to the CPOC. The funnel-and-gate approach under this alternative uses a low-permeability barrier wall as the funnel that would direct groundwater to a PRB in a gate configuration. The PRB would adsorb dissolved COCs from the groundwater as it passes through the gate. Any COCs that remain in groundwater passing the gate, as well as any COCs that are downgradient of the funnel and gate, would attenuate naturally as groundwater moves to the CPOC, as described for Groundwater Alternative 1. The funnel-and-gate configuration would be located downgradient of the source areas and would be sized to intercept the full width of the groundwater plume (Figure 12-5).

For the conceptual design used for this FFS, the low-permeability funnel would be a soil-bentonite barrier wall constructed using the slurry wall technique, as described in Section 11.5. An estimated 300 linear feet of barrier extending to a depth of 15 feet would be constructed, resulting in about 5,250 vertical square feet of impermeable barrier. The conceptual design considered for the gate would be a perforated concrete vault, approximately 20 feet long and 15 feet deep, that would hold the sorbent medium (Figure 12-5). The medium selected for the conceptual design is granular activated carbon (GAC), but other media, such as a sorbent clay, may be considered during final design if this alternative is selected for implementation. The conceptual layout is shown in Figure 12 5; the final design and layout would likely differ from that used for this FFS.

In order to avoid groundwater mounding upgradient of the funnel and gate and to help redistribute flow downgradient of the gate, two high-porosity trenches would be installed along both the upgradient and downgradient sides of the barrier wall funnel. These trenches would be backfilled with coarse rock and fitted with perforated piping to facilitate groundwater flow. A total of 600 linear feet of trench would be needed to avoid mounding, based on the conceptual design assumptions. Construction of the funnel and gate, including the collection and distribution trenches, would generate approximately 400 CY (2,400 tons) of excavated soil; for conceptual design, it has been assumed that excavated soil would require off-Site disposal in a solid waste landfill.

The gate would be a permeable barrier constructed of a perforated concrete vault containing a material that would absorb TPH and other Site COCs. As noted above, GAC was selected as the sorptive medium for the FFS. The quantity of GAC included for this alternative was based on the estimated mass of COCs in groundwater, which was based on groundwater monitoring data. It was assumed that this quantity of GAC would be sufficient to last several years, but it was not expected to last until the Site was restored. Monitoring would be performed to assess the effectiveness of the adsorbent. It was further assumed that the sorptive medium would be maintained as needed (including periodic replacement) to achieve cleanup objectives if this alternative is chosen. For estimating the cost of this alternative, it was assumed that the media would be replaced in years 6, 15, and 30. The approximate location and preliminary, conceptual alignment of the system is shown on Figure 12-5. The funnel-and-gate system is expected to substantially remove dissolved COCs passing through the gate and to decrease the mass of contaminants that must attenuate to achieve the cleanup standard for Site groundwater.

In order to evaluate the performance of the funnel and gate, the removal of dissolved COCs from the groundwater, and the effectiveness of MNA in achieving the cleanup standard, a groundwater monitoring program would be implemented. The groundwater monitoring program for this alternative is the same as the monitoring program described in Section 12.2.1 for Groundwater Alternative 1 and was assumed to continue through the assumed restoration time of 50 years. This program would also be implemented in the same way that was described for Groundwater Alternative 1.

13 EVALUATION OF ALTERNATIVES

The MTCA regulations in WAC 173-340-350(8) provide general requirements for completing feasibility studies to select a preferred remediation alternative for the Site. In order for a cleanup action to be selected under MTCA, WAC 173-340-360 specifies that the cleanup action must meet the following requirements:

1. Protect human health and the environment.
2. Comply with cleanup standards.
3. Comply with applicable state and federal laws and regulations.
4. Provide for compliance monitoring.
5. Prevent or minimize present and future releases of hazardous substances.
6. Rely primarily on a method other than dilution and/or dispersion to achieve the cleanup standard.
7. Use permanent solutions to the maximum extent practicable.
8. Provide a reasonable restoration time frame.
9. Consider public concerns.

The remediation alternatives described in Section 12 have been designed to meet the minimum requirements noted above by combining one of the source area alternatives with one of the groundwater alternatives. The remediation alternatives selected for the Site also will incorporate institutional controls as outlined in Section 12, as it is infeasible to permanently remove all affected soil and groundwater for this Site.

The source area alternatives will be evaluated separately from the groundwater alternatives. The evaluation will identify the best-performing source area alternative and the best-performing groundwater alternative. In the DCAP, the source area and groundwater alternatives will be combined to comprehensively address Site cleanup and achieve cleanup objectives. Each group of alternatives will be evaluated against the criteria specified in WAC 173-340-360(3)(f)—protectiveness, permanence, cost, long-term effectiveness, management of short-term risks, technical and administrative implementability, public concerns, and restoration time frame. In addition, the alternatives will be evaluated against sustainability concerns to assess the life-cycle impact of the alternative on the global ecology.

13.1 SOURCE AREA ALTERNATIVES

The comparison of remediation alternatives for the source areas is presented in Table 13-1 and summarized below. Ratings from 1 to 10 were used for this evaluation, with 10 being exceptional and 1 being very low. Thus, a rating of 10 indicates that an alternative fully achieves the criterion, a rating of 5 indicates that the alternative partially achieves the criterion, and a rating of 1 indicates that the alternative does not significantly address the criterion.

In general, the remediation alternative with the overall highest rating for all evaluation criteria and considering disproportionate costs, after review and approval by Ecology, will be selected as the preferred alternative in the DCAP.

13.1.1 PROTECTIVENESS

Protectiveness is gauged primarily on the level of risk reduction achieved by the alternative and the time required for the alternative to achieve risk reduction objectives and the cleanup standard. LNAPL at the Site is essentially immobile under existing conditions and it appears to have degraded significantly under normal Site conditions. The limited extent of the downgradient plume also indicates that there is limited existing risk associated with continued releases to groundwater. Protectiveness for all three alternatives would be affected by Site constituents remaining in the inaccessible areas; however, all three alternatives remove all accessible soil contaminated with LNAPL or residual LNAPL saturation. As shown in Table 13-1, Alternatives 1 and 2 were assigned a rating of 8 for protectiveness and Alternative 3 was assigned a slightly higher rating of 9. Protectiveness is similar for all three alternatives as similar quantities of LNAPL would be removed.

13.1.2 PERMANENCE

Permanence refers to the ability to reduce the toxicity, mobility, or volume of hazardous substances at a site, including the permanent destruction of hazardous substances. None of the three alternatives would result in permanent destruction of all Site COCs. None of the source removal alternatives would actively remove COCs from the inaccessible areas. For these reasons, the definition of *permanence* used in the rating of the three alternatives is the reduction in toxicity, mobility, or volume of hazardous substances in those areas that are technically feasible to actively remediate. Site COCs remaining are expected to be remediated by natural source zone attenuation, which would provide additional COC degradation and toxicity reduction. All three alternatives would remove accessible soils contaminated with LNAPL or residual LNAPL saturation and were therefore rated similarly. Alternative 3 relocates the greatest quantity of Site COCs and was assigned a rating of 9. Alternatives 1 and 2 relocate the same quantity of affected Site soil. For Alternative 2, the stabilized source area soils remaining after remediation would be somewhat less appropriate for natural source zone attenuation than the undisturbed soils remaining under Alternative 1. In addition, the stabilized source area soils remaining after stabilization would still contain residual COCs and would need to be managed appropriately if they were later excavated, such as for utility work or property redevelopment. Because the volume of soil remaining in the source areas is significantly smaller than the volume of soil in the inaccessible source area, any difference in permanence between Alternatives 1 and 2 would likely be negligible. Therefore, a rating of 8 was assigned to both Alternative 1 and Alternative 2.

13.1.3 COST

The cost evaluation addresses estimated costs related to implementation of an alternative, including costs for design and construction, operation and maintenance, monitoring, and reporting. The costs for operation, maintenance, monitoring, and reporting are recurring annual costs that will occur in the future. As requested by Ecology, it has been assumed that these costs would be incurred for a period of 50 years for each alternative. The cost estimates for the three source area alternatives, based on the conceptual designs described in Section 12, are presented in Table 13-2 and include the local sales tax of 9.7%, a 10–15% contingency for construction, and a 10% contingency for long-term monitoring/maintenance. The costs presented in Table 13-2 are in 2019 dollars and do not reflect changes in construction material costs that may have occurred since 2019. Alternative 2 was given a 15% construction contingency because Site-specific pilot testing has not been completed and a 15% contingency for operation and maintenance costs due to the uncertainty regarding the degree to which ISS could impede natural attenuation of stabilized COCs. If the restoration time frame was extended significantly, costs for Alternative 2 could be higher.

The total estimated cost for implementation and long-term monitoring and maintenance for Alternatives 1 through 3 are approximately $9.1, $10.7, and $10.7 million, respectively. Annual monitoring and maintenance costs are similar for each alternative. The implementation and long-term operation and maintenance costs were used to estimate the net present value (NPV) of the costs over a 50-year period for each alternative. The net discount rate used for the NPV calculations was 1.6% and was taken from the federal Office of Management and Budget Circular A-94 that was updated in November 2017. The 50-year NPV estimated for Alternatives 1 through 3 are $8.8, $10.3, and $10.3 million, respectively. The NPV costs were used for rating and comparing the alternatives.

All three alternatives would have significant costs and leave the same extent of impacted media in the inaccessible areas. As shown in Table 13-1, Alternative 1 was rated highest, with an assigned cost rating of 9, and Alternative 2 and 3 had similar costs and were rated lowest, with a cost rating of 4.

13.1.4 LONG-TERM EFFECTIVENESS

Long-term effectiveness assesses the degree of certainty and reliability of the alternative and whether treatment residue remains from implementation of the alternative that would require ongoing management. All three alternatives remove accessible soils contaminated with LNAPL or residual LNAPL saturation, therefore were rated similarly. As shown in Table 13-1, Alternative 3 was rated 8, and Alternatives 1 and 2 were rated 7. All three alternatives would require long-term, active management of affected soil and groundwater due to the inability to actively remediate the inaccessible areas. Alternatives 1 through 3 would all require the same long-term response plans and institutional controls to address affected media in the inaccessible areas. Alternative 3 was rated the highest because slightly more contaminated material would be removed from the site. Alternatives 1 and 2 were both rated 7, as stabilization of source area soils included in Alternative 2 is expected to hinder bioremediation and therefore provides little benefit compared to Alternative 1.

For all three alternatives, affected soil and groundwater would remain in the inaccessible areas for an extended period of time. These COCs would be remediated by natural source zone attenuation. None of the alternatives would appreciably decrease existing Site risks, as they would result in only partial remediation of affected Site media at the time of implementation.

13.1.5 MANAGEMENT OF SHORT-TERM RISKS

Short-term risks are the risks to human health and the environment during implementation of the alternative. Alternatives with more invasive construction or transportation requirements would inherently have greater short-term risks. As shown in Table 13-1, all three alternatives would have substantial short-term risks due to soil excavation, stockpiling, and off-site shipment of affected soil. All three alternatives have potential to mobilize LNAPL during implementation, thereby increasing the potential for worker exposure; this potential risk is somewhat greater for Alternative 3, as the excavation is more extensive. While the excavation for Alternative 2 is less extensive, ISS is included and would result in additional short-term risks associated with implementing two different remedial techniques. Construction for Alternative 2 would require two separate construction mobilizations with different personnel and equipment. Well-established measures, such as Site-specific training, implementation of safe work practice protocols, and standard protocols for work on hazardous waste operations and emergency response sites, would be implemented to mitigate the short-term risks associated with implementation of the selected alternative. For these reasons, Alternative 1 was rated highest (8) because it would require the lowest level of invasive construction work. Alternatives 2 and 3 were assigned a rating of 4 because they are considered roughly equivalent for short term risks, with Alternative 3 requiring a larger excavation area and Alternative 2 requiring two different remediation techniques, two separate mobilization events, and two sets of construction equipment.

13.1.6 TECHNICAL AND ADMINISTRATIVE IMPLEMENTABILITY

This criterion is based on whether implementation of the alternative is technically possible to implement relative to its complexity, administrative/regulatory requirements, size, access, and integration with existing Site conditions. Removal of LNAPL from inaccessible areas (the Terminal Avenue Overpass, Federal Avenue, and former Everett Avenue) would require removal of permanent structures and numerous utilities and is impracticable for all three alternatives. It is expected that inaccessible COCs would be remediated by natural degradation processes. All three alternatives would include fairly complex RMP agreements to establish risk mitigation procedures with the City of Everett, Port of Everett, and BNSF property owners to address worker safety and proper management of affected groundwater and/or soil during future subsurface construction or dewatering activities that may occur within currently inaccessible areas of the Site. Similar access agreements and permits are required for all three alternatives. All three alternatives would require open excavations in wet soils, which are inherently challenging to implement, particularly due to the existing surrounding features that must be protected. The remediation technologies used in the three alternatives are proven, and the alternatives are considered implementable. Therefore, all three alternatives were assigned ratings above 5.

Alternative 3 requires a greater excavation area than Alternative 1; therefore, it was rated lower. While Alternative 2 would have the same excavation area as Alternative 1, ISS would require a second construction mobilization with different remediation equipment, thereby adding considerable complexity to the remediation; therefore, Alternative 2 was rated lower. Site-specific pilot testing required for Alternative 2 has not yet been completed, therefore it was rated the lowest. Implementing the excavations for all three alternatives (which would require temporary shoring) without affecting improvements on adjacent properties or on properties owned and operated by others also increases the complexity involved in obtaining access agreements and permits. For these reasons, Alternative 1 was rated highest (9), Alternative 2 was rated 4, and Alternative 3 was rated 6.

13.1.7 PUBLIC CONCERNS

Public concerns are potential community concerns with design and implementation of the remediation alternative. All three alternatives would likely be accepted by the general public and other property owners. All three alternatives would leave the same extent of impacted soil in place within the inaccessible areas, where active remediation is infeasible for all three alternatives. Alternatives 2 and 3 would require greater amounts of construction-related traffic, and therefore were rated lower than Alternative 1. The Port of Everett has also indicated that ISS would likely not be permitted on Port property. Therefore Alternative 2 was assigned the lowest rating (4). Alternative 1 was rated 8 and Alternative 3 was rated 7.

13.1.8 RESTORATION TIME FRAME

The restoration time frame assesses the time required to complete remediation and involves the practicability of achieving more rapid Site restoration, with consideration given to a number of factors, including Site risks, Site use and potential use, effectiveness and reliability of institutional controls, and toxicity of hazardous substances present. Together, these factors assess the effectiveness of the alternative, the timely reduction of risk, and achieving cleanup goals. The restoration time for the inaccessible Site areas where constituents are present is similar for all of the alternatives. Alternative 2 was rated slightly lower because ISS is expected to hinder the natural attenuation of remaining source area COCs. Alternatives 1 and 3 were rated 7 and Alternative 2 was rated 6.

13.1.9 SUSTAINABILITY

Sustainability considers the life-cycle impacts of the alternative on the global environment: alternatives requiring more energy, more manufactured materials, more transportation, or more active operations would be considered less sustainable than alternatives using lesser amounts. This criterion is not cited in the MTCA regulations, but it is considered appropriate for evaluating long-term remediation alternatives. As noted in Table 13-1, Alternative 1 was rated highest for this criterion because it has the least extensive construction and transportation requirements. Alternatives 2 and 3 would require greater construction and transportation work than Alternative 1. Alternative 3 would require more waste transportation and utilize more landfill capacity than Alternatives 1 and 2, and was therefore rated lower. For these reasons, Alternative 1 was rated 8, Alternative 2 was rated 6, and Alternative 3 was rated 4.

13.1.10 SOURCE AREA ALTERNATIVES EVALUATION SUMMARY

The evaluation discussed above for the source area remediation alternatives is summarized in Table 13-1. Based on the individual criterion ratings assigned to the three alternatives, the ratings total, which is the sum of individual ratings, is shown at the bottom of Table 13-1. Comparison of the ratings totals shows that Source Area Alternative 1, LNAPL Area Excavation and Natural Source Zone Attenuation, was the highest rated source area remediation alternative. Alternative 2, LNAPL Area Excavation and Source Area Stabilization, had the lowest total rating.

13.2 GROUNDWATER ALTERNATIVES

The two groundwater remediation alternatives described in Section 12 are evaluated against the same criteria used for evaluating the source area alternatives above. The evaluation criteria cited in the MTCA regulations are considered in addition to sustainability. The ratings are summarized in Table 13-3 and discussed below.

13.2.1 PROTECTIVENESS

Protectiveness is gauged primarily on the level of risk reduction achieved by the alternative and the time required for the alternative to achieve risk reduction objectives and the cleanup standard. Both alternatives are considered highly protective of the environment. Groundwater Alternative 2 offers a slightly lower degree of protectiveness than Alternative 1 because it includes an engineered component to remove dissolved COCs from groundwater. However, dissolved COCs in groundwater are already below PCLs at the proposed CPOC. Because Alternative 2 could decrease the effectiveness of natural attenuation processes by removing substrate from groundwater and inaccessible areas and would require long-term maintenance of engineered components, it is rated 7 for this criterion, while Alternative 1 is rated 8.

13.2.2 PERMANENCE

Permanence refers to the ability to reduce the toxicity, mobility, or volume of hazardous substances at a site, including the permanent destruction of hazardous substances. Both groundwater alternatives would significantly reduce the toxicity of Site COCs and either permanently destroy COCs through biodegradation or immobilize them through adsorption to the PRB media. However, Alternative 2 relies on active operation and maintenance for effectiveness; thus, it is rated 7 for this criterion, while Alternative 1 is rated 9.

13.2.3 COST

The cost evaluation considers the estimated costs related to implementation of an alternative, including costs for initial design and construction, operation and maintenance, monitoring, and reporting. The estimated costs for the two alternatives, based on the conceptual designs discussed in Section 12, are presented in Table 13-4. The costs presented in Table 13-4 are in 2019 dollars and do not reflect changes in construction material costs that may have occurred since 2019. The cost estimate assumes one new additional monitoring well will be installed. The actual number of monitoring wells will be specified in the DCAP and Engineering Design Report. As noted above, the NPV of the long-term implementation and monitoring costs were used for cost evaluation. The NPV calculations for the groundwater alternatives were done using the same assumptions and evaluation time discussed in Section 13.1.3 for the source area alternatives. The two groundwater alternatives would have similar long-term monitoring costs, as noted in Table 13-4. The total estimated cost for Alternative 2 ($2.2 million) is more than three times the total estimated cost of Alternative 1 ($0.6 million). The 50-year NPV cost for Alternative 2 is about $2.1 million, which is over three times the NPV cost for Alternative 1. Due to this substantial difference in cost estimates and since PCLs are currently being met at the anticipated CPOC location, Alternative 1 was assigned a cost rating of 9 while Alternative 2 was assigned a rating of 4.

13.2.4 LONG-TERM EFFECTIVENESS

Long-term effectiveness consists of the degree of certainty and reliability of the alternative and whether treatment residue remains from implementation of the alternative that would require management. Both alternatives incorporate natural attenuation, which has been active at the Site and is currently achieving PCLs at the anticipated CPOC location. As natural attenuation is a passive remediation technology that relies totally on indigenous, natural processes that include biodegradation, the two groundwater alternatives are expected to be effective for as long as COCs are present. Because active maintenance would be required to maintain effectiveness of sorbent media in the PRB under Alternative 2, and because the PRB may affect intrinsic biodegradation downgradient of the funnel and gate due to altering the substrate composition in that area, Alternative 2 was rated 6, lower than Alternative 1, which was rated 9.

13.2.5 MANAGEMENT OF SHORT-TERM RISKS

Short-term risks are the risks to human health and the environment during implementation of the alternative. Alternatives with more invasive construction or transportation requirements would inherently have greater short-term risks. Alternative 2 has higher risk associated with implementation due to the intrusive work needed to install the funnel and gate system and for off-Site transportation and disposal of soil and groundwater removed from the excavations. Conventional construction methods would be used, short-term construction risks can be effectively managed, and thus a rating of 6 was assigned to Alternative 2. Alternative 1 has only minimal subsurface construction (i.e., monitoring well installation) and, therefore, has minimal short-term risks and was assigned a higher rating of 9.

13.2.6 TECHNICAL AND ADMINISTRATIVE IMPLEMENTABILITY

This criterion is based on whether implementation of the alternative is technically possible relative to complexity, administrative/regulatory requirements, size, access, and integration with existing Site conditions. Both alternatives are technically implementable; however, Alternative 1 would be much simpler to implement due to the substantially smaller construction requirements. However, it would be necessary to work with the Port of Everett to maintain groundwater monitoring wells over the long term and to locate the CPOC on their property. In addition to the considerations for Alternative 1, Alternative 2 would require extensive construction on property owned by the Port of Everett and leased to Vigor Marine. Negotiations and contractual conditions for installation of Alternative 2 would be more complicated than those for Alternative 1. Access agreements have been established previously with both the Port and Vigor Marine for installation and sampling of monitoring wells. Due to the large difference in implementability considerations, Alternative 1 was given a rating of 8 while Alternative 2 was given a rating of 5.

13.2.7 PUBLIC CONCERNS

Public concerns are potential community concerns with design and implementation of the alternative. As noted in Table 13-3, both groundwater remediation alternatives are considered to be equally acceptable to the public. Both are considered to be readily accepted by the public, and each alternative was given a rating of 7.

13.2.8 RESTORATION TIME FRAME

The restoration time frame involves capability of achieving Site remediation and the practicability of achieving more rapid Site restoration, with consideration given to a number of factors, including Site risks, Site use and potential use, availability of alternative water supply, effectiveness and reliability of institutional controls, and toxicity of hazardous substances present at the Site. Together, these factors are a measure of the urgency of reducing risk and achieving cleanup goals. As previously noted, groundwater located on the Port of Everett property, where the anticipated CPOC will be located, is currently below the PCLs for the Site. As shown in Table 13-3, both alternatives were assigned a rating of 9.

13.2.9 SUSTAINABILITY

Sustainability considers the life-cycle impacts of the alternative on the global environment; alternatives requiring more energy, more manufactured materials, more transportation, or more active operations would be considered less sustainable than alternatives using lesser amounts. Both remediation alternatives for groundwater are considered sustainable. Alternative 1 relies totally on a passive technology that involves indigenous, natural processes, and was assigned a higher rating of 9 for sustainability than Alternative 2, which was assigned a rating of 6. The PRB requires active monitoring and maintenance to assure effectiveness. Construction of the funnel and gate would generate a significant amount of waste that would require off-Site transportation and disposal. Additional waste generation may occur in the future under Alternative 2 due to maintenance of the PRB.

13.2.10 GROUNDWATER ALTERNATIVES EVALUATION SUMMARY

The evaluation of the groundwater remediation alternatives is presented in Table 13-3 and discussed above. Based on the ratings assigned to the individual evaluation criteria, the ratings total, which is the sum of individual ratings, is shown at the bottom of Table 13-3. The ratings total for Alternative 1 is substantially higher than the rating total for Alternative 2.

14 PREFERRED ALTERNATIVE

This section identifies and describes the preferred remediation alternative. The evaluation presented in Section 13 provides the basis for selecting the preferred approach for remediating the Site. The preferred source area alternative and the preferred groundwater alternative will be combined as the comprehensive Site remedy.

In accordance with MTCA requirements, pursuant to WAC 173-340-360 (3)(e)(ii)(A-C), a disproportionate cost analysis is also presented to support selection of the preferred Site remedy. The disproportionate cost analysis is used to compare the cost and total benefits of higher cost alternatives to those of lower cost alternatives. Costs are disproportionate to benefits if the incremental costs of the higher cost alternative exceed the benefits. A direct comparison of the ratio of the cost to the benefits may be made to select a preferred alternative. All alternatives were given a total rating score in Section 13 (Tables 13-1 and 13-3), which summarizes the overall benefit of each alternative. These ratings were then used to assign an overall benefit score for each alternative. The overall benefit score is the sum of the rating scores for all criteria except cost. A unit cost per benefit is then provided by taking the NPV cost estimated for the conceptual-level design described in this FFS and dividing it by the overall benefit score of each alternative. This unit cost per benefit for each alternative may then be used to directly compare the cost/benefit for all the alternatives. Results of the disproportionate cost analysis are summarized in Table 14-1. The disproportionate cost analysis presented in Table 14-1 is based on cost estimates in 2019 dollars. These cost estimates do not reflect changes in construction material costs that may have occurred since 2019.

14.1 SOURCE AREA REMEDIATION ALTERNATIVE

The three source area remediation alternatives are compared in Table 14-1. The three alternatives are similar in that they all incorporate institutional controls, and they all leave some affected soil in place, either within the two defined source areas or in the inaccessible areas. The three alternatives provide equally for long-term degradation of LNAPL and Site COCs from inaccessible areas. All three alternatives include removal and off-site disposal of affected soil from the source areas and a risk management plan to address affected media remaining within the inaccessible area.

In Table 14-1, the overall benefit for each alternative is quantified as the total of the ratings presented in Table 13-1 for all criteria except cost. The maximum possible overall benefit for each alternative is 80. Alternative 1 had the highest overall benefit score of 63, followed by Alternative 3 which had a benefit score of 54. Alternative 2 had the lowest overall benefit rating of 47.

Alternative 3 was rated highest for permanence, as shown in Table 14-1. However, Alternative 3 was rated only slightly better than Alternatives 1 and 2 for permanence. The estimated NPV costs, in 2019 dollars, for the three alternatives are shown on Table 14-1. Alternative 1 has the lowest estimated NPV cost of $8.8 million. The highest cost alternative is Alternative 2, which is approximately 17% higher than the cost for Alternative 1; Alternative 3 has a similar cost to Alternative 2.

The cost-to-benefit ratios are calculated by dividing the estimated NPV cost by the overall benefit score; the calculated ratios are summarized in Table 14-1. The alternative with the lowest cost-to-benefit ratio is preferred, as it provides the greatest benefit for the given expenditure. As shown in Table 14-1, Alternative 1, LNAPL Area Excavation and Natural Source Zone Attenuation, has the lowest cost-to-benefit ratio and would provide the most benefit per dollar spent on remediation. The overall benefit rating for Alternative 1 was also slightly higher than for the other two alternatives.

Alternative 1 has a cost-to-benefit ratio of $139,000. The most permanent alternative (Alternative 3) has the second highest cost to benefit ratio of $190,000. While Alternative 3 has the highest permanence, the permanence rating for Alternative 1 is only slightly lower. The 37% increase in cost to benefit associated with Alternative 3 compared to Alternative 1 is disproportionate to its slight improvement in permanence. The cost/benefit ratio for Alternative 2, the lowest rated alternative for overall benefit, also had the lowest cost-to-benefit ratio of $219,000, about 58% higher than Alternative 1. All three alternatives would incorporate similar institutional controls for long-term management of potential Site risks.

The results summarized in Table 14-1 indicate that Alternative 1 will provide the largest overall benefit for the lowest cost. While Alternative 1 is not the highest rated for protectiveness, permanence, and long-term effectiveness, its ratings are only slightly lower than those of Alternative 3, which had the highest ratings for these criteria.

As a result of the disproportionate cost evaluation described above and summarized in Table 14-1, the preferred source area remediation alternative is Alternative 1: LNAPL Area Excavation and Natural Source Zone Attenuation. This alternative meets the RAOs and the ARARs and has the highest rating for overall benefit (Table 14-1). The disproportionate cost evaluation considered the ratings for all evaluation criteria addressed in Section 13. Alternative 1 would provide the greatest benefit relative to the cost, would result in highly manageable short-term risks, and would use essentially the same approach as the other three alternatives for long-term management of residual impacted soil remaining at the Site. The substantially increased cost of Alternatives 2 and 3 compared to Alternative 1 that would be incurred to stabilize or remove impacted soils beyond the LNAPL/saturated areas within the source areas on the Property is not warranted given the significant extent of LNAPL and impacted soils that would remain in inaccessible areas. Alternative 1 would also be readily implementable with local contractors and was rated as the most sustainable alternative. Groundwater is currently below the PCLs at the anticipated CPOC located downgradient of the two defined source areas, indicating that Site groundwater poses low risk to human health and the environment and that the source area material removal or stabilization provided by the other source area alternatives would provide minimal additional benefit at substantially higher cost.

Under current conditions, subsurface contamination in the two defined source areas on the ADC/ExxonMobil properties and on the Port of Everett property is old, weathered, and, if left undisturbed, immobile. Under existing conditions, soil contamination is essentially limited to the areas where historic operations occurred and to which it migrated when it was unweathered. The contamination is effectively contained beneath the existing surface pavement cover on the Property, adjacent streets, or adjacent industrial properties. Alternative 1 would provide further protection by removal of the most highly contaminated soils located on ExxonMobil/ADC property and on Port of Everett property. It is expected that remaining Site COCs would be continually degraded by natural source zone attenuation processes.

Costs have been included in Alternative 1 to continue monitoring for LNAPL, to ensure an appropriate RMP is developed and implemented, and to maintain surface pavement cover as part of the preferred remedy. Costs have also been included to monitor the effectiveness of natural source zone attenuation. Environmental covenants would also be recorded on the Property to require that future development projects would appropriately manage affected soil and groundwater that may be encountered and provide adequate protection of indoor air quality. Environmental covenants would be established for the portions of the Site that are owned by other parties (i.e., the City of Everett, Port of Everett, and BNSF). These parties would be consulted to obtain their consent to proposed environmental covenants on their properties. The City of Everett would also be consulted so that proposed environmental covenants are consistent with current and future land-use plans.

As described in Section 12, Alternative 1 includes an RMP to address work that may be performed within the inaccessible areas where affected soil and groundwater would remain after implementing the preferred alternative. The RMP would ensure that risks to workers and the public are mitigated during work affecting the inaccessible areas, and also would ensure that any affected soil, affected groundwater, or LNAPL recovered from the inaccessible areas would be properly managed.

The evaluation presented in this FFS indicates that Source Area Alternative 1 is the preferred remediation alternative for the Site source areas.

14.2 GROUNDWATER REMEDIATION ALTERNATIVE

The groundwater remediation alternatives are also compared in Table 14-1. The overall benefit and cost were compared to calculate a cost to benefit ratio in a similar manner as described in Section 14.1 for source area alternatives. Groundwater Remediation Alternatives 1 and 2 both provide permanence, as both remove and/or destroy contaminants present in groundwater, although Alternative 1 is rated somewhat higher since it does not require active maintenance to retain its effectiveness. Under existing conditions, groundwater downgradient of the western source area, located on Port of Everett property, is below the PCLs; Alternative 1 would maintain existing conditions in the downgradient groundwater plume. Directly comparing the benefits of the two alternatives indicates that Alternative 1 would achieve greater overall benefit than Alternative 2, primarily due to its ease of implementation, better sustainability, and lower short-term risks. The NPV cost for Alternative 2 is also about 4 times the NPV cost of Alternative 1, which results in a cost-to-benefit ratio for Alternative 2 that is nearly 4.9 times the ratio for Alternative 1 (Table 14-1). Also, Alternative 1 does not rely on engineering controls and long-term operations that are included in Alternative 2. Alternative 1 would not generate waste for disposal in a commercial landfill, whereas Alternative 2 would require off-Site disposal of soils with low levels of contamination from remedy construction and generate spent sorbent in the future.

The evaluation presented in this SC-FFS indicates that Groundwater Remediation Alternative 1 is the preferred approach to remediate Site groundwater.

14.3 PREFERRED COMPREHENSIVE SITE REMEDY

The comprehensive Site remedy identified by this FFS combines Source Area Alternative 1 with Groundwater Remediation Alternative 1.

The comprehensive Site remedy would consist of the following elements:

- excavation and landfill disposal of the most highly affected soil within the two source areas located on ExxonMobil/ADC property and on Port of Everett property;
- natural source zone attenuation to remediate COCs remaining in the source areas and inaccessible areas, including a monitoring program to assess the effectiveness of the remedy;
- a groundwater monitoring program to assess potential LNAPL mobility in the vicinity of the inaccessible areas and to assess groundwater quality downgradient of the source areas, including Port of Everett property;
- MNA to continue to degrade groundwater COCs upgradient of the anticipated CPOC, which would be located on Port of Everett property, downgradient of the source areas, and in the vicinity of existing downgradient monitoring wells;
- risk management planning by ExxonMobil/ADC with the City of Everett, Port of Everett, and BNSF property owners to address worker safety and management of LNAPL, affected soil, and/or affected groundwater resulting from potential future work within inaccessible areas on or near Federal Avenue, former Everett Avenue, and/or the overpass; and
- environmental covenant(s) to require that affected groundwater, soil, and/or soil vapor that may potentially be exposed during future construction is properly managed in accordance with MTCA and the solid and dangerous waste regulations.

The source area component of the Site remedy, which is based on Source Area Alternative 1, would remove the most highly affected soil and provide long-term management of both the source areas and the inaccessible areas. The conceptual excavation areas shown in Figure 12-2 represent accessible areas where potentially mobile LNAPL may be present based on historical observation of LPH in wells or TPH levels that exceeded residual saturation concentrations during several decades of environmental investigations and interim remedial activities at the Site. These areas would be used to guide excavation, with the objective to remove accessible soils containing LNAPL or hydrocarbon concentrations above residual saturation.

The excavation area on the Port of Everett property was delineated by Cardno (2021) and therefore will not change from what is presented on Figure 12-2. The excavation area delineated on the Port of Everett property is based on comprehensive sampling and will not require sidewall or excavation base sampling.

For the excavation on the ExxonMobil/ADC property, performance samples for soil remediation will be collected from the base of the excavation and from accessible sidewalls (i.e., sidewalls where sheet piling does not block access to the sidewall) to confirm removal of soils containing LNAPL. Accessible sidewall soil samples will be collected after the planned extent of excavation has been reached and field screening indicates that LNAPL or residually saturated soils are not present. If samples taken from the accessible sidewalls or the base of the excavation exceed remediation levels based on the residual saturation concentrations described below, additional excavation will be conducted, and the sidewall or excavation base will be resampled to confirm removal of soils containing LNAPL.

Remediation levels for LNAPL will be based on residual saturation concentrations. In the absence of site-specific data, LNAPL will be assumed to be present when TPH concentrations exceed the following lower limits of the residual saturation concentrations for each hydrocarbon class:

- TPH-D: 4,800 mg/kg.
- TPH-O: 5,810 mg/kg.
- TPH-G: 2,470 mg/kg.

Further details on soil sampling and soil management will be developed as part of the DCAP and the EDR.

Groundwater will be managed as described in Section 12.1.1, and a detailed groundwater management plan will be presented in the DCAP.

Remaining Site COCs in source areas and inaccessible areas would be remediated by natural source zone attenuation. The groundwater component of the Site remedy, which is based on Groundwater Alternative 1, would rely on MNA to continue to degrade groundwater COCs in the plume that is downgradient of the source areas and the inaccessible portions of the Site. It is expected that a CPOC would be established on the Port of Everett property west of Federal Avenue in the vicinity of existing groundwater monitoring wells; this location is necessary due to the source area located west of Federal Avenue. Groundwater monitoring data collected in the vicinity of the anticipated CPOC indicate that natural attenuation has achieved the PCLs described in this FFS. The number of CPOC monitoring wells will be specified in the DCAP and EDR.

The comprehensive Site remedy would provide an appropriate remedy for the Site, where releases occurred decades ago and are highly weathered and immobile. Institutional controls would ensure that Site workers would be protected, and that future use of the ExxonMobil/ADC properties are limited to industrial use. An environmental covenant would be in place to ensure that any future exposure of affected groundwater and/or soil will be handled in accordance with appropriate solid and dangerous waste regulations. In addition, the Risk Management Plan described in Section 12.1.1 would establish procedures and plans to manage worker safety and establish protocols for proper management and disposal of soil and water if exposed in the future (e.g., future utility maintenance or development activities).

It is expected that natural attenuation, in combination with the source area remediation by excavation and natural source zone attenuation, would continue to achieve groundwater cleanup levels well upgradient of the shoreline.

In accordance with WAC 173-340-410, the comprehensive Site remedy will include monitoring to verify the protectiveness of the remediation and to assess the effectiveness of natural source zone attenuation at achieving the required cleanup levels for soil and groundwater set forth in Tables 5-1 and 5-2, respectively. The details of the confirmation monitoring program will be included in the DCAP and EDR and will include regularly scheduled collection of groundwater samples at the CPOC and designated Site monitoring wells, inspections of the Site cap, and collection of soil samples in areas where COCs remain above cleanup levels.

The total estimated NPV cost for the preferred Site remedy would be approximately $9.3 million, which includes the cost for 50 years of monitoring and maintenance. This remedy would comprehensively address Site contamination and continue to limit migration of Site COCs via intrinsic biodegradation. The comprehensive Site remedy is sustainable and relies primarily upon noninvasive and natural remediation techniques after initial construction has been completed. Due to the presence of affected soil and groundwater within the inaccessible areas, COCs will be present at the Site for a significant time.

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TABLES

TABLE 3-1: CHRONOLOGY OF HISTORICAL ON-SITE ENVIRONMENTAL INVESTIGATIONS

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

Date	Consultant	Location	Reference	Activities	Tasks Performed	Notes
May-85	RZA	ExxonMobil Parcel	RZA 1985	Borings, monitoring well installation	2-inch-diameter monitoring wells B-1 through B-5 (MW-1 through MW-5 in several reports) installed.	B-1, B-2, B-4, and B-5: Petroleum odor noticed in borings; evidence found of contamination below groundwater table.
Mar-88	RZA	ExxonMobil Parcel	AMEC E&E 2010a	Borings, monitoring well installation	2-inch-diameter monitoring wells MW-6 through MW-18 installed.	Soil and groundwater samples collected. LPH (1.29 feet) measured in MW-14.
Jan-90	ESE	ADC Parcel	AMEC E&E 2010a	Borings	Hand augers AD-01 through AD-19 to depths ranging from 1 to 4.5 feet.	Soil samples collected.
Feb-90	ESE	ADC Parcel	AMEC E&E 2010a	Borings, monitoring well installation	HSA borings W-1 through W-7. 2-inch-diameter monitoring wells W-1 through W-6 installed.	W-7 was backfilled.
Jun-90	ESE	ADC Parcel	AMEC E&E 2010a	Hand-auger borings	Hand-auger borings W-8 through W-17 to depths of 6–10 feet.	No soil data found for W-8 through W-17. Gauging data indicate that free product was observed in 10 of the 17 monitoring wells located at and around the ADC Parcel.
Oct-90	RZA	ExxonMobil Parcel	AMEC E&E 2010a	Shallow grid soil sampling, bio-feasibility study	Hand augers B-1 through B-25. Two soil samples were studied to conduct a slurry flask bio-feasibility study.	0-3 feet bgs. Rapid biodegradation of TPH-G fraction was observed. Biodegradation of TPH (undifferentiated) was not achieved.
Nov-90	Unknown	ExxonMobil Parcel	AMEC E&E 2010a	Monitoring well decommissioning	B-3 (MW-3), B-4 (MW-4), and MW-7 destroyed.	No documentation of well decommissioning.
March–June 1991	RZA	Parcels surrounding ExxonMobil Parcel	AMEC E&E 2010a	Borings, monitoring well installation	Six percussion soil borings to depths ranging from 5 to 5.5 feet bgs, 2-inch diameter monitoring wells MW-19 through MW-24, and 4-inch diameter monitoring wells MW-27 through MW-30 installed. Soil boring B-21-91 advanced to depth of 29 feet bgs.	MW-25 and MW-26 were inaccessible or dry and later renamed as B-25 and B-26. No well decommissioning records were found.
Jun-91	RZA and ESE	The Property	AGRA 1996g	Quarterly groundwater monitoring	Groundwater monitoring event. New 2-inch diameter monitoring wells MW-25 and MW-26 installed. Gauged wells: RW-1, B-1, B-2, B-5, MW-6, MW-8 through MW-13, MW-15 through MW-18, AD-19, W-1 through W-6, and W-8 through W-15.	B-1, MW-8, AD-19, W-1, W-6, W-9, W-11, W-12, W-13, and W-15 contained LPH and were not sampled.
Nov-91	RZA AGRA	ExxonMobil Parcel	AMEC E&E 2010a	Borings, recovery well	8-inch diameter recovery well RW-2 installed. Deep soil borings B-1A, B-8A, and B-15A advanced.	Soil borings advanced in vicinity of existing wells B-1, B-8, and B-15. No analytical data found for this event.

TABLE 3-1: CHRONOLOGY OF HISTORICAL ON-SITE ENVIRONMENTAL INVESTIGATIONS

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

Date	Consultant	Location	Reference	Activities	Tasks Performed	Notes
Dec-91	RZA AGRA	ExxonMobil Parcel	AGRA 1996g	Quarterly groundwater monitoring, aquifer and tidal study	Quarterly groundwater monitoring. Gauged wells: RW-1, B-1, B-2, B-5, MW-6, MW-8 through MW-13, MW-15 through MW-30, and AD-19. Aquifer study involved 24-hour pumping from MW-10 at a rate of 1 to 2 gpm and measuring response in MW-18, RW-1, and RW-2 for 48 hours.	B-1, MW-8, MW-11, MW-26, MW-27, MW-29, and AD-19 contained LPH and were not sampled. Hydraulic conductivity at the Site was estimated as 4 to 9.5 feet/day. Minimum tidal influence was observed.
1992	RZA AGRA	NA	NA	Discussions with Ecology	Ecology discussed enforcement with Mobil and RZA AGRA. Ecology decided to allow Site to go independent.	
Dec-93	RZA AGRA	West of ExxonMobil Parcel	AMEC E&E 2010a	Off-Property borings, monitoring well installation, GPR survey	2-inch diameter monitoring wells MW-31 through MW-33 and MW-35 through MW-37 were installed; B-34 advanced and backfilled. GPR survey was conducted to assess whether underground product lines had been removed.	Survey did not identify any subsurface linear features.
Dec-93	RZA AGRA	ExxonMobil Parcel and off-Property to the west	AGRA 1996g	Quarterly groundwater monitoring	Groundwater monitoring event. Gauged wells B-1, B-2, MW-6, MW-8 through MW-13, MW-15 through MW-18, MW-27 through MW-33, MW-35 through MW-37.	B-1, MW-27, and MW-29 contained LPH and were not sampled.
Dec-93	RZA AGRA	West of ExxonMobil Parcel	AMEC E&E 2010a	Test pits, recovery trench	Excavated five test pits, TP-1 through TP-5, to depths ranging from 3 to 3.5 feet bgs. Recovery trench installed along the western border of ExxonMobil Parcel.	Monitoring well MW-21 was reportedly decommissioned during the recovery trench installation activities. However, a 2002 decommissioning record was found that stated that MW-21 was decommissioned in 2002.
1995			NA	Agreed Order DE-95TC-N402		Required evaluation of LPH.
Jul-95	RZA AGRA	ADC Parcel	AGRA 1996g	Quarterly groundwater monitoring	Groundwater monitoring event. Gauged wells: W-3, W-5, W-9, W-10, W-12 through W-15.	W-9, W-12, and W-13 contained LPH and were not sampled.
Oct-95	U.S. Coast Guard Puget Sound Marine Safety Office & City of Everett	North of the Property	AMEC E&E 2010a	Investigation of petroleum product discharge into Everett Harbor	Camera surveys of the sewer lines made.	Outfall located approximately 175 yards northwest of the ADC Parcel; LPH seepage observed in section of CSO line.
Nov-95	RZA AGRA	Site	AGRA 1996g	Groundwater monitoring	Groundwater monitoring event. Gauged wells: RW-1, RW-2, B-1, B-2, MW-6, MW-8 to MW-13, MW-15 to MW-18, MW-27 to MW-37, and NRW-1.	B-1, MW-18, MW-29, and MW-30 contained LPH and were not sampled.

TABLE 3-1: CHRONOLOGY OF HISTORICAL ON-SITE ENVIRONMENTAL INVESTIGATIONS

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

Date	Consultant	Location	Reference	Activities	Tasks Performed	Notes
Dec-95	RZA AGRA	Site	AGRA 1996g	Groundwater monitoring	Groundwater monitoring event. Gauged wells: RW-2, B-2, MW-8, MW-9, MW-18, MW-15 through MW-18, MW-27, and MW-28.	RW-2, MW-9, MW-18, and MW-28 contained LPH and were not sampled.
Mar-96	AGRA	North of the Property	AMEC E&E 2010a	Borings	Direct-push soil borings GP-1 through GP-13. Borings associated with the CSO line repair.	The collected soil sample results indicated that soil surrounding the damaged portion of the CSO had petroleum hydrocarbon impacts. LPH accumulation was noticed in temporary screens installed in soil borings. No groundwater samples were collected from temporary screens.
Apr-96	City of Everett		AMEC E&E 2010a	Meeting	Meeting held to discuss options for repairing the section of CSO line.	Decisions made regarding replacement of the settled portion of the line and slip lining of the remaining portion of the line.
May-96	AGRA	ADC Parcel	AGRA 1996d	Borings	Bobcat borings BB-1 through BB-14.	Soil samples collected.
Jun-96	AGRA	ADC Parcel	AGRA 1996d	Borings, monitoring wells, and test pits	4-inch diameter recovery well VRW-1 and 2-inch diameter monitoring well MW-38 installed. Seven test pits TP-1-96 through TP-7-96 excavated.	Wells were installed on the northeast corner of the property. Test pits were located throughout the ADC Parcel.
Aug-96	AGRA	Site	AMEC E&E 2010a	Monitoring wells	Gauged wells at the property.	LPH found in B-1, VRW-1, MW-27, MW-29, MW-30, MW-38, W-1, W-9, W-15.
Feb-97	PTI	Site	PTI 1997	LPH recovery technical memorandum	Technical memorandum to summarize environmental investigations, LPH recovery activities, and geology.	PTI concluded that long-term, passive (LPH only) recovery may be the most effective method of LPH recovery. PTI also concluded that active LPH and groundwater recovery that had been performed up to that time had been effective for short durations, but recovery structures did not continue to recover LPH for extended periods of time when active recovery was employed.

TABLE 3-1: CHRONOLOGY OF HISTORICAL ON-SITE ENVIRONMENTAL INVESTIGATIONS

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

Date	Consultant	Location	Reference	Activities	Tasks Performed	Notes
November 1997 through January 1998	Pacific Environmental Group, Inc.	Kimberly-Clark property	Pacific Environmental Group, Inc. 1998	Borings, monitoring wells	Direct-push borings Probe-1 through Probe-15 were advanced, and 2-inch diameter HSA monitoring wells KC-1 and KC-2 were installed inside the KC warehouse.	Groundwater samples were collected from temporary screens installed in each boring. LPH not identified in soil borings or monitoring wells. TPH-D and TPH-O were detected above MTCA Method A cleanup levels in borings advanced in the vicinity of repaired CSO line. Samples not collected in vicinity of former ASTs.
1998			NA	Agreed Order DE98TC-P-N223		Required remedial investigation/focused feasibility study.
Jul-98	Exponent	Site	Exponent 1998a	Remedial Investigation and Focused Feasibility Study	Exponent summarized the history of the Property and evaluated feasible remedial options for the Site.	Exponent recommended the installation of LPH recovery trenches and installation of a low-permeability cap over the property.
Jul-98	Exponent	Site	Exponent 1998b	Final Interim Action Work Plan and Engineering Design Report	Exponent presented design for interim measures at the Property.	Exponent provided specifications for demolition of existing Site structures and installation of LPH recovery trenches, water treatment system, and low-permeability cap over the Property.
Oct-99	Kleinfelder	The Property	Exponent 2000	Monitoring wells installation	Monitoring wells W-10R, W-15R, and MW-40R.	Wells installed to replace wells W-10, W-15, and MW-40.
Dec-99	Dames and Moore/URS	South and southeast of the Property	URS 2000a	Geotechnical drilling and piezometer installation	DM-6, DM-7, and DM-8 were sampled for environmental samples.	Work associated with CSTO Project.
Sep-00	URS	South, east, and southeast of the Property	URS 2000b	Borings	Phase II investigation for the CSTO Project. Push-probe borings UG-1 through UG-12.	Groundwater samples collected from temporary screens installed in UG-2 and UG-8. Estimated 7,600 cubic yards of petroleum-contaminated soil present along the overcrossing alignment.
Jul-01	URS	Johnston Petroleum parcel	URS 2001a and b	Borings	Phase II investigation for Johnson Petroleum parcel. Push-probe borings JP-1 through JP-7.	Soil samples collected. Groundwater samples collected from JP-1, JP-4, and JP-7. No significant contamination found.

TABLE 3-1: CHRONOLOGY OF HISTORICAL ON-SITE ENVIRONMENTAL INVESTIGATIONS

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

Date	Consultant	Location	Reference	Activities	Tasks Performed	Notes
Feb-02	ERI	Site and vicinity	ERI 2002a	Monitoring well decommissioning and re-installment	Abandonment of monitoring wells (MW-22, MW-23, MW-24, MW-35, and MW-37) and piezometer DM-6 due to proximity to the CSTO Project. Re-installed well W-2 screened from 3 to 23 feet bgs.	No soil samples taken during W-2 installation. The reported abandonment of MW-21 in 2002 contradicts the reported decommissioning of MW-21 due to installation of the recovery trench to the west of the Property in December 1995.
2002	Reid Middleton	CSTO	Reid Middleton 2002	Memorandum to Ecology	Southeast corner of the asphalt cap over the ExxonMobil Parcel removed. Steel piles for concrete foundation were installed.	No information regarding contaminant soil excavation and removal was found.
2002-2007	Kleinfelder, ERI, AMEC	Site	Various	Groundwater monitoring	Monthly LPH gauging and quarterly groundwater monitoring.	LPH greater than 0.02 foot thick is bailed manually and oleophilic socks are replaced.
Jul-02	ERI	West of the ExxonMobil Parcel	ERI 2002b	Well decommissioning	Monitoring wells MW-20, MW-21, and one unidentified well were decommissioned.	The record contradicts the records that indicate that MW-21 was decommissioned during the December 1993 recovery trench installation.
Feb-07	AMEC/Bravo Environmental	Site	AMEC E&E 2007	Video survey of storm drain system	AMEC contracted Bravo to conduct a video survey of the storm drain system installed as part of 1999 interim measure to verify that groundwater from the Property is not infiltrating into the stormwater system through possible cracks and fissures in the piping and catch basins.	No significant cracks or fissures within the stormwater system were observed.
2007–present	AMEC	Site	AMEC E&E 2010a	Groundwater monitoring	AMEC requested to change to semiannual groundwater monitoring in 2007.	Request was accepted by Ecology.
2008	AMEC	West of the Property	AMEC E&E 2008b	Monitoring wells	Off-property monitoring wells MW-A1 and MW-A2 installed on the west side of Federal Avenue.	Monitoring wells MW-A1 and MW-A2 are incorporated into existing groundwater monitoring network.
Feb-08	AMEC	Site	AMEC E&E, 2008a	Tidal study	Measured tidal response in W-3, W-6, MW-11, MW-28, & MW-40R.	Minimal response in each well, except MW-11.
Jun-08	AMEC	Site	2010 updated survey included as Appendix C	Well head elevations survey	True North Land Surveying of Seattle, Washington, surveyed recovery and monitoring wells located on-Site.	Recovery wells LPH-1 to LPH-9 and monitoring wells W-1, W-2, W-3, W-6, W-10R, MW-10, MW-11, W-15R, W-17, RW-2, MW-19, MW-27, MW-28, MW-29, MW-30, MW-40R, MW-A1, and MW-A2.

TABLE 3-1: CHRONOLOGY OF HISTORICAL ON-SITE ENVIRONMENTAL INVESTIGATIONS

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

Date	Consultant	Location	Reference	Activities	Tasks Performed	Notes
2010	AMEC	Site	AMEC E&E 2010a	Focused Feasibility Study Work Plan	Summarized Site history, previous environmental investigations and interim remedial activities, known environmental conditions, preliminary conceptual site model, and remaining data gaps.	FFS Work Plan included a sampling and analysis plan to guide data gaps investigation and identified applicable remedial technologies to be evaluated n the FFS.
2010	AMEC	Site	AMEC E&E 2010a	Agreed Order DE 6184		Required FFS and Draft CAP.
2010	AMEC	Site	AMEC E&E 2011f	Sampling for City of Everett Force Main	Borings CE-1 to CE-8 advanced on Federal Avenue, former Everett Avenue, and the BNSF property to characterize soils in the alignment of City's planned force main.	Analytical results were provided to City of Everett and used to characterize soil excavated for the force main project for disposal purposes.
2011	AMEC	Site	AMEC E&E 2011b	Data gaps investigation	Seven deep borings (AB-1 to AB-5, AP-6, MW-7ab), six shallow borings (AP-1 through AP-5, AP-7), five new off-Property monitoring wells (MW-A3 through MW-A7), aquifer testing, and tidal influence study.	A plume of groundwater with petroleum hydrocarbon impacts was identified west & northwest of the Property. Groundwater downgradient and upgradient from the Property was not affected by COCs. Geochemical parameters were consistent with an anaerobic environment in which active petroleum biodegradation appears to be occurring. No continuous silt layer was identified beneath the Property. Monitoring wells MW-A3 through MW-A7 incorporated into existing groundwater monitoring network.
2011	AMEC	Site	AMEC E&E 2011a	Tidal influence investigation	A stilling well with transducer was installed on the Everett Pier to automatically record tidal elevations. Pressure transducer/ data loggers were installed in monitoring wells W-3, W-6, MW-11, MW-19, MW-28, MW-40R, and MW-A1 through MW-A7 to record groundwater levels every 6 minutes for 6 days.	Monitoring wells W-3, MW-11, MW-A1, MW-A2, MW-A3, MW-A5, and MW-A6 are tidally influenced, with tidal fluctuations ranging from 0.1 foot to 1.1 feet. MW-19, MW-28, MW-40R, MW-A4, and W-6 exhibited minimal tidal influence, and MW-A7 was unaffected by tidal elevation. A potentiometric surface map showed groundwater flow toward the west.
2011	AMEC	Former Everett Avenue	AMEC E&E 2011g and h	Observations of seeps along former Everett Avenue	AMEC recorded photographs in the field to document observations of petroleum product seeps through the pavement on former Everett Avenue.	

TABLE 3-1: CHRONOLOGY OF HISTORICAL ON-SITE ENVIRONMENTAL INVESTIGATIONS

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

Date	Consultant	Location	Reference	Activities	Tasks Performed	Notes
2012	AMEC	Federal Avenue and former Everett Avenue	AMEC 2012b	Observations during City of Everett force main replacement	AMEC observed excavation and drilling activities during installation of the City's force main and recorded notable subsurface features when relevant, including the presence of LPH if encountered.	AMEC documented the presence of LPH in borings and/or trenches along much of the alignment on former Everett Avenue, and at selected locations along Federal Avenue.
2013–2014	AMEC	Site	AMEC 2014a	Data gaps investigation	A total of 33 soil borings were drilled on the Property and nearby properties, and soil samples were analyzed to delineate areas of affected soil at the Site. One of the borings was completed as a new monitoring well (MW-A8).	Higher COC concentrations were found primarily on the Property and in the western portion of the former ADC garage. Contamination from the Site extends to the former ADC garage and former Everett Avenue. Contamination on KC property north of former Everett Avenue likely originates from sources on the KC property. Monitoring well MW-A8 incorporated into groundwater monitoring network.
2020-2021	Cardno	Port of Everett	Appendix F	Excavation delineation	A total of 51 soil borings were drilled on the Port of Everett property, and soil samples were analyzed to delineate areas exceeding remediation levels for future excavation. Two geotechnical borings were also advanced. Analytical results will be used so that collection of sidewall and base soil samples during future excavation work is not necessary.	COC concentrations exceeding remediation levels are present as deep as 16 feet bgs.

Abbreviations

ADC = American Distributing Company
AMEC = AMEC Environment & Infrastructure, Inc.
AMEC E&E = AMEC Earth & Environmental, Inc.
AST = aboveground storage tank
bgs = below ground surface
CAP = Cleanup Action Plan
COC = constituent of concern
CSO = combined sewer outflow
CSTO = California Street Overcrossing
Ecology = Washington State Department of Ecology
ERI = Environmental Resolutions, Inc.
ESE = Environmental Science and Engineering, Inc.
FFS = Focused Feasibility Study
gpm = gallons per minute
GPR = ground penetrating radar
HSA = hollow-stem auger
KC = Kimberly-Clark
Kleinfelder = Kleinfelder, Inc.
LPH = liquid petroleum hydrocarbons
MTCA = Model Toxics Control Act
PTI = PTI Environmental Services
RZA = Rittenhouse-Zeman & Associates, Inc.
RZA AGRA = RZA AGRA Earth & Environmental, Inc.
TPH = total petroleum hydrocarbons
TPH-D = total petroleum hydrocarbons-diesel range organics
TPH-G = total petroleum hydrocarbons-gasoline range organics
TPH-O = total petroleum hydrocarbons-residual range organics

TABLE 3-2: 2010 FORCE MAIN SAMPLING SOIL ANALYTICAL DATA[1]

ExxonMobil/ADC Site, Ecology Site ID 2728, Everett, Washington

(all results are in milligrams per kilogram, dry weight basis)

Sample ID	Sample Depth	Arsenic			Barium			Cadmium			Chromium			Lead			Selenium			Silver			Mercury		
		Result		LOQ	Result		LOQ	Result		LOQ	Result		LOQ	Result		LOQ	Result		LOQ	Result		LOQ	Result		LOQ
	MTCA CUL[2]	20			16,000			2.00			19.0/2,000[3]			250			400			400			2.00		
CE 1	0.5-3 feet	1.99		1.19	22.2		2.37	1.19	U	1.19	20.7		1.19	14.2		1.19	2.37	U	2.37	1.19	U	1.19	0.116	U	0.116
CE 1	6.5-8 feet	4.19	U	4.19	14.8		8.37	4.19	U	4.19	9.63		4.19	8.88		4.19	8.37	U	8.37	4.19	U	4.19	0.411	U	0.411
CE 2	1-4 feet	1.08	U	1.08	43.1		2.16	1.08	U	1.08	22.3		1.08	4.68		1.08	2.16	U	2.16	1.08	U	1.08	0.111	U	0.111
CE 2	4-8 feet	1.63		1.13	63.7		2.26	1.13	U	1.13	27.3		1.13	16.7		1.13	2.26	U	2.26	1.13	U	1.13	0.114	U	0.114
CE 3	1-4 feet	2.34		1.02	14.0		2.05	1.02	U	1.02	28.2		1.02	2.81		1.02	2.05	U	2.05	1.02	U	1.02	0.104	U	0.104
CE 3	4-8 feet	4.80		1.65	72.6		3.29	1.65	U	1.65	68.6		1.65	4.41		1.65	3.29	U	3.29	1.65	U	1.65	0.160	U	0.160
CE 4	0.5-4 feet	4.64		1.25	83.2		2.51	1.25	U	1.25	32.8		1.25	70.4		1.25	2.51	U	2.51	1.25	U	1.25	0.126	U	0.126
CE 4	5-7 feet	1.68		1.25	46.0		2.51	1.25	U	1.25	25.3		1.25	5.44		1.25	2.51	U	2.51	1.25	U	1.25	0.124	U	0.124
CE 5	0.5-4 feet	6.87		1.14	105		2.27	1.14	U	1.14	23.0		1.14	26.6		1.14	2.27	U	2.27	1.14	U	1.14	0.115	U	0.115
CE 5	5-8 feet	1.40		1.11	38.8		2.22	1.11	U	1.11	27.7		1.11	2.09		1.11	2.22	U	2.22	1.11	U	1.11	0.107	U	0.107

Notes

1. Data qualifiers were applied by laboratory. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. MTCA Method A CULs were used for arsenic, cadmium, chromium, lead, and mercury because this value is the most conservative. MTCA Method B CULs associated with direct contact were used for barium, selenium, and silver because MTCA Method A cleanup levels were not available for these analytes, and because the data were used for waste profiling.
3. Samples were not analyzed for chromium speciation, therefore both the MTCA Method A CULs for hexavalent chromium (19.0) and trivalent chromium (2,000) are shown.

Abbreviations

CE = City of Everett	LOQ = limit of quantification
CUL = cleanup level	MTCA = Model Toxic Control Act
ID = identification	N/A = not applicable

TABLE 4-1: CHRONOLOGY OF HISTORICAL INTERIM REMEDIAL MEASURES

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

Date	Consultant	Location	Reference	Activities	Tasks Performed	Notes
April–May 1988	RZA	ExxonMobil Parcel	PTI 1997	Recovery trench installation, SVE and groundwater treatment system test (oil-water separator and air stripper), infiltration gallery, pumping subsurface fluids	Installation of recovery trench near MW-14, SVE system and groundwater treatment system to evaluate feasibility of extracting LPH. Infiltration gallery installed in the vicinity of MW-14. Subsurface fluids were pumped with a vacuum truck from the sumps.	Decommissioned in 1998 during construction of low-permeability cap at the Property. The gallery was T-shaped and 45 feet long with two 55-gallon drums installed at both ends as sumps. 1,400 gallons of liquid removed, 50 gallons was LPH. As a result, LPH thickness in MW-14 decreased to 0.40 foot by August 1988.
Mar-89	RZA	ExxonMobil Parcel	RZA 1989	Automated groundwater extraction and treatment system	An automated groundwater extraction and treatment system was installed in the location of the infiltration gallery. The system included fluid extraction sump stationed in RW-1 (formerly MW-14), oil-water separator, air stripper, and re-infiltration gallery.	The groundwater extraction and treatment system was shut down in March 1990 due to flooding of the re-infiltration gallery, and has not been restarted.
Nov-91	RZA AGRA	ExxonMobil Parcel	PTI 1997	Borings, recovery well	8-inch diameter recovery well RW-2 installed.	No analytical data found for this event.
Dec-93	RZA AGRA	West of ExxonMobil Parcel	AGRA 1993	Test pits, recovery trench	Recovery trench installation along the western border of ExxonMobil Parcel.	
Jun-96	AGRA	North of the Property	AGRA 1996b and c	CSO line repairs	Excavation of settled portion of pipe replaced. Slip-lining of remaining CSO line. CSO line excavation dewatering.	1,450,800 gallons of groundwater and 23,050 gallons of LPH were removed during CSO line excavation and dewatering.
Jun-96	AGRA	LPH Vacuum Recovery Pilot Test	AGRA 1996a, d,e, and f	LPH vacuum recovery pilot test	14-day test included SVE and groundwater/LPH pumping system.	125 gal of LPH and 28,228 gallons of groundwater removed from VRW-1 during test.
Nov-98	Kleinfelder	ADC Parcel	Exponent 2000	Survey, geotechnical evaluation	Initial survey. Asbestos survey prior to demolition.	Demolition activities included four buildings on the ADC parcel. Asbestos abatement activities were conducted in November 1998, and demolition was completed in January 1999.
Dec-98	Kleinfelder	Water management and treatment system	Exponent 2000	Installation of treatment system	A water management and treatment system consisting of an oil–water separator, a settling tank, and a carbon polishing unit was constructed at the Property.	System treated approximately 2.5 million gallons of water between December 1998 and September 1999. Approximately 19,900 gallons of oily water and 450 gallons of sludge were collected between December 1998 and September 1999.
Dec-98	Kleinfelder	The Property	Exponent 2000	Interim remedial action	Removed TPH-impacted soil, graded the property, removed purge water.	162 tons of contaminated shallow soil and vegetation removed from within the ADC firewall area during demolition and transported to TPS Technologies facility for disposal. 3.5 tons of class 3 PCS taken to CRS Associated. Marine Services, Inc. removed 110 gallons of purge water.
1999	Kleinfelder	The Property	Exponent 2000	Interim remedial action	Monitoring well abandonment. Interceptor trench construction along the western and northern property boundaries. Low-permeability cap construction over the property. Recovery wells LPH-1 through LPH-9 installed in interceptor trench. Stormwater collection system that connects to the City of Everett sewer system was installed.	Monitoring wells MW-6, MW-8, MW-9, MW-12, MW-13, MW-15, MW-16, MW-17, MW-38, WP-1, B-1, B-2, W-4, W-8, W-11, W-12, W-14, AD-11, AD-12, AD-13, AD-15, AD-19, W-10, W-15, and MW-40 abandoned. Completed Site grading, installation of two layers of geotextile fabric, asphalt-treated base material, and paving fabric and asphalt cap.
2002–present	Kleinfelder, ERI, AMEC E&E	Site	Various	Petroleum recovery	Monthly removal of LPH.	LPH greater than 0.02 foot thick is bailed manually, and oleophilic socks are replaced.
Jul-08	Floyd|Snider	North-northeast of the Property	AMEC E&E 2010a	Excavation and disposal of PCS and dewatering the excavation	Soil associated with Puget Sound Outfall 5 Overflow Structure project was excavated and disposed of. In addition, dewatering occurred during excavation.	Soil was field screened. Soil exhibiting obvious signs of contamination was disposed of as Class II soil without sampling. Soil that appeared to be "clean" was sampled and then disposed as Class II soil. Water from the excavation was sampled for the City sewer discharge requirements.
2010	AMEC E&E	Federal Avenue and Port of Everett property	AMEC E&E 2011e	Removal of abandoned pipes and affected soil	AMEC decommissioned pipelines west of the Property to prepare for upgrades to the storm sewer line planned by the City of Everett.	A total of 76.55 tons of construction debris, 243 tons of soil, 487 linear feet of piping, 65,669 gallons of non-regulated liquid, four 55-gallon product/ water drums, and four 55-gallon solid waste drums were removed and disposed of off Site. Samples from base of excavation showed contaminated soil left in place.
2011–2012	AMEC	BNSF and KC properties	AMEC 2012a	Interim removal action	Excavation and off-Site disposal of surface asphalt, affected soil, and recovered LPH and treatment of the recovered groundwater from the secondary source areas on the BNSF and KC properties. Monitoring wells MW-27 through MW-30 abandoned.	Approximately 3,785 tons of material was excavated and disposed of at a permitted landfill, approximately 2,530 gallons of LPH was removed, and 1,489,246 gallons of petroleum-affected groundwater was removed and treated. Affected material was evident and left in place at all side wall areas of the completed excavation on the BNSF property and on the north and east sidewalls on the KC property.

Abbreviations

ADC = American Distributing Company
AMEC = AMEC Environment & Infrastructure, Inc.
AMEC E&E = AMEC Earth & Environmental, Inc.
BNSF = BNSF Railway Company
CSO = combined sewer outflow
ERI = Environmental Resolutions, Inc.
KC = Kimberly-Clark
Kleinfelder = Kleinfelder, Inc.

LPH = liquid petroleum hydrocarbons
PCS = petroleum-contaminated soil
PTI = PTI Environmental Services
RZA = Rittenhouse-Zeman & Associates, Inc.
RZA AGRA = RZA AGRA Earth & Environmental, Inc.
SVE = soil vapor extraction
TPH = total petroleum hydrocarbons

TABLE 4-2: 2010 REMOVAL OF ABANDONED PIPES AND AFFECTED SOIL STOCKPILE SOIL ANALYTICAL DATA[1]

ExxonMobil/ADC Site, Ecology Site ID 2728, Everett, Washington

(all results are in milligrams per kilogram, dry weight basis)

Sample ID	Arsenic			Barium			Cadmium			Chromium			Lead			Selenium			Silver			Mercury		
	Result		LOQ	Result		LOQ	Result		LOQ	Result		LOQ	Result		LOQ	Result		LOQ	Result		LOQ	Result		LOQ
MTCA CUL[2]	20			16,000			2.00			19.0/2,000[3]			250			400			400			2.00		
SP-1	2.08		1.53	72.4		3.06	1.53	U	1.53	25.1		1.53	30.9	J	1.53	3.06	U	3.06	1.53	U	1.53	0.160	U	0.160
SP-2	3.53		1.16	75.8		2.32	1.16	U	1.16	27.4		1.16	61.9		1.16	2.32	U	2.32	1.16	U	1.16	0.116	U	0.116
SP-3	4.45		1.24	81.0		2.49	1.24	U	1.24	34.1		1.24	55.9		1.24	2.49	U	2.49	1.24	U	1.24	0.128	U	0.128
SP-4	4.95		1.76	110		3.51	1.76	U	1.76	64.1		1.76	59.9		1.76	3.51	U	3.51	1.76	U	1.76	0.181	U	0.181
SP-5	3.51		1.24	102		2.47	1.24	U	1.24	33.3		1.24	39.4		1.24	2.47	U	2.47	1.24	U	1.24	0.128	U	0.128
D-1	1.82		1.25	36.9		2.49	1.25	U	1.25	53.1		1.25	16.7		1.25	2.49	U	2.49	1.25	U	1.25	0.126	U	0.126
Average - SP	3.70			88.2			1.39			36.8			49.6			2.77			1.39			0.143		
Average - All	3.39			79.7			1.36			39.5			44.1			2.72			1.36			0.140		

Notes

1. Data qualifiers were applied by laboratory. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = Reported value is an estimate.
2. MTCA Method A CULs were used for arsenic, cadmium, chromium, lead, and mercury because this value is the most conservative. MTCA Method B CULs associated with direct contact were used for barium, selenium, and silver because MTCA Method A cleanup levels were not available for these analytes, and because the data were used for waste profiling.
3. Samples were not analyzed for chromium speciation, therefore both the MTCA Method A CULs for hexavalent chromium (19.0) and trivalent chromium (2,000) are shown.

Abbreviations

CUL = cleanup level
D = drum
ID = identification
LOQ = limit of quantification
MTCA = Model Toxic Control Act
N/A = not applicable
SP = stockpile

TABLE 5-1: PRELIMINARY CLEANUP LEVELS FOR GROUNDWATER[1]

ExxonMobil/ADC Site, Ecology Site ID 2728, Everett, Washington

Values in micrograms per liter (µg/L)

Constituent	CAS Number	Groundwater, MTCA Method A Cleanup Level	Groundwater, MTCA Method B Cleanup Level		Groundwater, MTCA Most Restrictive ARAR	Surface Water, MTCA Method B Cleanup Level		Surface Water ARAR - Aquatic Life - Marine/Acute (WAC 173-201A- 240)	Surface Water ARAR - Aquatic Life - Marine/Chronic (WAC 173-201A- 240)	Surface Water ARAR - Aquatic Life - Human Health (WAC 173-201A- 240)	Surface Water ARAR - Aquatic Life - Marine/Acute (CWA §304)	Surface Water ARAR- Aquatic Life - Marine/Chronic (CWA §304)	Surface Water ARAR - Human Health Consumption of Organisms (CWA §304)	EPA Human Health SW Criteria - Marine (40 CFR 131.45)	Method B Groundwater Screening Level Protective of Indoor Air[2]	PQL	Preliminary Cleanup Level[3]
Volatile Organic Compounds																	
Benzene	71-43-2	5	0.8	c	5	23	c	--	--	1.6	--	--	16	--	2.4	0.5	1.6
Ethylbenzene	100-41-4	700	800	nc	700	6,900	nc			270	130			31	2800		31
Xylenes	1330-20-7	1,000	1600	nc	10,000										310		310
Semivolatile Organic Compounds																	
1-methylnaphthalene	90-12-0	--	1.5	c				--	--		--	--	--		--	0.5	1.5
Total cPAHs[4]	--	0.1	0.023	c	0.2	0.22	c	--	--	0.0021	--	--	1.30E-04	1.60E-05	--	0.1	0.1[5]
Total Petroleum Hydrocarbons																	
Gasoline	86290-81-5	800						--	--		--	--	--		--	800	800
Diesel	NA	500						--	--		--	--	--		--	500	500
Motor oil	NA	500						--	--		--	--	--		--	500	500

Notes

1. All levels downloaded from Washington State Department of Ecology Cleanup Levels and Risk Calculations website at https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx.
2. Method B groundwater screening level protective of indoor air, lowest of carcinogenic or non-carcinogenic, in the Washington State Department of Ecology 2015 Vapor Intrusion Updated Excel table issued on 4/6/2015.
3. The preliminary cleanup level is the lowest value of the presented ARARs because MTCA method A values are based on protection of drinking water, which is not a complete pathway.
4. The cleanup levels and remediation levels established for benzo(a)pyrene shall be used, respectively, as the cleanup levels and remediation levels for mixtures of cPAHs (WAC 173-340-708[8][e]).
5. The PCL for total cPAHs was revised so that PCL was no lower than PQL for project laboratory (WAC 173-340-705[6]).

Abbreviations

-- = not available
ARAR = applicable or relevant and appropriate requirement
c = carcinogenic
CAS = Chemical Abstracts Service
CFR = Code of Federal Regulations
cPAH = carcinogenic polycyclic aromatic hydrocarbons
CWA = Clean Water Act
MTCA = Model Toxics Control Act
NA = not applicable
nc = noncarcinogenic
PCL = preliminary cleanup level
PQL = practical quantitation limit
SW = surface water
WAC = Washington Administrative Code

Table 5-2: PRELIMINARY CLEANUP LEVELS FOR SOIL[1]

ExxonMobil/ADC Site, Ecology Site ID 2728, Everett, Washington

Values in milligrams per kilogram (mg/kg)

Constituent	CAS Number	Soil, MTCA Method A Cleanup Level, Unrestricted Land Use	Soil, MTCA Method B Cleanup Level, Unrestricted Land Use		Soil Cleanup Level Protective of Groundwater (Unsaturated)[2]	Soil Cleanup Level Protective of Groundwater (Saturated)[2]	Practical Quantitation Limit	Preliminary Cleanup Level (Unsaturated)	Preliminary Cleanup Level (Saturated)
Volatile Organic Compounds									
Benzene	71-43-2	0.03	18	c	0.009	0.0006	0.005	0.009	0.005[3]
Ethylbenzene	100-41-4	6	8,000	nc	0.3	0.02	0.005	0.3	0.02
Xylenes	1330-20-7	9	16,000	nc	2.8	0.16	0.005	2.8	0.16
Semivolatile Organic Compounds									
1-methylnaphthalene[3]	90-12-0	NA[4]	34	c	0.08	0.004	0.50	0.08	0.5[3]
Total cPAHs[5]	NA	0.1	0.19	c	1.9	0.1	0.02	0.2	0.1
Total Petroleum Hydrocarbons									
Gasoline	86290-81-5	30/100[6]			NA	NA	0.5		30
Diesel	NA	2,000			NA	NA	5.0		2,000
Lube Oil	NA	2,000			NA	NA	5.0		2,000

Notes

1. All levels downloaded from Washington State Department of Ecology Cleanup Levels and Risk Calculations website at https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx.
2. The calculations for soil cleanup levels protective of groundwater are presented in Table 5-3. The soil to groundwater cleanup level is based on a groundwater cleanup level of 31 µg/L, which is protective of surface water.
3. PCLs for benzene and methylnaphthalene were revised so that PCLs were not lower than the PQL for the project laboratory (WAC 173-340-705[6]).
4. There is no MTCA Method A cleanup level specified for 1-methylnaphthalene; MTCA Method B cleanup level for direct contact with soil is 34.5 mg/kg.
5. The cleanup levels established for benzo(a)pyrene shall be used as the cleanup levels for mixtures of cPAHs (WAC 173-340-708[8][e]).
6. The preliminary cleanup level for TPH-G is 30 mg/kg if benzene is present, and 100 mg/kg if it is not present. Since benzene has been detected in site soils, the preliminary cleanup level is set to 30 mg/kg.

Abbreviations

c = carcinogenic
CAS = Chemical Abstracts Service
cPAH = carcinogenic polycyclic aromatic hydrocarbons
MTCA = Model Toxics Control Act
NA = not available
nc = noncarcinogenic

Table 5-3: GROUNDWATER PROTECTION CALCULATIONS[1]

ExxonMobil/ADC Site, Ecology Site ID 2728 Everett, Washington

Chemical	CAS	C_w [2] (µg/L)	Chemical Specific Constants K_{oc} [3] (ml/g)	 K_d [4] (L/kg)	 H_{cc} [5]	C_s [5] (Unsaturated) (mg/kg)	C_s [5] (Saturated) (mg/kg)
Volatile Organic Compounds							
Benzene	71-43-2	1.6	62	0.06	0.133	0.009	0.0006
Ethylbenzene	100-41-4	31	204	0.20	0.162	0.26	0.015
Xylenes[6]	1330-20-7	310	233	0.233	0.138	2.8	0.16
Semivolatile Organic Compounds							
Benzo(a)pyrene	50-32-8	0.1	9.70E+05	969	6.39E-06	1.9	0.1
1-methylnaphthalene	90-12-0	1.5	2.53E+03	2.53	1.59E-02	0.08	0.004
Total Petroleum Hydrocarbons							
Diesel	--	500.00	--	--	--	--	--
Gasoline	86290-81-5	800.00	--	--	--	--	--
Heavy Oil	--	500.00	--	--	--	--	--

Notes

1. Groundwater calculations provided by the Washington State Department of Ecology; Wood did not reproduce these calculations.
2. C_w values obtained from Table 5-1.
3. K_{oc} values obtained from the Washington State Department of Ecology CLARC online database.
4. K_d values were calculated using MTCA Equation 747-2.
5. Constants and soil concentration values were obtained from a letter by the Washington State Department of Ecology dated 4/9/2018. Use H_{cc} at 13 degrees Celsius.
6. Values used for o-xylene.

Abbreviations

-- = not available
µg/L = micrograms per liter
CAS = Chemical Abstracts Service
CLARC = Cleanup Levels and Risk Calculations
C_s = soil concentration
C_w = groundwater preliminary cleanup level
H_{cc} = Henry's law constant (dimensionless)
K_d = distribution coefficient
K_{oc} = soil organic carbon-water partitioning coefficient
L/kg = liters per kilogram
mg/kg = milligrams per kilogram
ml/g = milliliters per gram
MTCA = Model Toxics Control Act

TABLE 6-1: GROUNDWATER SAMPLE ANALYTICAL RESULTS [1,2]

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

Well ID		LPH-1	LPH-2	LPH-3	LPH-4	LPH-5	LPH-6	LPH-7	LPH-8	LPH-9	MW-10	MW-11	MW-19	MW-40R	MW-A1	MW-A2		MW-A3
Date Sampled	**PCL**	**01/06/2015**	**01/06/2015**	**01/07/2015**	**01/07/2015**	**01/07/2015**	**01/07/2015**	**01/08/2015**	**01/08/2015**	**01/08/2015**	**01/06/2015**	**01/06/2015**	**01/05/2015**	**01/06/2015**	**01/06/2015**	**01/05/2015**	**01/05/2015 FD**	**01/06/2015**
TPH (µg/L)																		
TPH as Gasoline	800	100 U	100 U	100	100 U	100 U	100 U	100 U	140	390	290	100 U	130 NJ	610	100 U	110	110	100 U
TPH as Diesel	500	100 U	130	200	**8,600**	450	240	140	140	**970**	**690**	100 U	180 NJ	**790**	**730 NJ**	320	320	110 NJ
TPH as Motor Oil Range	500	100 U	100 U	100 U	**4,100**	230	100 U	100 U	130	180	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
PAHs (µg/L)																		
Total cPAHs	0.1	0.0725 U	0.0717 U	0.0717 U	0.0717 U	0.0725 U	0.0717 U	0.0732 U	0.0717 U	0.0717 U	0.0725 U	0.0717 U	0.0725 U	0.0725 U	0.0725 U	0.0725 U	0.0725 U	0.0725 U
VOCs (µg/L)																		
Benzene	1.6	**4.3**	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

Well ID		MW-A4	MW-A5	MW-A6	MW-A7	MW-A8	RW-2	Sump 1	Sump 2	W-1	W-2		W-3	W-6	W-10R	W-15R	W-15R FD	W-17
Date Sampled	**PCL**	**01/06/2015**	**01/05/2015**	**01/05/2015**	**01/05/2015**	**01/05/2015**	**01/06/2015**	**01/08/2015**	**01/08/2015**	**01/07/2015**	**01/07/2015**	**01/07/2015 FD**	**01/07/2015**	**01/08/2015**	**1/7/2015**	**01/08/2015**	**01/08/2015**	**01/08/2015**
TPH (µg/L)																		
TPH as Gasoline	800	100 U	100 U	100 U	100 U	100 U	340	100 U	**1,900**	300	490 J	**1,000 J**	100 U	450	350	**2,500**	**2,900 J**	**1,000**
TPH as Diesel	500	100 U	240	100 U	100 U	100 U	270	100 U	**11,000**	**1,900**	**1,300**	**970**	250	390	**870**	**3,000**	**3,000**	**990**
TPH as Motor Oil Range	500	100 U	100 U	100 U	100 U	100 U	100 U	100 U	**2,900**	230	100 U	100 U	100 U	100 U	150	100 U	100 U	290
PAHs (µg/L)																		
Total cPAHs	0.1	0.0725 U	0.0717 U	0.0725 U	0.0717 U	0.0725 U	0.0725 U	0.0747 U	**10.45**	**0.1712**	0.0725 U	0.0717 U	0.0717 U	0.0732 U	0.0725 U	0.0717 U	0.0717 U	0.0725 U
VOCs (µg/L)																		
Benzene	1.6	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.53	0.50 U	0.72	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	**1.9**	**2.1**	0.50 U

Notes:

1. Data qualifiers are as follows:
   J = The result is an approximation.
   NJ = The result is estimated and the identification is tentative due to a poor match with the reference standard.
   U = not detected at or above the laboratory reporting limit shown.
2. Bolded values exceed the PCLs summarized on Table 5-1.

Abbreviations:

µg/L = micrograms per liter
cPAHs = carcinogenic polycyclic aromatic hydrocarbons
FD = field duplicate
PAHs = polycyclic aromatic hydrocarbons
PCL = preliminary cleanup level
TPH = total petroleum hydrocarbons
VOCs = volatile organic compounds

TABLE 6-2: HISTORY OF LNAPL RECOVERY AT THE SITE

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

LNAPL Activity	Date	Gallons of Water Recovered	Gallons of LNAPL Recovered	Comments
May 1988 LNAPL Infiltration Trench	5/12/1988	1,150	250	A 45-foot-long trench with two sumps constructed. Vacuum truck used to recover water and LNAPL from sumps; diminishing recovery of LNAPL noted after two events.
	5/26/1988	1,200	50	
March 1989 Groundwater Extraction and Treatment	March 1989 to March 1990	NA	NA	Groundwater extraction and treatment system was installed in the location of the May 1988 infiltration gallery. Fluid extraction at RW-1, a former monitoring well, and re-infiltration into a 190-foot long trench. Groundwater pumped at 2 to 3 gallons per minute. No LNAPL recovered or observed.
June 1989 Bailing	June to August 1989	NA	7	LNAPL noted in MW-8 and MW-18; wells bailed and limited LNAPL recovered.
December 1990 Test Pit Installation	December 1, 1993	NA	0	Five test pits installed to 4 feet below ground surface and blackish LNAPL was observed; insufficent LNAPL was present to allow for recovery of oil.
June 1996 LNAPL Vacuum Recovery Pilot Test	May to June 1996	28,228	125	After investigations identifed LNAPL in a number of borings, a 4-inch-diameter vacuum recovery well (VRW-1) was installed at the northeast corner of the ADC property. The system was operated in three modes—skimmer, vacuum, and depression mode—with greater submersion of a total fluids pump and higher vacuums. LNAPL recovery was variable and the the test ran for fourteen days.
June 1996 LNAPL Recovery Trench Pilot Test	June 1996	1,000s	0	Three test pits were installed with two monitoring wells. For the recovery test, one test pit and two wells were evacuated with a vacuum truck. No measureable LNAPL was observed in the wells or the selected test pit.
June 1996 CSO Dewatering	June 1996 to July 1996	1,450,800	23,050	City of Everett repairs to the CSO line in the former Everett Avenue ROW just south of the Kimberly Clark Building. Repairs were coordinated with a dewatering project to recover LNAPL from three dewatering wells. Dewatering began on June18 and continued through July 10. LNAPL daily production peaked at 7,550 gallons on June 21, 1996, and decreased asymmtotically to zero by July 4, 1996.
January 1997 LNAPL Bailing	January 1997	NA	12.33	LNAPL was hand-bailed from a series of eight wells over eight separate events.
LNAPL Interceptor Trench	January 1999 to Present	NA	None since March 2010	A 485-foot-long passive LNAPL recovery trench was installed along the western and northern sides of the Exxon-Mobil/ADC Property. The trench is 3 feet wide, approximately 4.5 feet deep, backfilled with permeable material, and uses a downgradient barrier to LNAPL migration (former concrete footings or 16-mil HDPE). The trench is equiped with nine LNAPL recovery wells. Since installation approximately 16 years ago, only trace quanitities of LNAPL have been noted.
BNSF Soil Excavation	November 2010 to Mid-February 2011	1,489,246	6,019	Dewatering during excavation to approximately 10 feet deep. LNAPL recovered by vacuum truck during excavation as LNAPL accumulated on water surface within the excavation.
City of Everett Force Main	May 2012 through July 2012	3,000,000	unknown	Dewatering using dewatering points installed in fomer Everett Avenue toward the west and then south along Federal Avenue. The City did not record the volume of LNAPL recovered during this project.
Passive LNAPL Recovery from Wells and Sumps	March 2010 to August 2016	NA	33.9	Passive LNAPL recovery from wells, groundwater monitoring wells, and sumps frrom March 2010 through August 2016. Recovery methods including pumping oil from well, and using sorbent materials.

Abbreviations:

BNSF = BNSF Railway Company
City = City of Everett
CSO = combined sewer overflow
HDPE = high density polyethylene
LNAPL = light non-aqueous phase liquid
NA = not applicable
ROW = right of way

TABLE 7-1: HYDRAULIC PARAMETERS FROM AQUIFER AND SLUG TESTS

ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington

Test Type	Well Name	Hydraulic Conductivity (cm/sec)	Transmissivity (gpd/ft)	Storativity [1]	Source
Aquifer Test	MW-10	1.84E-03	627	0.01	AGRA (drawdown at observation well) [2]
	MW-10	3.35E-03	1136	0.006	AGRA (recovery at observation well) [2]
	MW-10	1.80E-03	608	0.008	AGRA (elastic response at observation well) [2]
	MW-18	2.01E-03	685	0.004	
	RW-1	1.41E-03	482	0.34	AGRA (delayed response at pumping well) [2]
Slug Test	MW-A1	2.65E-02	--	--	AMEC (rising head) [3]
	MW-A5	6.35E-03	--	--	
	MW-A6	9.28E-03	--	--	

Notes:

1. Storativity is dimensionless.
2. Undated AGRA pump test data included as an appendix to Remedial Investigation and Focused Feasibility Study, Mobil and ADC/Miller Properties, Everett, Washington (Exponent, 1998a).
3. Geometric mean of 5 slug test results (AMEC Earth & Environmental, 2010c).

Abbreviations:

ADC = American Distributing Company
AGRA = AGRA Earth & Environmental, Inc
cm/sec = centimeters per second
gpd/ft = gallons per day per foot of drawdown

TABLE 13-1: COMPARISON OF SOURCE AREA REMEDIATION ALTERNATIVES

ExxonMobil/ADC Site, Ecology Site ID 2728 Everett, Washington

Standards/Criteria		Alternative 1: LNAPL Area Excavation and Natural Source Zone Attenuation	Alternative 2: LNAPL Area Excavation and Source Area Stabilization	Alternative 3: Source Area Excavation
Protectiveness	Pros	Removes accessible LNAPL for placement in an engineered landfill. Remaining source area soils are undisturbed, supporting natural source zone attenuation Controls are included to implement appropriate action if LNAPL remaining in inaccessible areas becomes mobilized.	Removes accessible LNAPL for placement in an engineered landfill. Stabilizes remaining source area soils and limits groundwater flow through the stabilized soil. Controls are included to implement appropriate action if LNAPL remaining in inaccessible areas becomes mobilized.	Removes source area soils with placement in an off-Site engineered landfill. Controls are included to implement appropriate action if LNAPL remaining in inaccessible areas becomes mobilized.
	Cons	LNAPL and COCs would remain in inaccessible areas. COCs remain in unexcavated portion of source areas. Excavation could induce mobility in LNAPL outside the excavation area.	LNAPL and COCs would remain in inaccessible areas. Excavation could induce mobility in LNAPL outside the excavation area. Stabilization of source area soils would likely inhibit natural source zone attenuation and extend restoration time.	LNAPL and COCs would remain in inaccessible areas. Larger excavation than Alternative 1 and 2, therefore a greater risk of inducing mobility for LNAPL outside the excavation area.
	Rating	8	8	9
Permanence	Pros	Removes the accessible LNAPL for placement in an engineered landfill, reducing Site toxicity and impacted source area volume but not destroying contaminants. Natural source zone attenuation is expected to provide continued intrinsic degradation of LNAPL and COCs remaining after LNAPL excavation.	Removes the accessible LNAPL for placement in an engineered landfill, reducing Site toxicity and impacted source area volume but not destroying contaminants. Stabilizes remaining source area contamination to the extent practicable. Stabilization materials have long effective life. Natural source zone attenuation is expected to provide continued intrinsic degradation of LNAPL and COCs remaining in inaccessible areas.	Removes source area contamination to the extent practicable for placement in an engineered landfill, reducing Site toxicity and contaminant volume slightly more than Alternatives 1 and 2, but not destroying contaminants. Natural source zone attenuation is expected to provide continued intrinsic degradation of LNAPL and COCs remaining in inaccessible areas.
	Cons	Affected soil would remain in source areas and LNAPL would remain in inaccessible areas.	Affected soil would remain in stabilized source area soils and in inaccessible areas. LNAPL would remain in the inaccessible areas. Stabilization of source area soils would likely inhibit natural source zone attenuation and extend restoration time.	Affected soil and LNAPL would remain on Site primarily in inaccessible areas.
	Rating	8	8	9

TABLE 13-1: COMPARISON OF SOURCE AREA REMEDIATION ALTERNATIVES

ExxonMobil/ADC Site, Ecology Site ID 2728 Everett, Washington

Standards/Criteria		Alternative 1: LNAPL Area Excavation and Natural Source Zone Attenuation	Alternative 2: LNAPL Area Excavation and Source Area Stabilization	Alternative 3: Source Area Excavation
Cost	Pros	Lowest cost estimate.	Second lowest cost estimate.	None.
	Cons	Significant initial implementation cost. Long-term costs for response plans, maintenance, and monitoring.	Significant initial implementation cost. Highest cost. Long-term costs for response plans, maintenance, and monitoring.	Significant initial implementation cost, greater than lowest cost alternative. Long-term costs for response plans, maintenance, and monitoring.
	Rating	9	4	4
Long-Term Effectiveness	Pros	The most highly contaminated material in source areas would be removed and placed in an off-Site landfill. Relies on intrinsic degradation processes for remediation of Site COCs and LNAPL (inaccessible areas) remaining after excavation.	The most highly contaminated material in source areas would be removed and placed in an off-Site landfill. Relies on intrinsic degradation processes for remediation of Site COCs and LNAPL (inaccessible areas) remaining after excavation. Soil stabilization uses natural components that have a long-term viability.	The most highly contaminated material in source areas would be removed and placed in an off-Site landfill. Relies on intrinsic degradation processes for remediation of COCs and LNAPL in inaccessible areas after excavation.
	Cons	Long-term, active Site management would be required. Surface cover would require periodic maintenance. Limited soil contamination would remain in source areas until fully degraded. Long-term response plans and institutional controls would be required to address remaining affected soil and/or LNAPL outside of excavation and in the inaccessible areas.	Long-term, active management would be required. Surface cover would require periodic maintenance. Long-term response plans and institutional controls would be required to address remaining affected soil and/or LNAPL outside of excavation and in the inaccessible areas. Stabilized soil would likely hinder natural degradation processes for remaining COCs in source areas.	Long-term, active Site management would be required. Long-term response plans and institutional controls would be required to address remaining affected soil and/or LNAPL in the inaccessible areas.
	Rating	7	7	8
Management of Short-Term Risks	Pros	Reduced potential for short-term risk relative to Alternatives 2 and 3 due to smaller construction/transportation requirements. Proven construction methodologies are available to mitigate potential short-term risks during work.	Proven construction methodologies are available to mitigate short-term risks during work.	Reduced potential for short-term risk relative to Alternative 2 due to single construction method. Proven construction methodologies are available to mitigate short-term risks during work.
	Cons	Significant excavation, with significant potential for releases to air and surface water during construction and transportation and with significant potential for worker exposure. Significant potential to adversely affect adjacent improvements. Shoring would be required to mitigate risks of structural failure.	Significant excavation, with significant potential for releases to air and surface water during construction and transportation, and with significant potential for worker exposure. Significant potential to adversely affect adjacent improvements. Shoring would be required to mitigate risks of structural failure. Soil mixing creates substantial potential for worker exposure. Added complexity of implementing two different remedial techniques. Two separate mobilizations required using two different sets of equipment.	Larger excavation than Alternative 1, with greater potential for releases to air and surface water during construction and increased potential for worker exposure. Increased transportation increases short-term risks. Greater potential to adversely affect adjacent improvements; increased shoring would be required compared to Alternative 1 to mitigate risks of structural failure.
	Rating	8	4	4

TABLE 13-1: COMPARISON OF SOURCE AREA REMEDIATION ALTERNATIVES

ExxonMobil/ADC Site, Ecology Site ID 2728 Everett, Washington

Standards/Criteria		Alternative 1: LNAPL Area Excavation and Natural Source Zone Attenuation	Alternative 2: LNAPL Area Excavation and Source Area Stabilization	Alternative 3: Source Area Excavation
Technical and Administrative Implementability	Pros	Somewhat less invasive than Alternative 3. Could be implemented with local contractors. Natural source zone attenuation is non-invasive and can be readily implemented.	Portions of the work could be performed by local contractors. Soil stabilization is a frequently used technology. Natural source zone attenuation is non-invasive and can be readily implemented.	Could be implemented with local contractors. Natural source zone attenuation is non-invasive and can be readily implemented.
	Cons	Excavation would be difficult due to Site conditions. Requires excavation through water, increasing the potential for releases to adjacent properties or surface water. Groundwater management would be difficult; permitting and safeguards would be difficult to implement. Requires agreements with City of Everett, Port of Everett, and KC property owner concerning remaining LNAPL in inaccessible areas. Potential for inducing LNAPL movement from inaccessible areas.	Excavation would be difficult due to Site conditions. Requires excavation through water, increasing the potential for releases to adjacent properties or surface water. Groundwater management would be difficult; permitting and safeguards would be difficult to implement. Requires agreements with City of Everett, Port of Everett, and KC property owner concerning remaining LNAPL in inaccessible areas. Potential for inducing LNAPL movement from inaccessible areas. Specialty contractor and equipment would be needed for soil stabilization. Second mobilization would be required. Site-specific pilot testing has not been completed.	Excavation would be difficult due to Site conditions. Requires excavation through water, increasing the potential for releases to adjacent properties or surface water. Groundwater management would be difficult; permitting and safeguards would be difficult to implement. Requires agreements with City of Everett, Port of Everett, and KC property owner concerning remaining LNAPL in inaccessible areas. Higher potential for inducing LNAPL movement from inaccessible areas than Alternatives 1 & 2.
	Rating	9	4	6
Public Concerns	Pros	Expected to be accepted by public.	Expected to be accepted by public.	Expected to be accepted by public.
	Cons	Some concern may result due to contamination left in soil/source areas and inaccessible areas and the long-term risk management approach.	Some concern may result due to contamination left in soil/source areas and inaccessible areas and the long-term risk management approach. Greatest amount of construction related traffic. Port of Everett will likely not permit ISS on port property.	Some concern may result due to contamination in inaccessible areas and the long-term risk management approach. Community concern may result due to increased truck transportation relative to Alternative 1.
	Rating	8	4	7
Restoration Time Frame	Pros	Shortest initial construction time. Partial removal of source area contamination may somewhat shorten restoration time. Source area COCs remaining after implementation are expected to attenuate by natural processes. LNAPL and COCs in inaccessible areas are expected to slowly degrade by natural degradation processes.	Partial removal and ISS of source area contamination would be completed in a short time, but slightly longer than for Alternative 1. COCs remaining in source areas after implementation would have reduced mobility. LNAPL and COCs in inaccessible areas are expected to slowly degrade by natural degradation processes.	Removal of source area contamination may somewhat shorten Site restoration time. LNAPL and COCs in inaccessible areas are expected to slowly degrade by natural degradation processes.
	Cons	Site COCs would remain in source areas and inaccessible areas following remediation activities and slowly attenuate by natural degradation processes. LNAPL would remain in inaccessible areas and slowly attenuate by natural degradation processes.	Construction time longer than Alternative 1 and longer than Alternative 3. Site COCs and/or LNAPL would remain in the inaccessible areas following remediation activities. COCs would remain in source areas for an extended time. Stabilized soil may slightly hinder natural attenuation processes for COCs in source area.	Construction time longer than Alternative 1. Site COCs and/or LNAPL would remain within inaccessible areas following active remediation.
	Rating	7	6	7

TABLE 13-1: COMPARISON OF SOURCE AREA REMEDIATION ALTERNATIVES

ExxonMobil/ADC Site, Ecology Site ID 2728 Everett, Washington

Standards/Criteria		Alternative 1: LNAPL Area Excavation and Natural Source Zone Attenuation	Alternative 2: LNAPL Area Excavation and Source Area Stabilization	Alternative 3: Source Area Excavation
Sustainability	Pros	Resource use for excavation and transportation is lower than for Alternatives 2 and 3. Non-invasive processes applied for remediation of portion of source areas and inaccessible areas.	Resource use is comparable to Alternative 3. Non-invasive processes applied for remediation of inaccessible areas.	Resource use is comparable to Alternative 2. Non-invasive processes applied for remediation of inaccessible areas.
	Cons	Significant requirements for waste transportation and use of landfill capacity for disposal. Requires long-term monitoring program for remaining LNAPL and COCs in source areas and inaccessible areas.	Significant requirements for waste and material transportation and significant use of landfill capacity for disposal. Requires long-term monitoring program for remaining LNAPL and COCs in the source areas and inaccessible areas.	Greatest requirements for waste transportation and landfill capacity for disposal. Requires long-term monitoring program for remaining LNAPL and COCs in the inaccessible areas.
	Rating	8	6	4
RATING TOTAL		**72**	**51**	**58**
OVERALL BENEFIT		**63**	**47**	**54**

Notes:

Comparison Ratings:
10 = Exceptional. This rating indicates an alternative fully achieves the criterion.
5 = Medium. Alternative partially achieves the requirements for the criterion.
1 = Very Low. The alternative does not achieve the requirements for the criterion.
Rating total = sum of ratings for all nine criteria. Overall benefit = sum of rating for all criteria except cost

Abbreviations:

COC = contaminants of concern
KC = Kimberly-Clark Corporation
LNAPL = light nonaqueous phase liquid

TABLE 13-2: PRELIMINARY COST ESTIMATE FOR SOURCE AREA ALTERNATIVES

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

			Alternative 1: LNAPL Area Excavation and Natural Source Zone Attenuation		Alternative 2: LNAPL Area Excavation and Source Area Stabilization		Alternative 3: Source Area Excavation	
Description	**Rate[1]**	**Units**	**Quantity**	**Cost**	**Quantity**	**Cost**	**Quantity**	**Cost**
Contractor Cost								
Mobilization/Demobilization	$100,000	LS	4	$400,000	6	$600,000	5	$500,000
Site Setup	$50,000	LS	2	$100,000	3	$150,000	3	$150,000
Structures Removal and Restoration	$75,000	LS	2	$150,000	3	$225,000	3	$225,000
Soil Stabilization (1% bentonite, 10% cement)	$57	CY	0	$0	3,400	$194,000	0	$0
Existing Asphalt Removal	$12	CY	900	$11,000	1,100	$14,000	1,100	$14,000
Asphalt Paving	$140	TON	1,800	$252,000	2,200	$308,000	2,200	$308,000
Soil Excavation (including sloping)	$17	CY	22,700	$386,000	22,700	$386,000	23,200	$395,000
Stockpile/placement of clean sloping for fill	$10	CY	2,500	$25,000	2,500	$25,000	2,200	$22,000
Backfill Import	$26	TON	30,900	$804,000	28,800	$749,000	34,900	$908,000
Soil Transport & Disposal	$87	TON	30,900	$2,689,000	30,500	$2,654,000	34,900	$3,037,000
Sheet Pile Shoring	$33	SF	26,200	$865,000	26,200	$865,000	36,000	$1,188,000
Stormwater Treatment System Operation	$43,000	MO	4	$172,000	5	$215,000	5	$215,000
Security Fence	$38	LF	600	$23,000	600	$23,000	600	$23,000
SUBTOTAL				**$5,877,000**		**$6,408,000**		**$6,985,000**
Sales Tax	9.7	%		$570,000		$622,000		$678,000
CONTRACTOR COST				**$6,447,000**		**$7,030,000**		**$7,663,000**
Consultant Cost								
Field Investigation	$100,000	LS	1	$100,000	2	$200,000	1	$100,000
Access Agreements	$100,000	LS	1	$100,000	1	$100,000	1	$100,000
Well Abandonment	$800	LS	20	$16,000	20	$16,000	20	$16,000
Surveying	$2,300	Day	15	$35,000	15	$35,000	15	$35,000
Design	$50,000	LS	3	$150,000	4	$200,000	3	$150,000
Permitting	$40,000	LS	2	$80,000	2	$80,000	2	$80,000
Project Management	$2,500	MO	20	$50,000	20	$50,000	20	$50,000
Sampling and Analysis	$50,000	LS	2	$100,000	4	$200,000	3	$150,000
Archeological Oversite	$5,000	LS	1	$5,000	1	$5,000	1	$5,000
Construction Management	$15,000	WK	20	$300,000	28	$420,000	28	$420,000
Construction Report	$50,000	LS	1	$50,000	2	$100,000	1	$50,000
Institutional Controls	$75,000	LS	1	$75,000	1	$75,000	1	$75,000
Risk Management Planning	$60,000	LS	1	$60,000	1	$60,000	1	$60,000
CONSULTANT COST				**$1,121,000**		**$1,541,000**		**$1,291,000**
CAPITAL COST SUBTOTAL				**$7,568,000**		**$8,571,000**		**$8,954,000**
CONTINGENCY	1	%	10	$757,000	15	$1,286,000	10	$895,000
TOTAL CAPITAL COST				**$8,325,000**		**$9,857,000**		**$9,849,000**
Operation and Maintenance								
Years 1 through 5								
NSZA Rate Measurements	$500	EA	25	$12,500	25	$12,500	25	$12,500
Gauging & Bailing	$1,300	EA	60	$78,000	60	$78,000	60	$78,000
Non-Hazardous Oil Disposal	$250	Drum	10	$2,500	10	$2,500	10	$2,500
Project Management	$29,000	Annual	5	$145,000	5	$145,000	5	$145,000
Years 6 through 50								
Gauging & Bailing	$1,300	EA	175	$227,500	175	$227,500	175	$227,500
Non-Hazardous Oil Disposal	$250	Drum	55	$13,800	55	$13,800	55	$13,800
NSZA Rate Measurements	$500	EA	50	$25,000	50	$25,000	50	$25,000
Project Management	$6,000	Annual	45	$270,000	45	$270,000	45	$270,000
O&M COST SUBTOTAL				**$761,800**		**$761,800**		**$761,800**
Contingency	1	%	10	$76,000	15	$114,000	10	$76,000
TOTAL O&M COST				**$837,800**		**$875,800**		**$837,800**
TOTAL ESTIMATED COST				**$9,163,000**		**$10,733,000**		**$10,687,000**
50 Year NPV (1.6% net discount rate)				**$8,788,000**		**$10,295,000**		**$10,271,000**

Notes
1. Rates are in 2019 US dollars.

Abbreviations:
CY = cubic yard
EA = each
LF = linear feet
LS = lump sum
MO = month
NPV = net present value
NSZA = natural source zone attentuation
O&M = operation and maintenance
SF = square feet
WK = week

TABLE 13-3: COMPARISON OF GROUNDWATER REMEDIATION ALTERNATIVES

ExxonMobil/ADC Site, Ecology Site ID 2728 Everett, Washington

Standards/Criteria		Alternative 1: Monitored Natural Attenuation	Alternative 2: Funnel and Gate
Protectiveness	Pros	Protective of human health and the environment. Intrinsic biodegradation is active at Site and is presently achieving PCLs at proposed CPOC. Relies on natural constituent degradation processes that are currently active at Site.	Protective of human health and the environment. Provides more robust means to remove groundwater COCs. Combines engineered component with ongoing natural attenuation processes.
	Cons	Effectiveness must be maintained for long-term attenuation of COCs from inaccessible areas.	Requires long-term operation and maintenance to maintain effectiveness. Could decrease effectiveness of natural attenuation process by removing substrate from groundwater. Inaccessible areas would require long-term maintenance of engineered components.
	Rating	8	7
Permanence	Pros	Permanently destroys or reduces toxicity of COCs by natural processes. Natural attenuation is currently active at the Site.	Immobilizes COCs on sorbent media. Destroys or reduces toxicity of non-adsorbed COCs by natural processes.
	Cons	Relies on natural environmental conditions that could change.	Relies on active maintenance and natural environmental conditions that could change. Implementation time would be associated with funnel and gate construction.
	Rating	9	7
Cost	Pros	Lower cost than Alternative 2. Total cost less than half of Alternative 2.	None. High cost alternative.
	Cons	Long-term monitoring required to confirm effectiveness.	Long-term monitoring and maintenance required to maintain and confirm effectiveness. Construction cost substantially higher than Alternative 1.
	Rating	9	4
Long-Term Effectiveness	Pros	Intrinsic biodegradation is effective at present for releases that occurred more than 50 years ago and is expected to remain effective in the future due to reliance on indigenous organisms and natural processes.	Proven technologies used for this alternative that are known to be effective. The PRB has a fixed life but is backed up by MNA.
	Cons	No active control over natural attenuation rate.	Active maintenance required to maintain effectiveness of sorbent media in the PRB. The PRB may affect intrinsic biodegradation downgradient of the funnel and gate due to altering the substrate composition in that area.
	Rating	9	6
Management of Short-Term Risks	Pros	Very limited construction required for implementation, thereby minimal potential for short-term risk.	Funnel and gate construction occurs in area with fairly low levels of groundwater contamination.
	Cons	Minor potential for short-term risk due to installation of monitoring wells.	Excavation required for installation of funnel and gate system, creating short-term health and safety risks during implementation.
	Rating	9	6
Technical and Administrative Implementability	Pros	Simple alternative that can be implemented within 1–2 days by multiple local contractors, with minimal permitting requirements and access agreements that already have been negotiated.	Proven technologies that can be readily installed by specialty contractors.
	Cons	Access agreements required for monitoring wells and CPOC.	Construction occurs on third party property and within active industrial areas, requiring more complex access agreements and scheduling to avoid adversely affecting ongoing industrial operations. Access agreements required for monitoring wells and CPOC. Ongoing access needed to inspect and maintain funnel and gate.
	Rating	8	5
Public Concerns	Pros	Expected to be accepted by public.	Expected to be accepted by public.
	Cons	May be some concern due to reliance on intrinsic biodegradation, a passive remedy.	May be some concern due to ultimate reliance on a passive remedy.
	Rating	7	7
Restoration Time Frame	Pros	Natural attenuation is currently achieving cleanup standard at anticipated CPOC.	Natural attenuation is currently achieving cleanup standard at anticipated CPOC.
	Cons	None. Natural attenuation has been effective at Site.	Funnel and gate would not affect restoration time frame.
	Rating	9	9

TABLE 13-3: COMPARISON OF GROUNDWATER REMEDIATION ALTERNATIVES

ExxonMobil/ADC Site, Ecology Site ID 2728 Everett, Washington

Standards/Criteria		Alternative 1: Monitored Natural Attenuation	Alternative 2: Funnel and Gate
Sustainability	Pros	Minimal requirements for materials, equipment, and transportation to implement this alternative. Remedy relies on natural, passive processes that are already active at Site.	Readily available materials are used for remedy construction. The remedy operates using a combination of natural processes and an engineered component that requires limited active operation.
	Cons	None. Natural attenuation has been effective at Site.	The PRB requires active monitoring and maintenance to ensure effectiveness. A significant amount of waste would be generated from construction that would require off-Site transportation and disposal. Additional waste generation may occur in the future due to maintenance of the PRB.
	Rating	9	6
RATING TOTAL		**77**	**57**
OVERALL BENEFIT		**68**	**53**

Notes:
Comparison Ratings:
10 = Exceptional. This rating indicates an alternative fully achieves the criterion.
5 = Medium. Alternative partially achieves the requirements for the criterion.
1 = Very Low. The alternative does not achieve the requirements for the criterion.
Rating total = sum of ratings for all nine criteria. Overall benefit = sum of rating for all criteria except cost

Abbreviations:
COC = constituent of concern
CPOC = conditional point of compliance
MNA = monitored natural attenuation
PCL = preliminary cleanup level
PRB = permeable reactive barrier

TABLE 13-4: PRELIMINARY COST ESTIMATE FOR GROUNDWATER ALTERNATIVES

ExxonMobil/ADC Property, Ecology Site ID 2728

Everett, Washington

Description	Rate	Units	Alternative 1: Monitored Natural Attenuation		Alternative 2: Funnel and Gate	
			Quantity	Cost	Quantity	Cost
Contractor Cost						
Mobilization/Demobilization	$50,000	LS		$0	1	$50,000
Site Setup	$20,000	LS		$0	1	$20,000
Structure Removal and Restoration	$150,000	LS		$0	1	$150,000
Low Permeability Barrier Wall	$25	SF		$0	5,250	$132,000
Low Permeability Barrier Import	$21	TON		$0	1,200	$26,000
Reactive Barrier Vault	$50,000	EA		$0	1	$50,000
Reactive Media	$2,500	TON		$0	80	$200,000
Asphalt Paving	$140	TON		$0	70	$10,000
Soil Transport & Disposal	$87	TON		$0	2,400	$209,000
SUBTOTAL				**$0**		**$847,000**
Sales Tax	9.7	%		$0		$82,200
CONTRACTOR COST				**$0**		**$929,200**
Consultant Cost						
Field Investigation	$25,000	LS	0	$0	1	$25,000
Monitoring Well Installation	$2,500	EA	1	$3,000	1	$3,000
Surveying	$2,000	Day	1	$2,000	3	$6,000
Design	$60,000	LS	0	$0	1	$60,000
Permitting	$20,000	LS	0	$0	1	$20,000
Project Management	$2,500	MO	1	$2,500	4	$10,000
Sampling and Analysis	$10,000	LS	1	$10,000	2	$20,000
Construction Management	$15,000	WK	0.5	$8,000	8	$120,000
Construction Report	$5,000	LS	1	$5,000	4	$20,000
CONSULTANT COST				**$30,500**		**$284,000**
CAPITAL COST SUBTOTAL				**$30,500**		**$1,213,200**
CONTINGENCY	10	%		$3,000		$121,000
TOTAL CAPITAL COST				**$34,000**		**$1,334,000**
Monitoring and/or Maintenance						
Years 1 through 5						
Reactive Media Excavation and Disposal	$30,000	Round	0	$0	0	$0
Reactive Barrier Media Replacement	$50,000	Annual	0	$0	0	$0
IDW Disposal	$1,000	Annual	5	$5,000	5	$5,000
Groundwater Monitoring	$15,000	EA	10	$150,000	10	$150,000
Reports	$5,100	EA	10	$51,000	10	$51,000
Project Management		Annual	5	$0	5	$0
Years 6 through 50						
Reactive Barrier Excavation and Disposal	$30,000	Annual	0	$0	3	$90,000
Reactive Barrier Media Replacement	$50,000	Annual	0	$0	3	$150,000
IDW Disposal	$500	Annual	15	$7,500	15	$7,500
Well Maintenance	$2,000	EA	10	$20,000	10	$20,000
Groundwater Monitoring	$15,000	EA	15	$225,000	15	$225,000
Reports	$5,100	EA	15	$76,500	15	$76,500
Well Decommissioning	$600	EA	16	$9,600	16	$9,600
Project Management		Annual	15	$0	15	$0
O&M COST SUBTOTAL				**$544,600**		**$784,600**
Contingency	10	%		$54,460		$78,460
TOTAL O&M COST				**$599,060**		**$863,060**
TOTAL ESTIMATED COST				**$633,000**		**$2,197,000**
50 Year NPV (1.6% net discount rate)				**$545,000**		**$2,063,000**

Abbreviations:

EA = each
IDW = investigation-derived waste
LS = lump sum
MO = month
NPV = net present value
O&M = operation and maintenance
SF = square feet
WK = week

TABLE 14-1: DISPROPORTIONATE COST ANALYSIS FOR REMEDIATION ALTERNATIVES

ExxonMobil/ADC Site, Ecology Site ID 2728 Everett, Washington

		Source Area Alternatives			**Groundwater Alternatives**	
	Item	**1: LNAPL Area Excavation and Natural Source Zone Attenuation**	**2: LNAPL Area Excavation and Source Area Stabilization**	**3: Source Area Excavation**	**1: Monitored Natural Attenuation**	**2: Funnel and Gate**
Description of Alternatives[1]						
Components	Total Estimated NPV Cost[2] (2019 $)[3]	**$8,788,000**	**$10,295,000**	**$10,271,000**	**$545,000**	**$2,063,000**
	Institutional Controls	Yes	Yes	Yes	Yes	Yes
	Engineering Controls	Yes	Yes	Yes	No	Yes
	Contamination left in place	Yes	Yes	Yes	Yes	Yes
	Waste Disposal Off Site (tons)	30,900	30,500	34,900	Minimal	2,400
	LNAPL Recovery	Yes	Yes	Yes	No	No
	LNAPL Removal during Construction (gal)	1,000	1,000	1,200	Minimal	Minimal
Disproportionate Cost Analysis						
	Criteria	**Score[4]**	**Score[4]**	**Score[4]**	**Score[4]**	**Score[4]**
DCA & Relative Benefits Ranking Comparison	Protectiveness	8	8	9	8	7
	Permanence	8	8	9	9	7
	Long-Term Effectiveness	7	7	8	9	6
	Management of Short-Term Risks	8	4	4	9	6
	Technical and Administrative Implementability	9	4	6	8	5
	Public Concerns	8	4	7	7	7
	Restoration Time Frame	7	6	7	9	9
	Sustainability	8	6	4	9	6
	Overall Benefit Rating	63	47	54	68	53
	Ratio of Cost/Benefit	$139,000	$219,000	$190,000	$8,000	$39,000

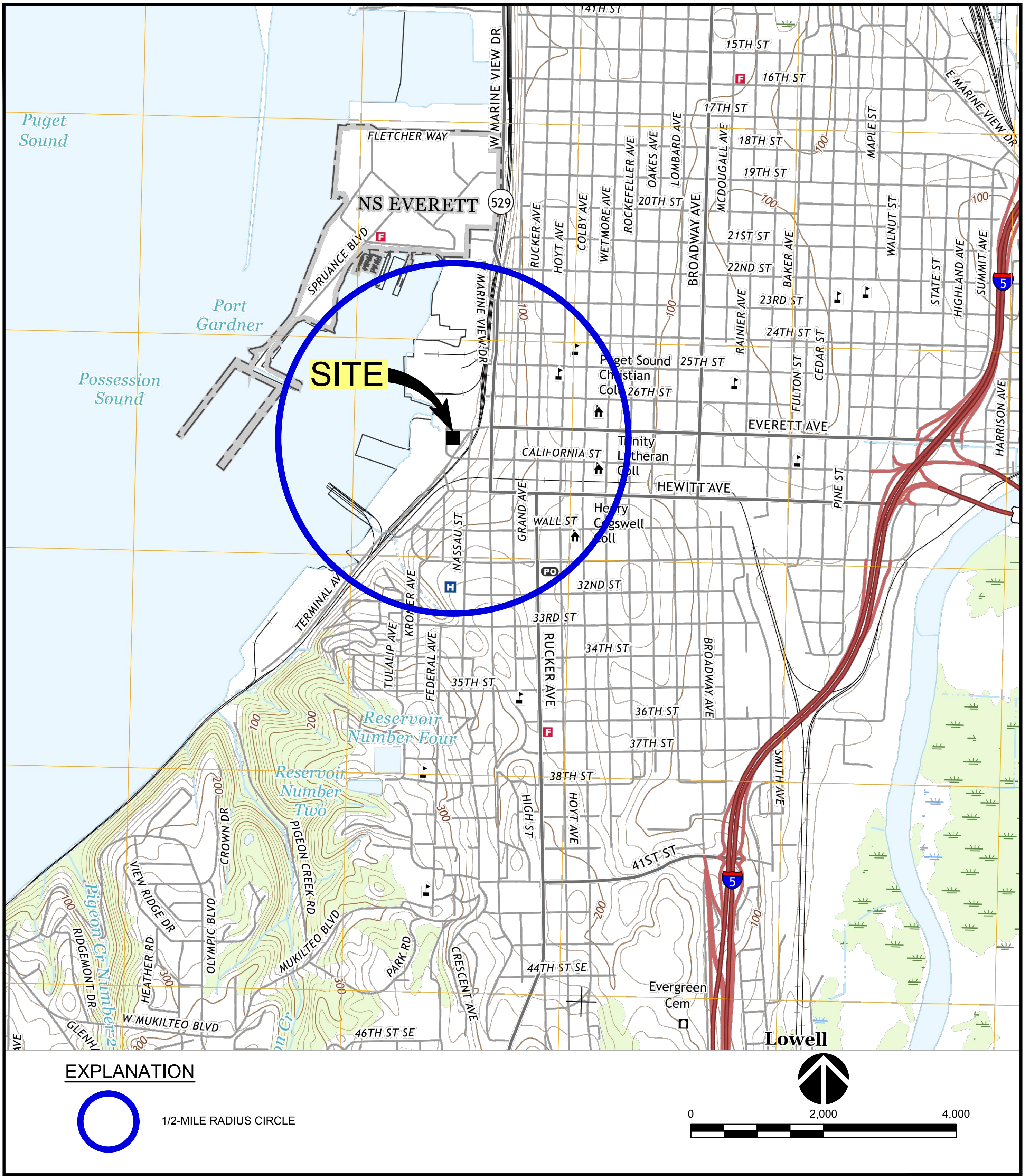
Notes:

1. The comprehensive Site remedy will consist of one soil/source area alternative and one groundwater alternative.
2. 50 years, 1.6 percent net discount rate.
3. Amounts are in 2019 US dollars.
4. Comparison Ratings:
   10 = Exceptional. This rating indicates an alternative fully achieves the criterion.
   5 = Medium. Alternative partially achieves the requirements for the criterion.
   1 = Very Low. The alternative does not achieve the requirements for the criterion.
   Overall benefit = sum of rating for all criteria except cost

Abbreviations:

DCA = disproportionate cost analysis
gal = gallons
LNAPL = light nonaqueous phase liquid
NPV = net present value

FIGURES



CLIENT		PROJECT	DATE
EXXONMOBIL AND AMERICAN DISTRIBUTING CO.	wood.	EXXONMOBIL/ADC PROPERTY ECOLOGY SITE ID 2728	JUNE 2017
			SCALE AS SHOWN
Wood Environment & Infrastructure Solutions, Inc. 600 University Street, Suite 600 Seattle, WA 98101		TITLE SITE LOCATION	PROJECT NO. 6103140009
			FIGURE No: 2-1

DRAWN BY: APS CHECKED BY: LV

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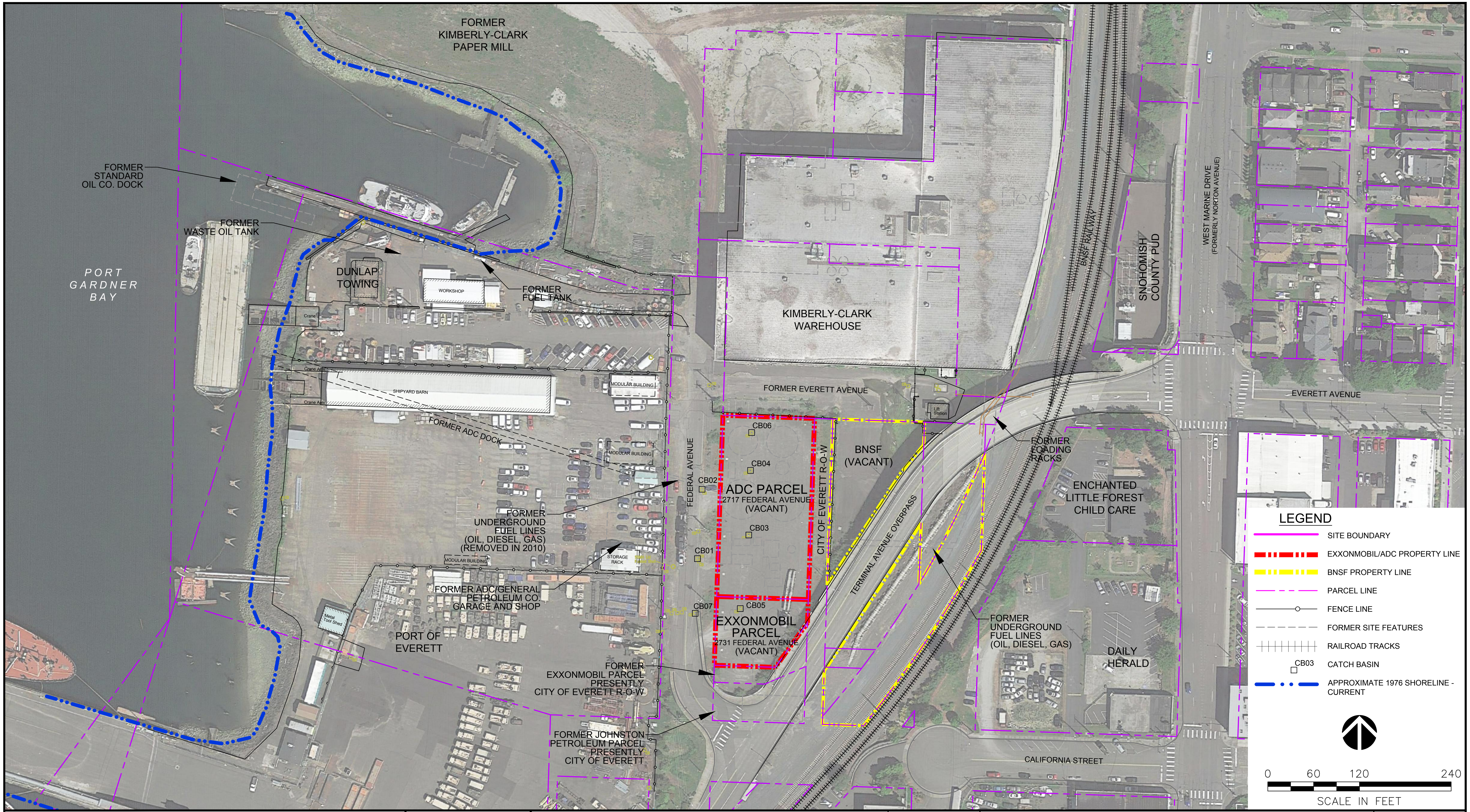


SOURCE: PARCELS FROM SNOHOMISH COUNTY.

wood.

CLIENT:
EXXONMOBIL
AMERICAN DISTRIBUTING CO.

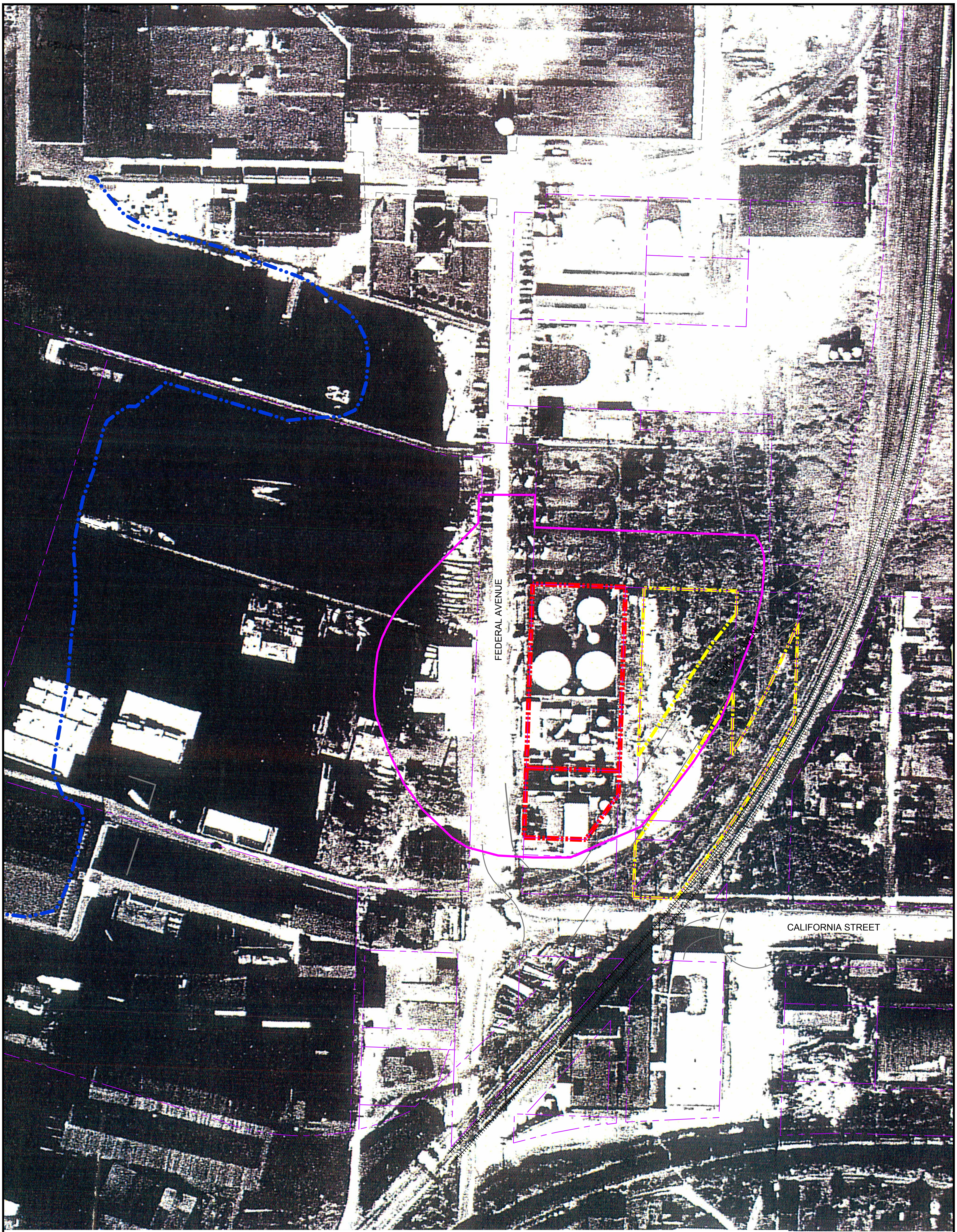
Wood Environment &
Infrastructure Solutions, Inc.
600 University Street, Suite 600
Seattle, WA, U.S.A. 98101

DWN BY: APS
CHK'D BY: LV/AS/MS
DATUM: NAD 83 N FT
PROJECTION: WASP
SCALE: AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
SITE VICINITY MAP

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 2-2



LEGEND

- SITE BOUNDARY
- PARCEL LINE
- EXXONMOBIL/ADC PROPERTY LINE
- BNSF PROPERTY LINE
- APPROXIMATE 1976 SHORELINE - CURRENT

CLIENT

EXXONMOBIL AND
AMERICAN DISTRIBUTION COMPANY

Wood Environment &
Infrastructure Solutions, Inc.
600 University Street, Suite 600
Seattle, Washington 98101

wood.

PROJECT

EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

1947 AERIAL PHOTOGRAPH

DATE
SEPTEMBER 2018

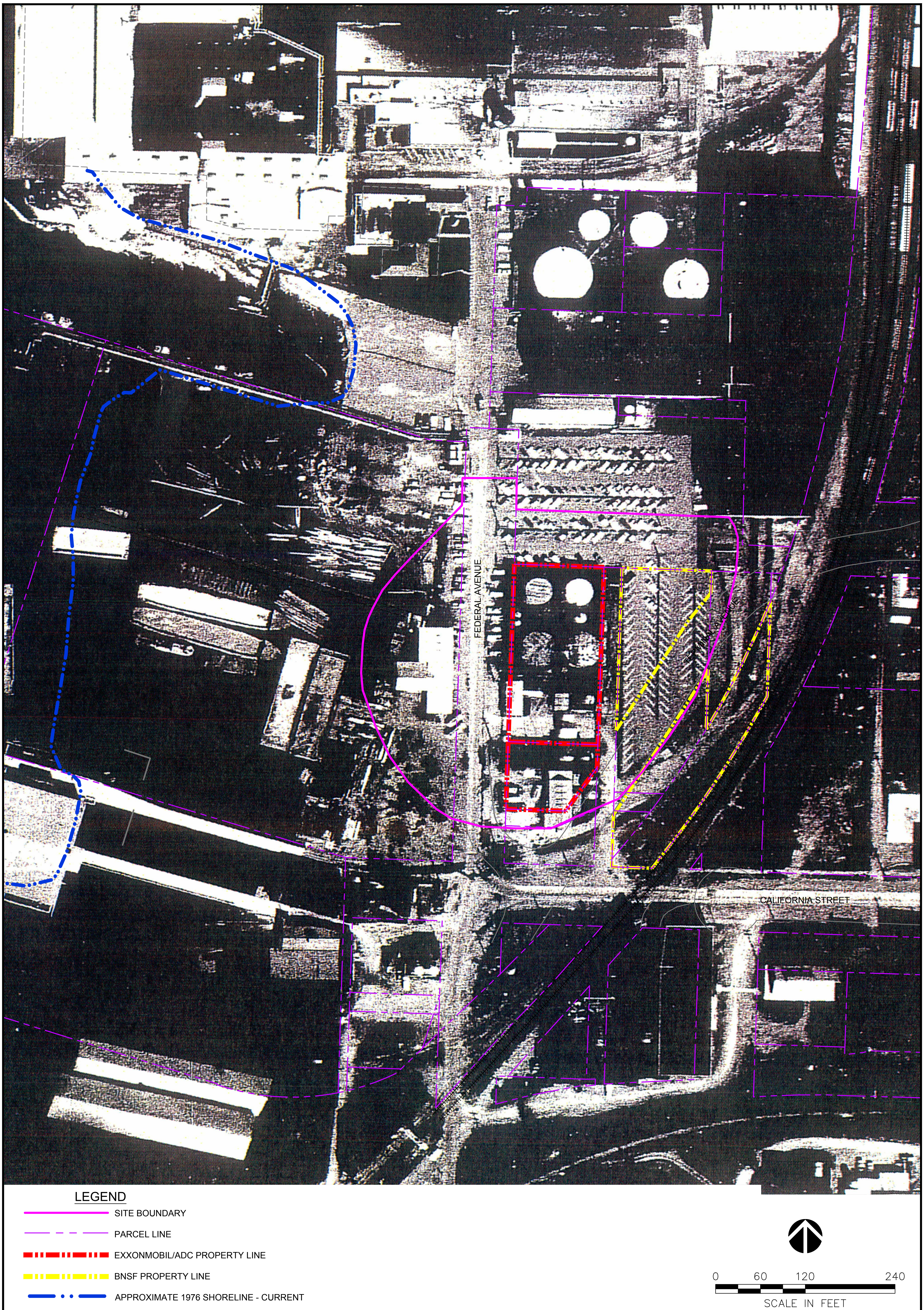
PROJECT NO.
6103150009

REV NO.
1

FIGURE No.
2-3

DRAWN BY: APS CHECKED BY: LV

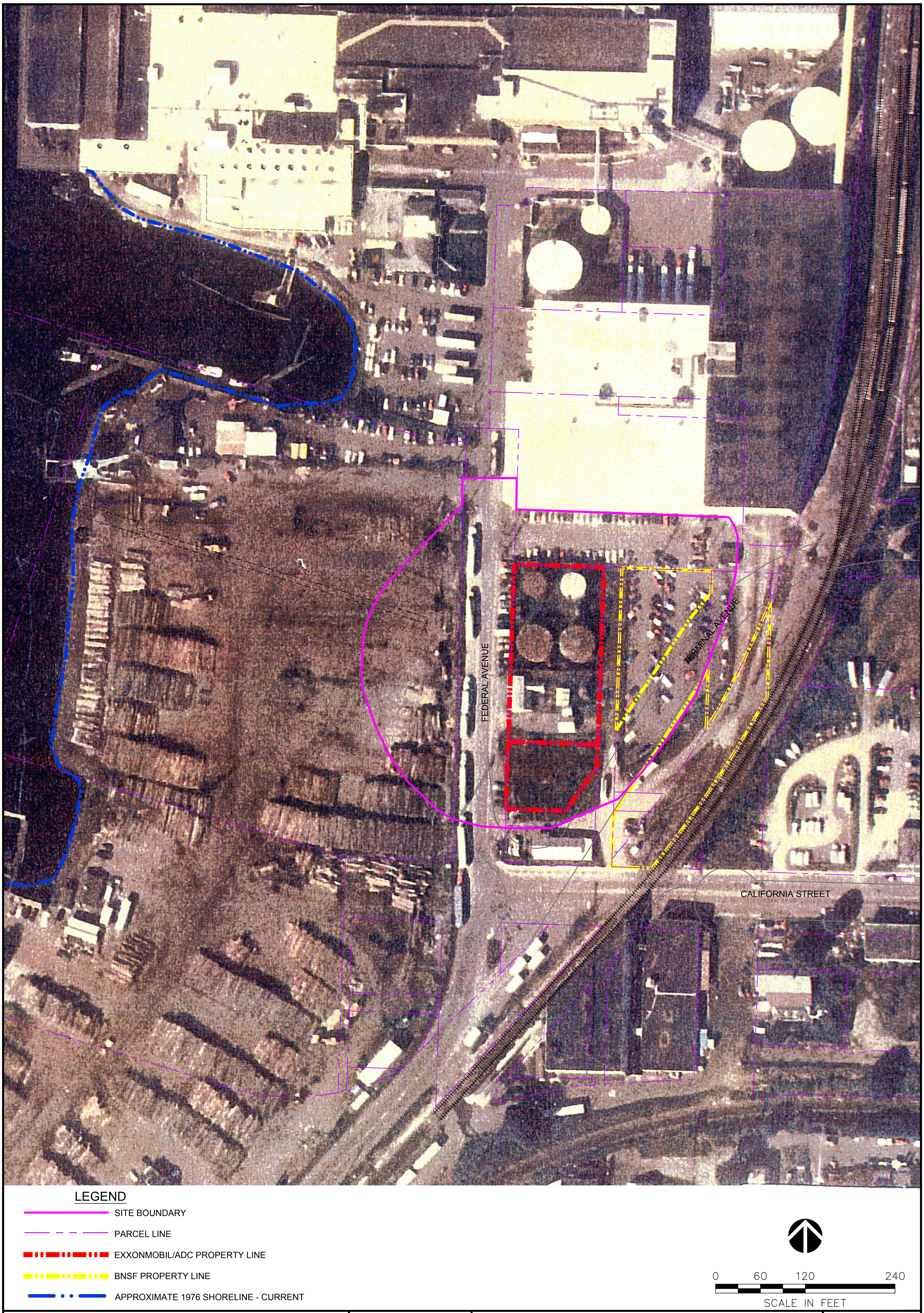
S:\6103-0009\001_DataInvestigationReport\Everett_EXM-Figures_091118.dwg – Fig2-3_1947aerial – Sep. 12, 2018 1:38pm – adam.stenberg



CLIENT EXXONMOBIL AND AMERICAN DISTRIBUTION COMPANY	wood.	PROJECT EXXONMOBIL/ADC PROPERTY ECOLOGY SITE ID 2728	DATE SEPTEMBER 2018 PROJECT NO. 6103180009
Wood Environment & Infrastructure Solutions, Inc. 600 University Street, Suite 600 Seattle, Washington 98101		TITLE 1967 AERIAL PHOTOGRAPH	REV NO. 1 FIGURE No. 2-4

DRAWN BY: APS CHECKED BY: LV

S:\6103-0009\001_DataInvestigationReport\Everett_EXM-Figures_091118.dwg – Fig2-4_1967aerial – Sep. 12, 2018 1:38pm – adam.stenberg



CLIENT

EXXONMOBIL AND
AMERICAN DISTRIBUTION COMPANY

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Infrastructure Solutions, Inc.
600 University Street, Suite 600
Seattle, Washington 98101

PROJECT

EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

1993 AERIAL PHOTOGRAPH

DATE
SEPTEMBER 2018

PROJECT NO.
6103180009

REV NO.
1

FIGURE No.
2-5

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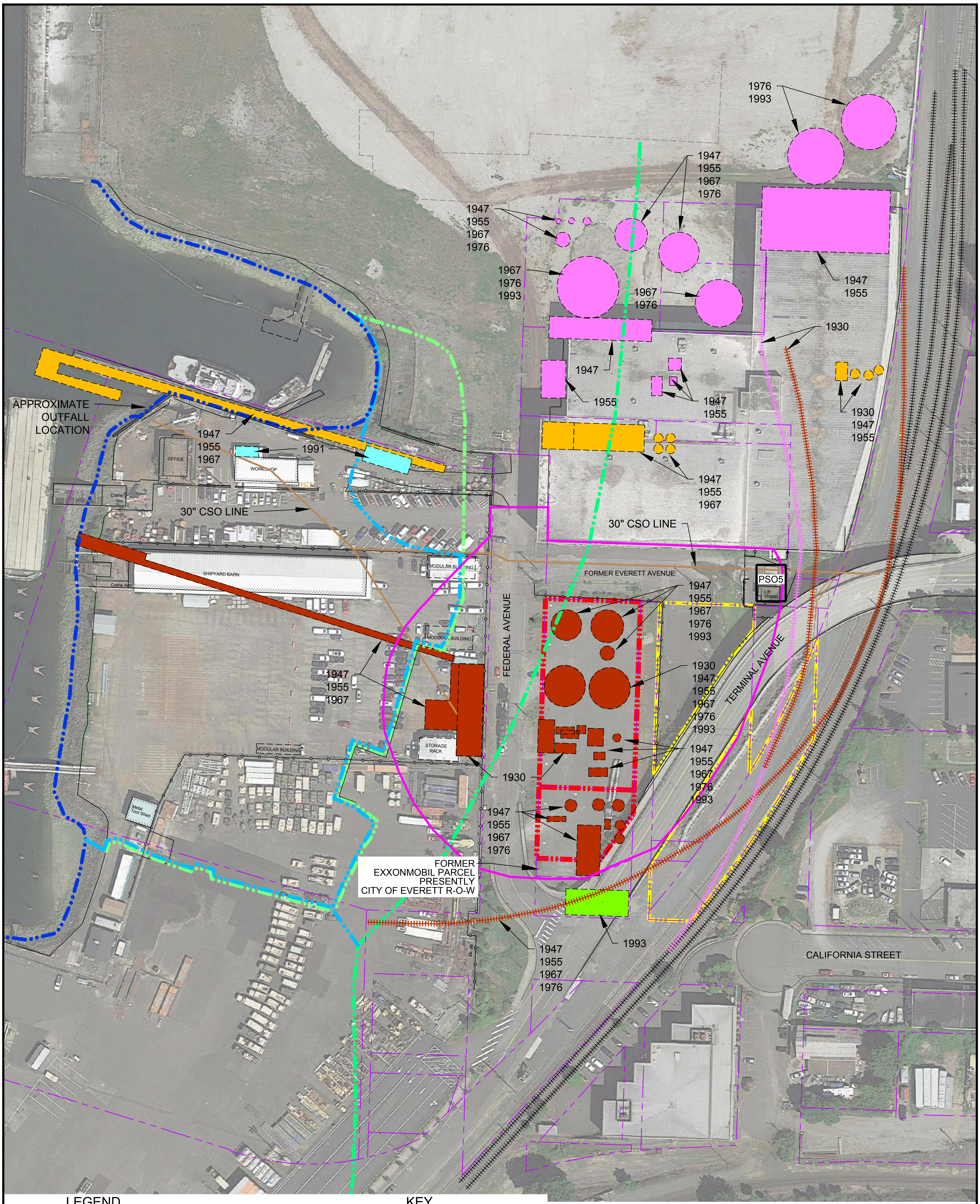

LEGEND

- SITE BOUNDARY
- EXXONMOBIL/ADC PROPERTY LINE
- BNSF PROPERTY LINE
- PARCEL LINE
- APPROXIMATE 1976 SHORELINE - CURRENT
- APPROXIMATE 1967 SHORELINE
- APPROXIMATE 1947 SHORELINE
- APPROXIMATE 1914 SHORELINE

KEY

- 🟥 EXXONMOBIL/ADC AND PREDECESSORS
- 🟪 ASSOCIATED OIL COMPANY / KIMBERLY CLARK
- 🟧 STANDARD OIL COMPANY
- 🟩 JOHNSTON PETROLEUM
- 🟦 DUNLAP TOWING
- 1947 1955 DATES FEATURE OBSERVED IN HISTORICAL DOCUMENTS

NOTES:

1. PARCELS LAYER FROM SNOHOMISH COUNTY, FTP://FTP.SNOCO.ORG
2. MAY 13 2018 AERIAL FROM GOOGLE EARTH PRO.
3. MAP SHOWS APPROXIMATE LOCATIONS OF SURFACE FEATURES EVIDENT IN HISTORICAL AERIAL PHOTOS AND MAPS FROM 1930 THROUGH 1993. DATES ABOVE INDICATE DATE OF IMAGE OR AERIAL PHOTO IN WHICH FEATURE WAS OBSERVED, NOT NECESSARILY DATE FEATURE WAS CONSTRUCTED.

PSO5 PUGET SOUND OUTFALL 5 OVERFLOW STRUCTURE PROJECT

0 60 120 240
SCALE IN FEET

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Seattle, Washington 98101

wood.

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
FEATURES EVIDENT IN HISTORICAL
DOCUMENTS AND AERIAL PHOTOS

DATE
SEPTEMBER 2018
PROJECT NO.
6103180009
REV NO.
1
FIGURE No.
2-6

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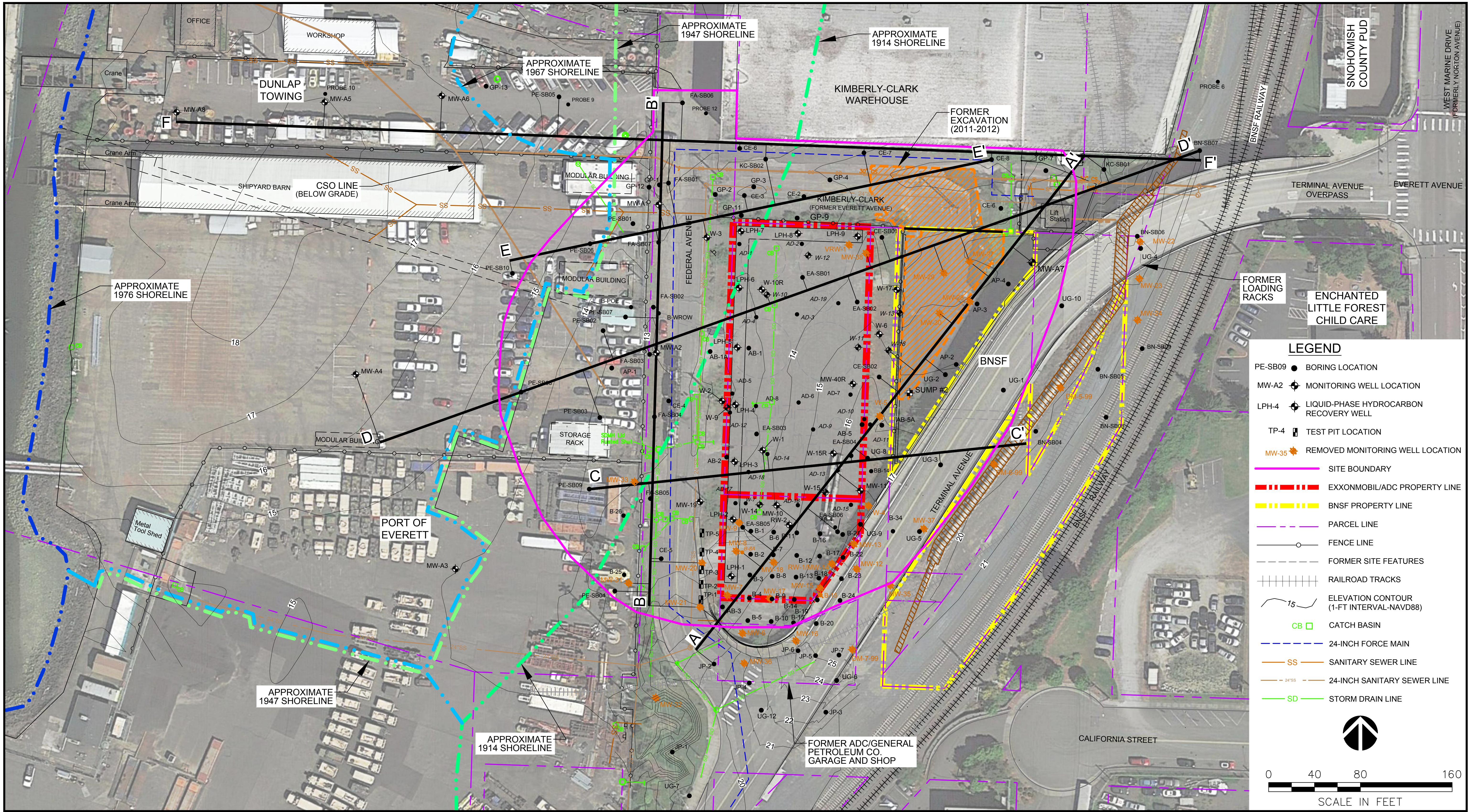

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DATUM:	NAD 83 N FT
PROJECTION:	WASP
SCALE:	AS SHOWN

PROJECT

EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

HISTORICAL EXPLORATIONS AND
LOCATIONS OF GEOLOGIC CROSS SECTIONS

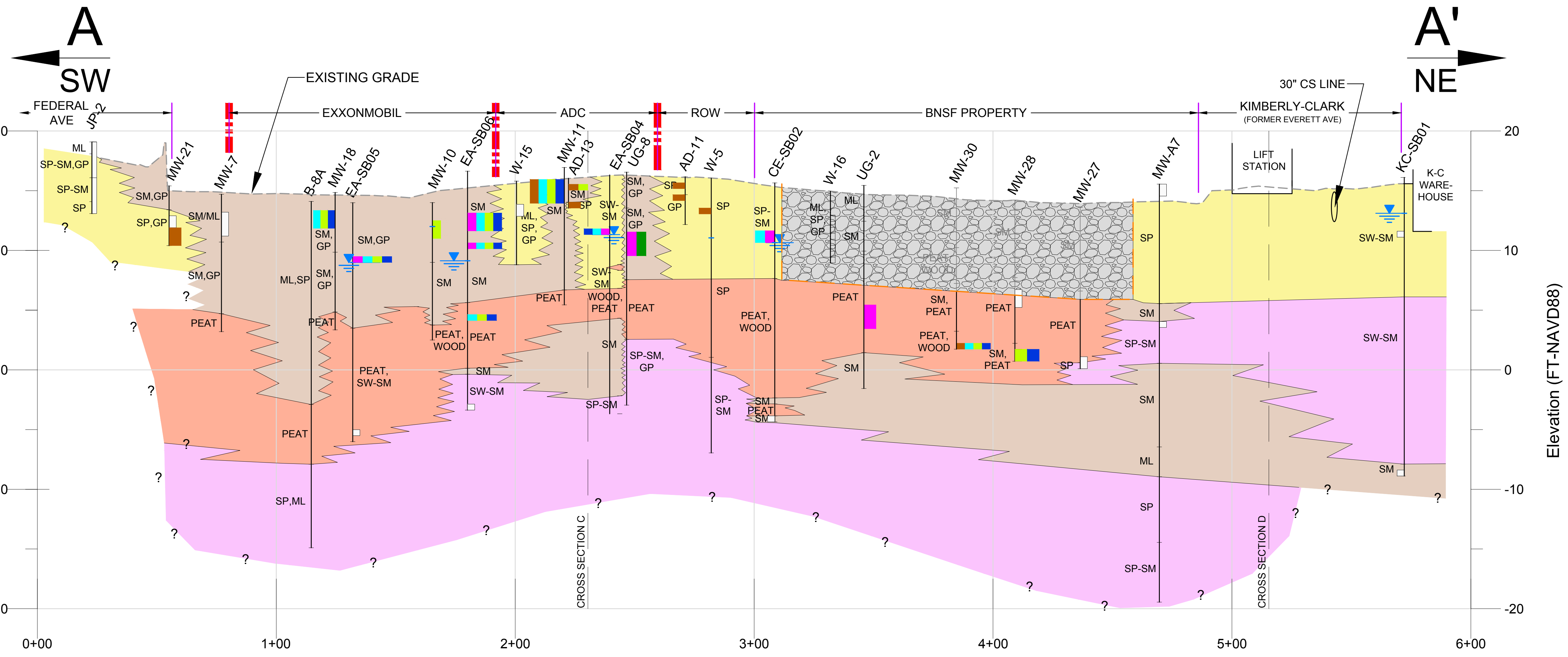
DATE:
SEPTEMBER 2018

PROJECT NO:
6103180009

REV. NO.:

FIGURE No.
2-7

S:\6103-0009\001_DataInvestigationReport\Everett_EXM-Figures_091118.dwg - Fig2-7_CrossSectLoc - Sep. 12, 2018 1:38pm - adam.stenberg



CROSS SECTION A-A'

KEY

- 🟫 SILTY SAND, SILT
- 🟧 PEAT
- 🟨 VERY LOOSE TO LOOSE, POORLY GRADED AND WELL-GRADED SAND
- 🟪 MEDIUM DENSE TO DENSE, POORLY GRADED AND WELL-GRADED SAND
- 🟩 GRAVEL
- ▨ ENGINEERED FILL (QUARRY SPALLS)

ABBREVIATIONS

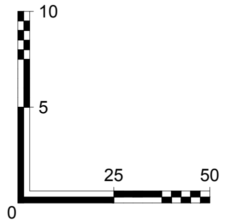
SW	WELL-GRADED SANDS
SP	POORLY GRADED SANDS
SM	SILTY SAND
GW	WELL-GRADED GRAVELS
GP	POORLY GRADED GRAVEL
ML	SILT

ANALYTES THAT EXCEEDED MTCA METHOD A CLEANUP LEVEL IN SOIL

- 🟫 TPH (UNDIFFERENTIATED)
- 🟩 TPH-DIESEL
- 🟪 TPH-GASOLINE
- ■ TPH-OIL
- 🟦 BENZENE
- 🟨 ETHYLBENZENE
- 🟦 TOTAL XYLENES
- ▽ WATER LEVEL

▯ SAMPLE LOCATION WITH NO DETECTIONS EXCEEDING CLEANUP LEVEL

NOTE:
LOCATIONS WITH DETECTIONS EXCEEDING CLEANUP LEVEL WERE SAMPLED FOR EACH ANALYTE; ONLY ANALYTES EXCEEDING CLEANUP LEVEL ARE INDICATED.



APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

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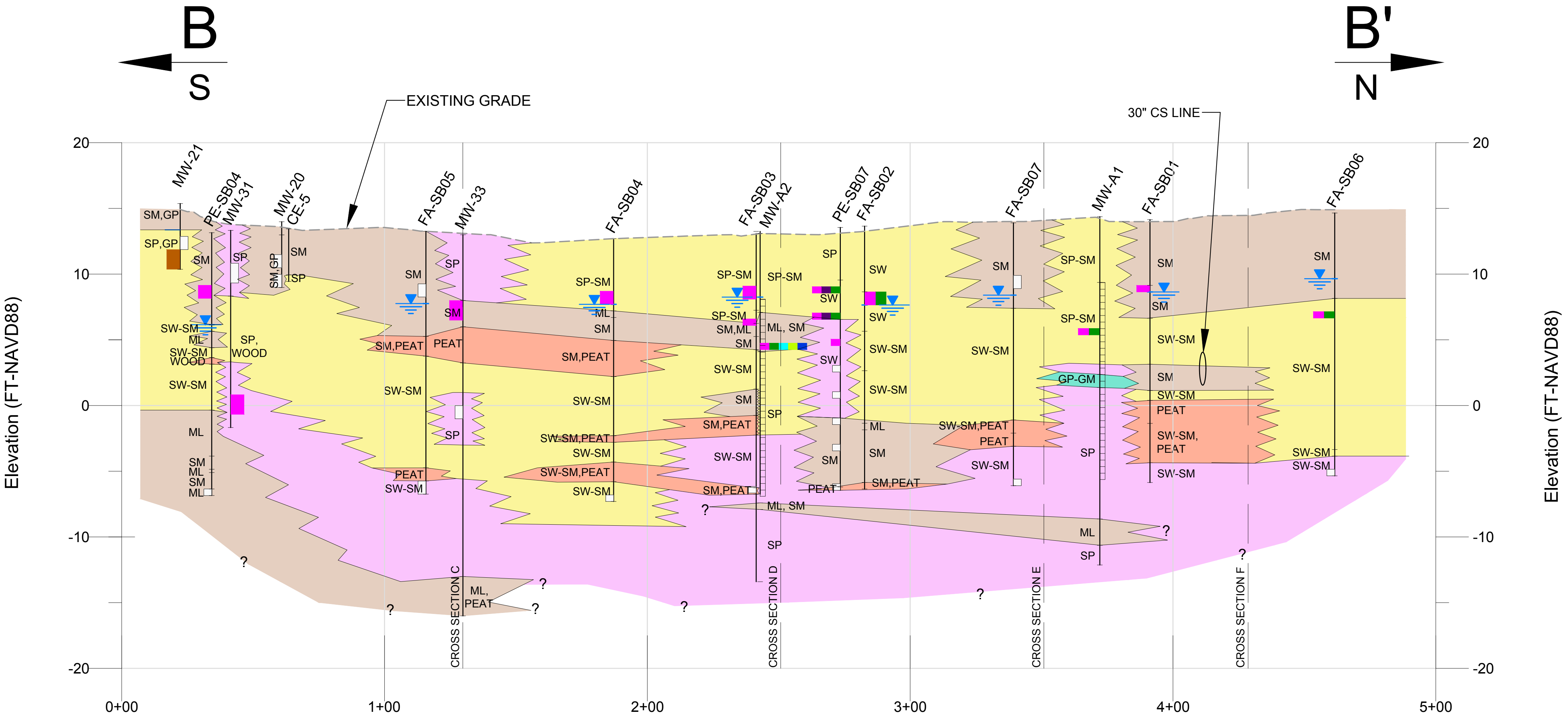
PROJECTION:	WASP
SCALE:	AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
CROSS SECTION A-A'

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 2-8

S:\6103-0009\001_DataInvestigationReport\Everett_EXM-Figures_091118.dwg – Fig2-8_CrossSectA – Sep. 12, 2018 1:38pm – adam.stenberg



CROSS SECTION B-B'

KEY

🟫 SILTY SAND, SILT

🟧 PEAT

🟨 VERY LOOSE TO LOOSE, POORLY GRADED AND WELL-GRADED SAND

🟪 MEDIUM DENSE TO DENSE, POORLY GRADED AND WELL-GRADED SAND

🟩 GRAVEL

ABBREVIATIONS

SW	WELL-GRADED SANDS
SP	POORLY GRADED SANDS
SM	SILTY SAND
GW	WELL-GRADED GRAVELS
GP	POORLY GRADED GRAVEL
ML	SILT

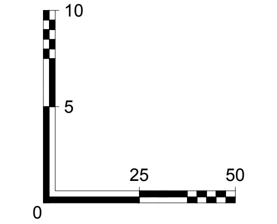
ANALYTES THAT EXCEEDED MTCA METHOD A CLEANUP LEVEL IN SOIL

🟫 TPH (UNDIFFERENTIATED)
🟩 TPH-DIESEL
🟪 TPH-GASOLINE
🟪 TPH-OIL
🟦 BENZENE
🟩 ETHYLBENZENE
🟦 TOTAL XYLENES

▼ WATER LEVEL

▯ SAMPLE LOCATION WITH NO DETECTIONS EXCEEDING CLEANUP LEVEL

NOTE:
LOCATIONS WITH DETECTIONS EXCEEDING CLEANUP LEVEL WERE SAMPLED FOR EACH ANALYTE; ONLY ANALYTES EXCEEDING CLEANUP LEVEL ARE INDICATED.



APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

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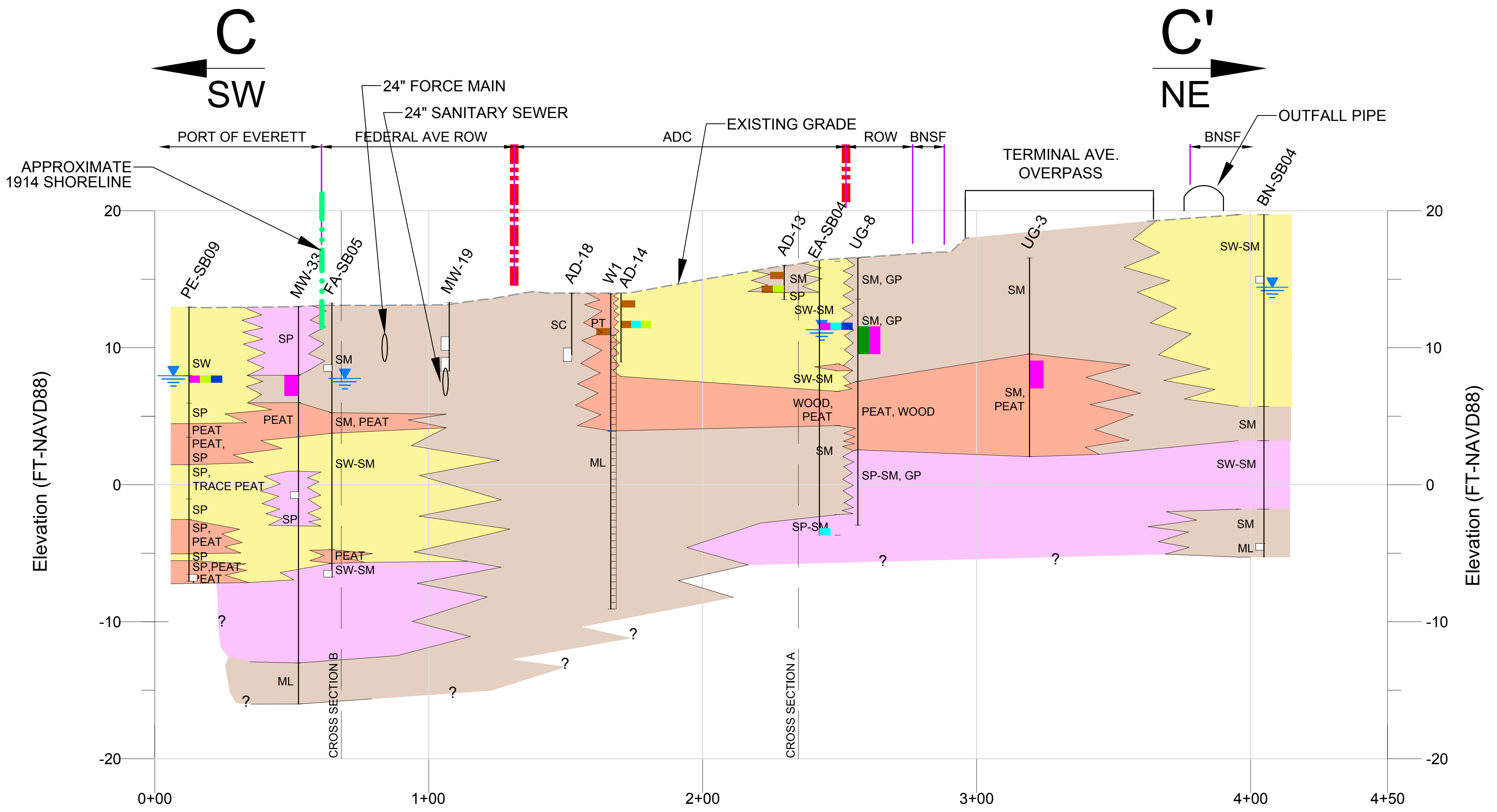
DATUM:	NAD 83 N FT
PROJECTION:	WASP
SCALE:	AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
CROSS SECTION B-B'

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	
FIGURE No.	2-9



CROSS SECTION C-C'

KEY

🟫	SILTY SAND, SILT
🟧	PEAT
🟨	VERY LOOSE TO LOOSE, POORLY GRADED AND WELL-GRADED SAND
🟪	MEDIUM DENSE TO DENSE, POORLY GRADED AND WELL-GRADED SAND
🟩	GRAVEL
⬜	ENGINEERED FILL (QUARRY SPALLS)

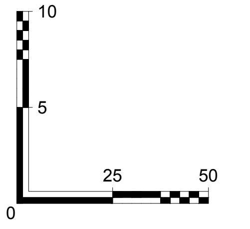
ABBREVIATIONS

SW	WELL-GRADED SANDS
SP	POORLY GRADED SANDS
SM	SILTY SAND
GW	WELL-GRADED GRAVELS
GP	POORLY GRADED GRAVEL
ML	SILT

ANALYTES THAT EXCEEDED MTCA METHOD A CLEANUP LEVEL IN SOIL

🟫	TPH (UNDIFFERENTIATED)
🟩	TPH-DIESEL
🟪	TPH-GASOLINE
🟪	TPH-OIL
🟦	BENZENE
🟩	ETHYLBENZENE
🟦	TOTAL XYLENES
▽	WATER LEVEL
▯	SAMPLE LOCATION WITH NO DETECTIONS EXCEEDING CLEANUP LEVEL

NOTE:
LOCATIONS WITH DETECTIONS EXCEEDING CLEANUP LEVEL WERE SAMPLED FOR EACH ANALYTE; ONLY ANALYTES EXCEEDING CLEANUP LEVEL ARE INDICATED.



APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

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DATUM: NAD 83 N FT
PROJECTION: WASP
SCALE: AS SHOWN

PROJECT
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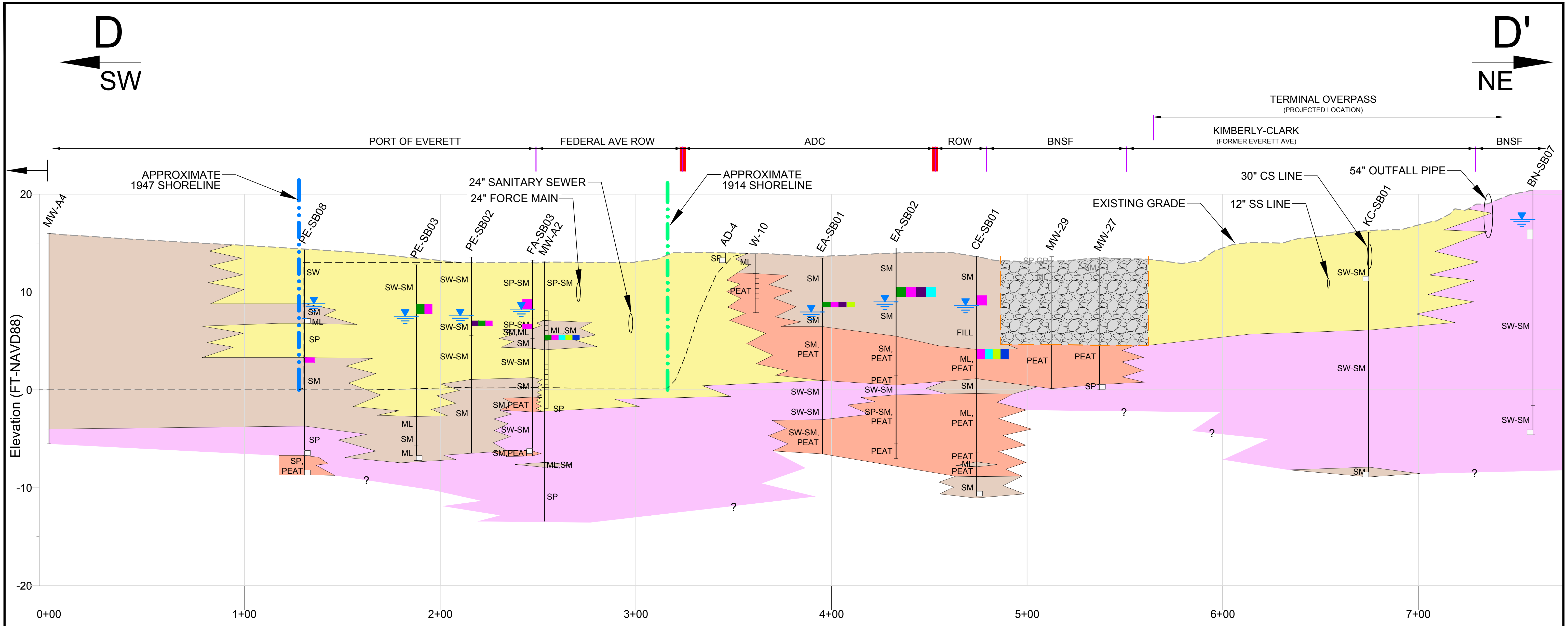
ECOLOGY SITE ID 2728

TITLE
CROSS SECTION C-C'

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 2-10



CROSS SECTION D-D'

KEY

▨	SILTY SAND, SILT
▨	PEAT
▨	VERY LOOSE TO LOOSE, POORLY GRADED AND WELL-GRADED SAND
▨	MEDIUM DENSE TO DENSE, POORLY GRADED AND WELL-GRADED SAND
▨	GRAVEL
▨	ENGINEERED FILL (QUARRY SPALLS)

ABBREVIATIONS

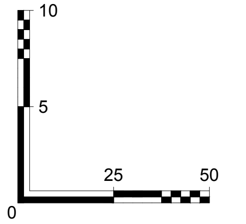
SW	WELL-GRADED SANDS
SP	POORLY GRADED SANDS
SM	SILTY SAND
GW	WELL-GRADED GRAVELS
GP	POORLY GRADED GRAVEL
ML	SILT

ANALYTES THAT EXCEEDED MTCA METHOD A CLEANUP LEVEL IN SOIL

🟧	TPH (UNDIFFERENTIATED)
🟩	TPH-DIESEL
🟪	TPH-GASOLINE
🟪	TPH-OIL
🟦	BENZENE
🟩	ETHYLBENZENE
🟦	TOTAL XYLENES
▽	WATER LEVEL

▯ SAMPLE LOCATION WITH NO DETECTIONS EXCEEDING CLEANUP LEVEL

NOTE:
LOCATIONS WITH DETECTIONS EXCEEDING CLEANUP LEVEL WERE SAMPLED FOR EACH ANALYTE; ONLY ANALYTES EXCEEDING CLEANUP LEVEL ARE INDICATED.



APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

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	CHK'D BY: LV		PROJECT NO: 6103180009
Wood Environment & Infrastructure Solutions, Inc. 600 University Street, Suite 600 Seattle, WA, U.S.A. 98101	DATUM: NAD 83 N FT	TITLE CROSS SECTION D-D'	REV. NO.:
	PROJECTION: WASP		FIGURE No. 2-11
	SCALE: AS SHOWN		

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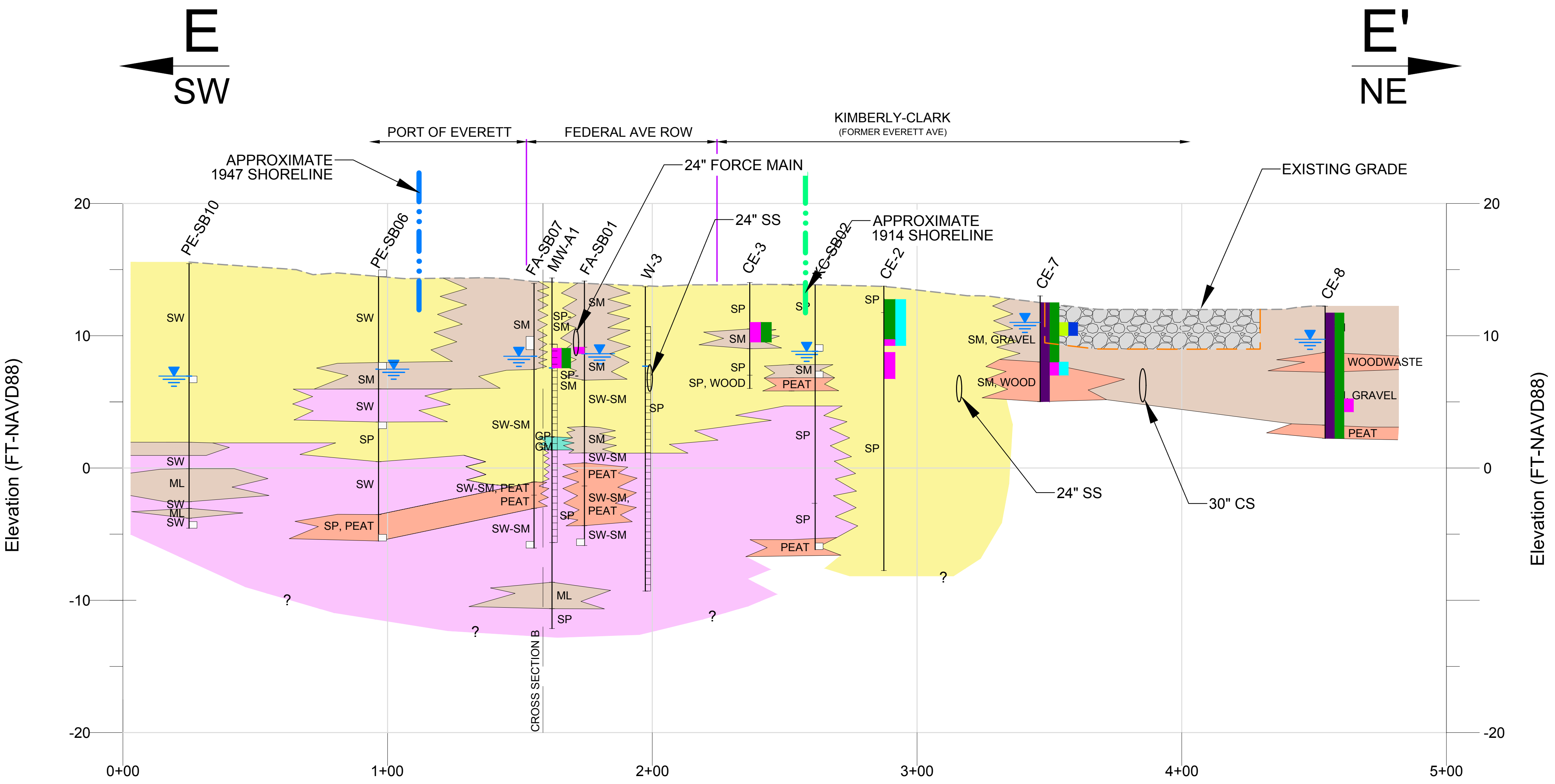


CROSS SECTION E-E'

KEY

🟫	SILTY SAND, SILT
🟧	PEAT
🟨	VERY LOOSE TO LOOSE, POORLY GRADED AND WELL-GRADED SAND
🟪	MEDIUM DENSE TO DENSE, POORLY GRADED AND WELL-GRADED SAND
🟦	GRAVEL
▨	ENGINEERED FILL (QUARRY SPALLS)

ABBREVIATIONS

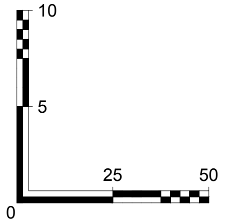
SW	WELL-GRADED SANDS
SP	POORLY GRADED SANDS
SM	SILTY SAND
GW	WELL-GRADED GRAVELS
GP	POORLY GRADED GRAVEL
ML	SILT

ANALYTES THAT EXCEEDED MTCA METHOD A CLEANUP LEVEL IN SOIL

🟫	TPH (UNDIFFERENTIATED)
🟩	TPH-DIESEL
🟪	TPH-GASOLINE
🟪	TPH-OIL
🟦	BENZENE
🟩	ETHYLBENZENE
🟦	TOTAL XYLENES
▽	WATER LEVEL

▯ SAMPLE LOCATION WITH NO DETECTIONS EXCEEDING CLEANUP LEVEL

NOTE:
LOCATIONS WITH DETECTIONS EXCEEDING CLEANUP LEVEL WERE SAMPLED FOR EACH ANALYTE; ONLY ANALYTES EXCEEDING CLEANUP LEVEL ARE INDICATED.



APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

wood.

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DATUM: NAD 83 N FT
PROJECTION: WASP
SCALE: AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
CROSS SECTION E-E'

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 2-12

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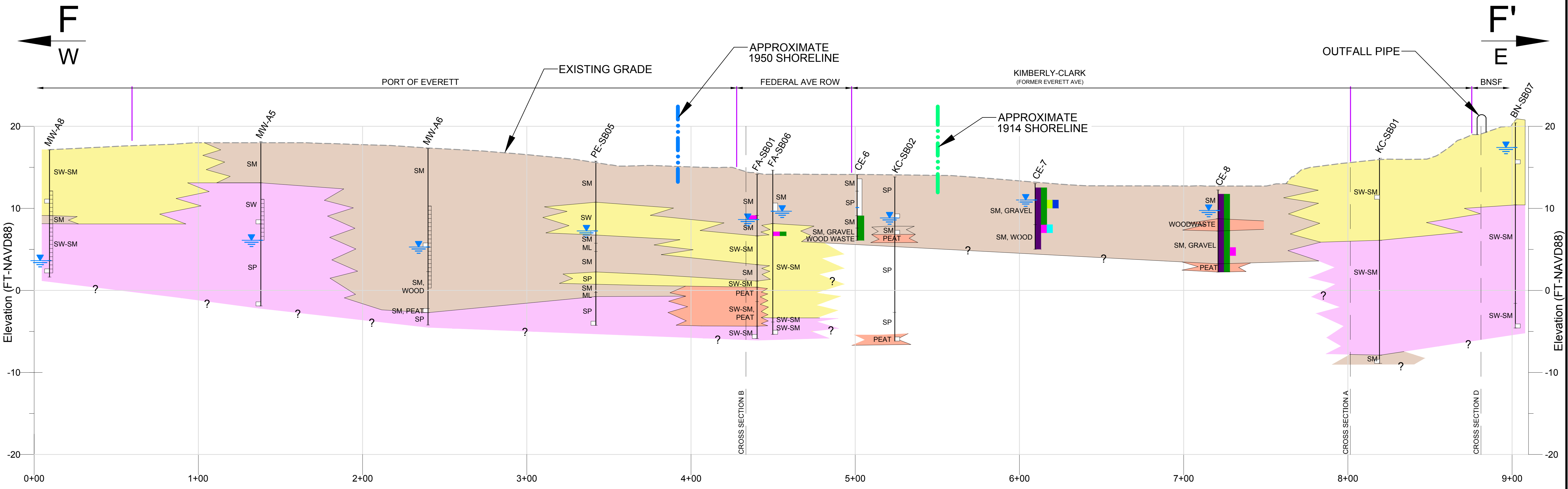


CROSS SECTION F-F'

KEY

- ■ SILTY SAND, SILT
- ■ PEAT
- ■ VERY LOOSE TO LOOSE, POORLY GRADED AND WELL-GRADED SAND
- ■ MEDIUM DENSE TO DENSE, POORLY GRADED AND WELL-GRADED SAND
- ■ GRAVEL

ABBREVIATIONS

SW	WELL-GRADED SANDS
SP	POORLY GRADED SANDS
SM	SILTY SAND
GW	WELL-GRADED GRAVELS
GP	POORLY GRADED GRAVEL
ML	SILT

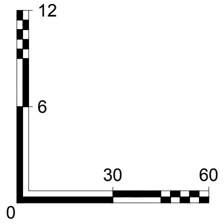
ANALYTES THAT EXCEEDED MTCA METHOD A CLEANUP LEVEL IN SOIL

- ■ TPH (UNDIFFERENTIATED)
- ■ TPH-DIESEL
- ■ TPH-GASOLINE
- ■ TPH-OIL
- ■ BENZENE
- ■ ETHYLBENZENE
- ■ TOTAL XYLENES

▽ WATER LEVEL

▯ SAMPLE LOCATION WITH NO DETECTIONS EXCEEDING CLEANUP LEVEL

NOTE:
LOCATIONS WITH DETECTIONS EXCEEDING CLEANUP LEVEL WERE SAMPLED FOR EACH ANALYTE; ONLY ANALYTES EXCEEDING CLEANUP LEVEL ARE INDICATED.



APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

wood.

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	CHK'D BY: LV			PROJECT NO: 6103180009	
Wood Environment & Infrastructure Solutions, Inc. 600 University Street, Suite 600 Seattle, WA, U.S.A. 98101	DATUM: NAD 83 N FT	TITLE	CROSS SECTION F-F'	REV. NO.:	
	PROJECTION: WASP			FIGURE No. 2-13	
	SCALE: AS SHOWN				

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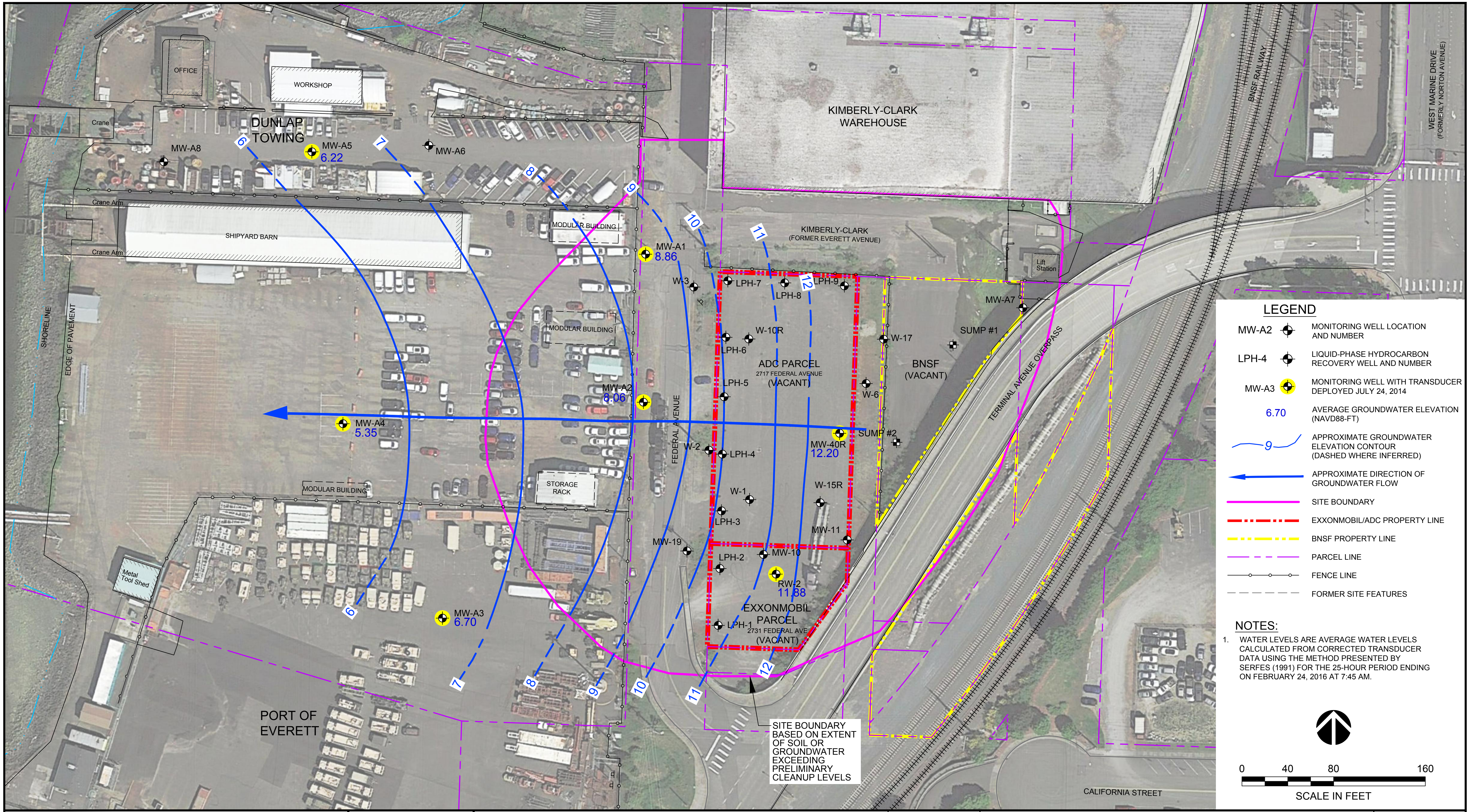

NOTES:

1. WATER LEVELS ARE AVERAGE WATER LEVELS CALCULATED FROM CORRECTED TRANSDUCER DATA USING THE METHOD PRESENTED BY SERFES (1991) FOR THE 25-HOUR PERIOD ENDING ON FEBRUARY 24, 2016 AT 7:45 AM.

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Seattle, WA, U.S.A. 98101

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DATUM: NAD 83 N FT
PROJECTION: WASP
SCALE: AS SHOWN

PROJECT

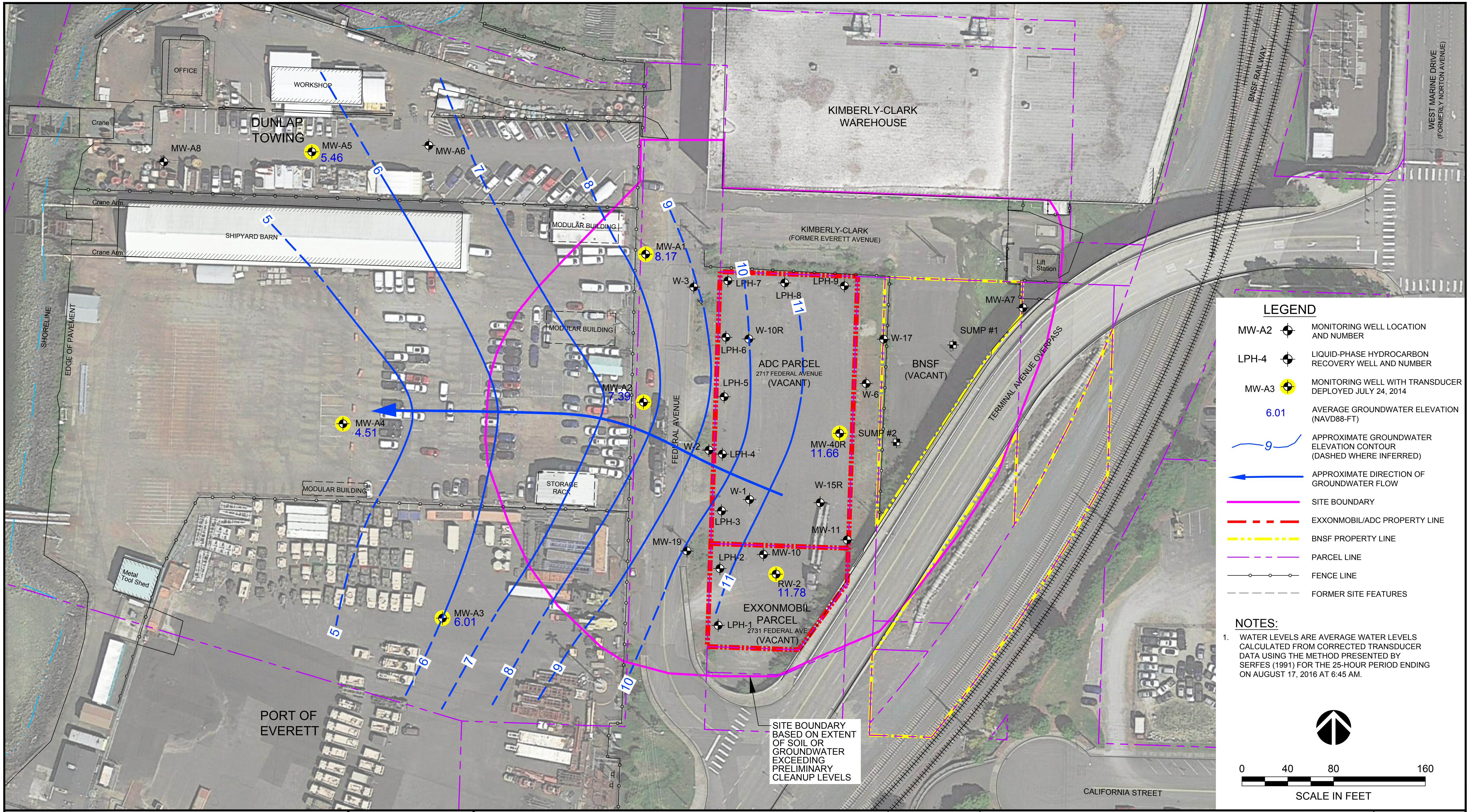
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

GROUNDWATER ELEVATION
AND FLOW DIRECTION
FEBRUARY 23 & 24, 2016

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 2-14

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_9936\Everett_EXM-GWData-Contours-Sept-2016_091218.dwg - Fig2-14_Feb23-24-2016 - Sep. 12, 2018 7:59pm - adam.stenberg



LEGEND

MW-A2 ⊕	MONITORING WELL LOCATION AND NUMBER
LPH-4 ⊕	LIQUID-PHASE HYDROCARBON RECOVERY WELL AND NUMBER
MW-A3 ⊕	MONITORING WELL WITH TRANSDUCER DEPLOYED JULY 24, 2014
6.01	AVERAGE GROUNDWATER ELEVATION (NAVD88-FT)
9	APPROXIMATE GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
←	APPROXIMATE DIRECTION OF GROUNDWATER FLOW
——	SITE BOUNDARY
— · —	EXXONMOBIL/ADC PROPERTY LINE
— · · —	BNSF PROPERTY LINE
— —	PARCEL LINE
—o—	FENCE LINE
— —	FORMER SITE FEATURES

NOTES:

1. WATER LEVELS ARE AVERAGE WATER LEVELS CALCULATED FROM CORRECTED TRANSDUCER DATA USING THE METHOD PRESENTED BY SERFES (1991) FOR THE 25-HOUR PERIOD ENDING ON AUGUST 17, 2016 AT 6:45 AM.

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Seattle, WA, U.S.A. 98101

DWN BY: APS
CHK'D BY: LV
DATUM: NAD 83 N FT
PROJECTION: WASP
SCALE: AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
GROUNDWATER ELEVATION
AND FLOW DIRECTION
AUGUST 17, 2016

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 2-15

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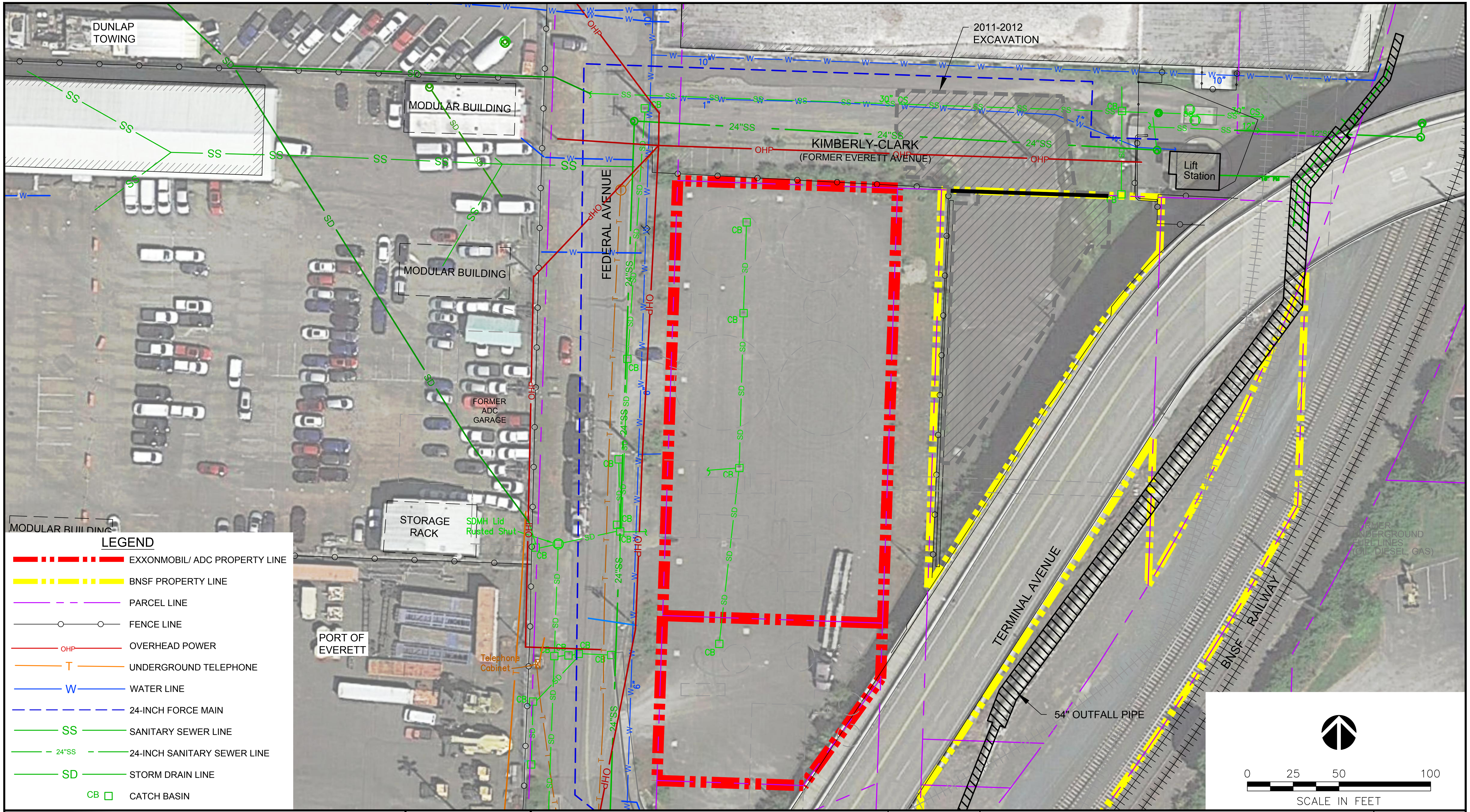

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wood.

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Infrastructure Solutions, Inc.
600 University Street, Suite 600
Seattle, WA, U.S.A. 98101

DWN BY: APS
CHK'D BY: LV
DATUM: NAD 83 N FT
PROJECTION: WASP
SCALE: AS SHOWN

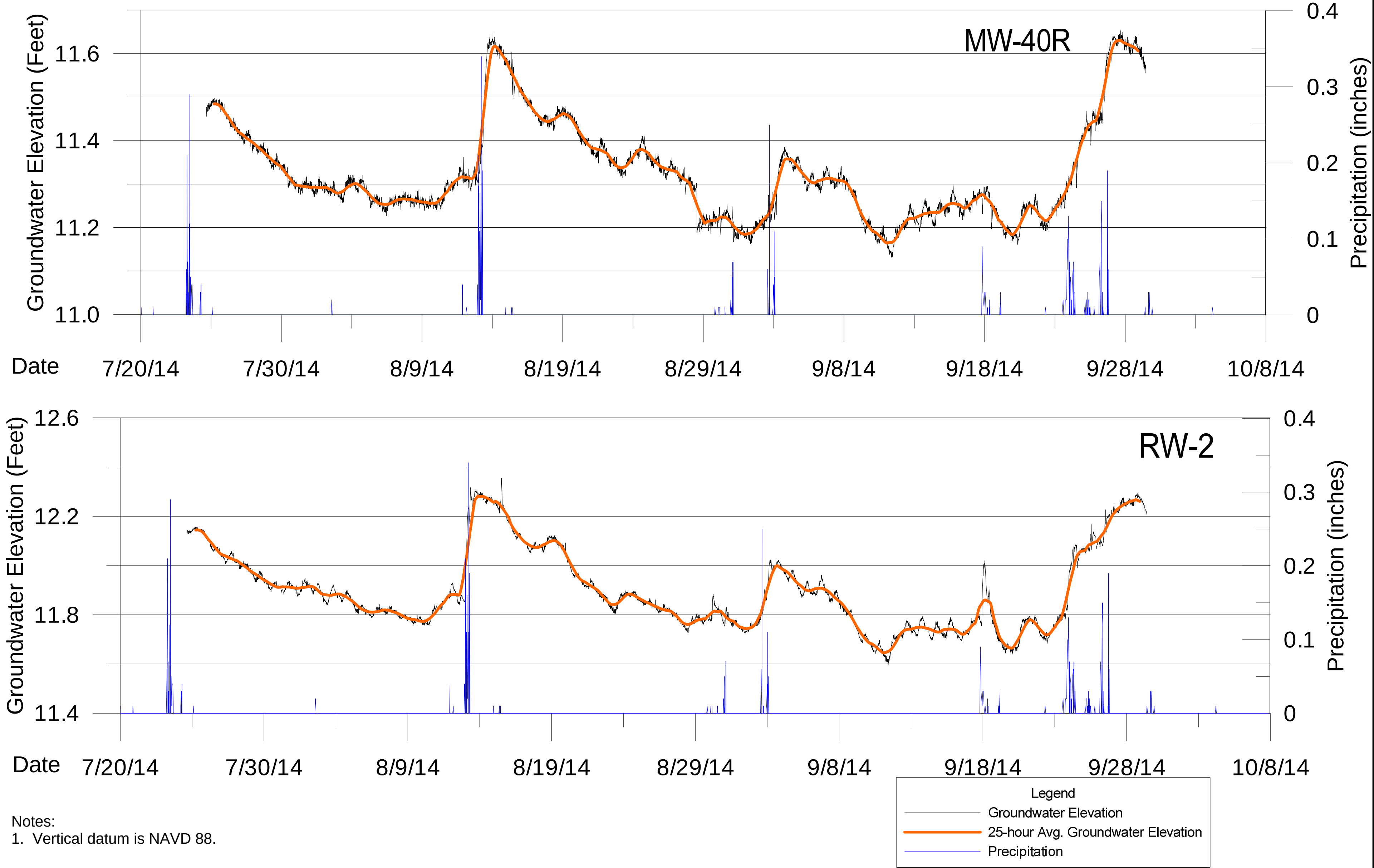
PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
UTILITY LOCATION PLAN

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 2-16

S:\6103-0009\001_DataInvestigationReport\Everett_EXM-Figures_091118.dwg – Fig2-16 UTILITIES – Sep. 12, 2018 1:38pm – adam.stenberg

P:\-ExxonMobil-Everettl\Technical Files (Lab & Field Data)\ENV5000.IND+LC\5000 Field Work\Transducer Download\Grapher\Groundwater Hydrographs.grt



Notes:
1. Vertical datum is NAVD 88.

wood.

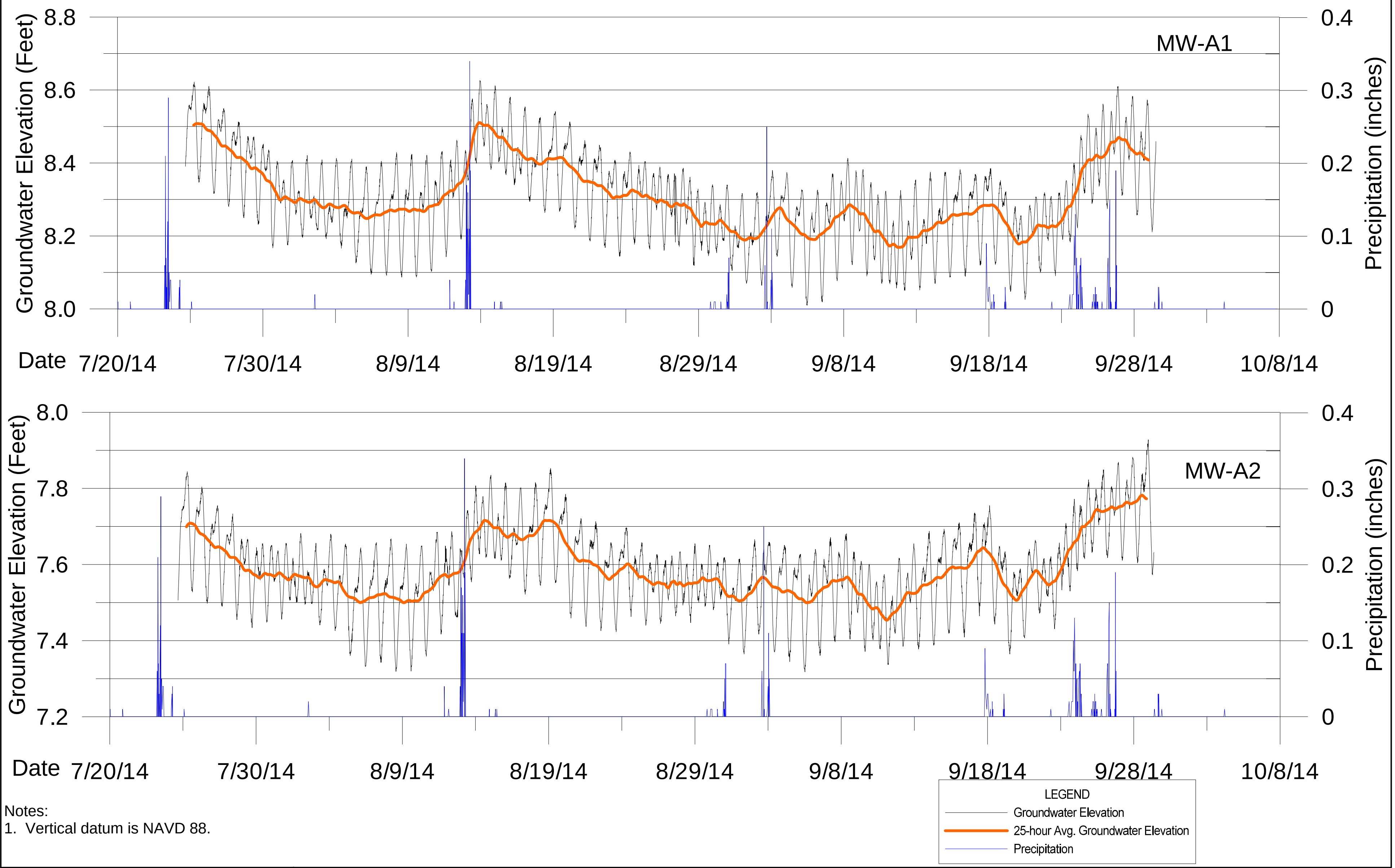
GROUNDWATER HYDROGRAPHS: WELLS MW-40R AND RW-2
ExxonMobil/ADC Site
Everett, Washington

Prepared By:
JB

10/10/14

Project No.
6103140009

Figure 2-17



Notes:
1. Vertical datum is NAVD 88.

wood.

GROUNDWATER HYDROGRAPHS: WELLS MW-A1 AND MW-A2
ExxonMobil/ADC Site
Everett, Washington

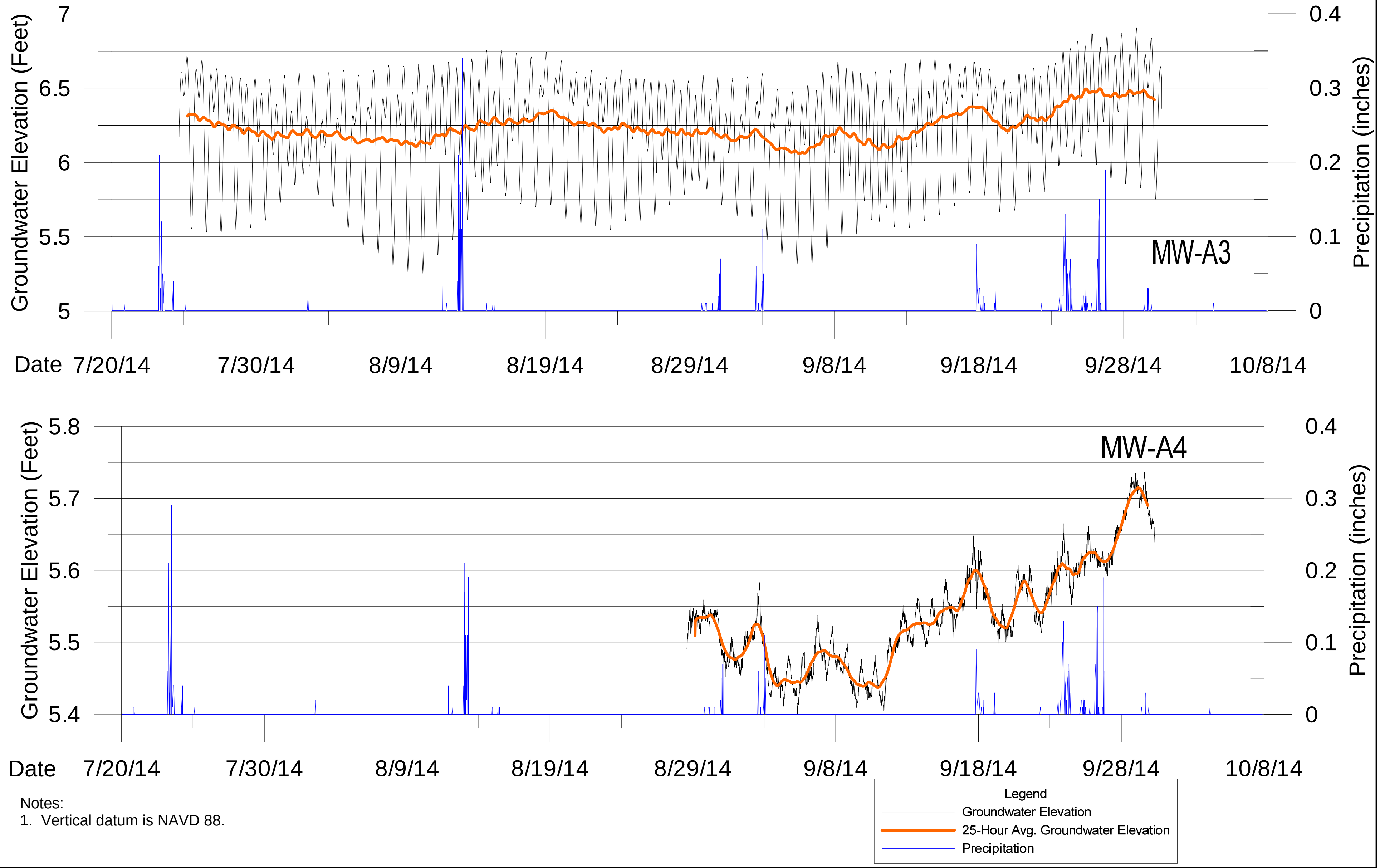
Prepared By:
JB

10/10/14

Project No.
6103140009

Figure 2-18

P:\-ExxonMobil-Everettl\Technical Files (Lab & Field Data)\ENV5000.IND+LC\5000 Field Work\Transducer Download\Grapher\Groundwater Hydrographs.grt



Notes:
1. Vertical datum is NAVD 88.

wood.

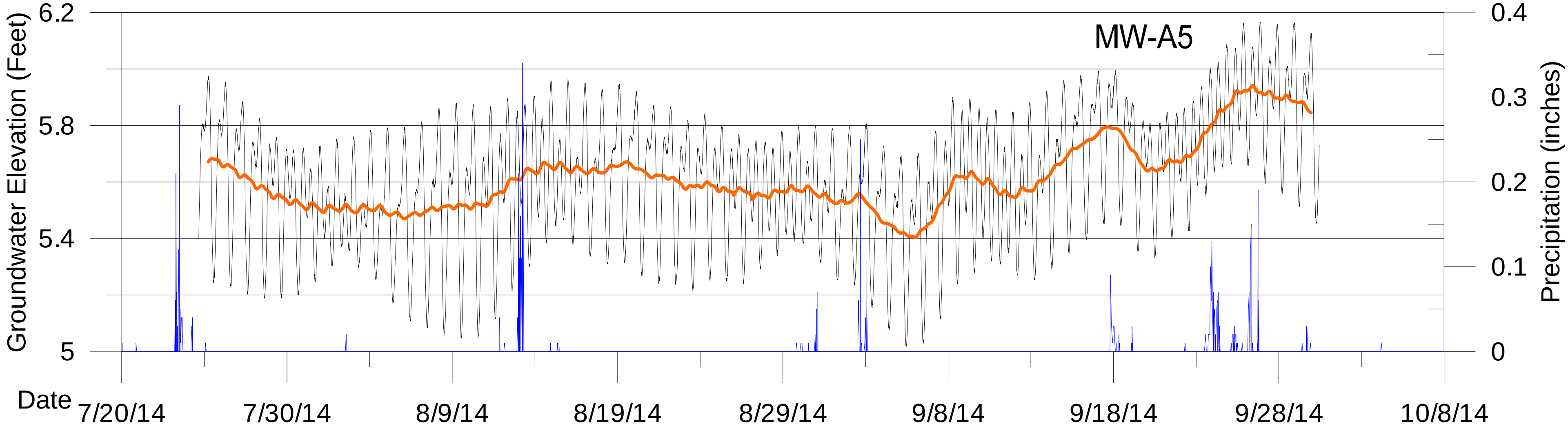
GROUNDWATER HYDROGRAPHS: WELLS MW-A3 AND MW-A4
ExxonMobil/ADC Site
Everett, Washington

Prepared By:
JB

10/10/14

Project No.
6103140009

Figure 2-19



Date

Legend

—	Groundwater Elevation
—	25-Hour Avg. Groundwater Elevation
—	Precipitation

Notes:
1. Vertical datum is NAVD 88.

wood.

GROUNDWATER HYDROGRAPHS: WELL MW-A5
ExxonMobil/ADC Site
Everett, Washington

Prepared By:
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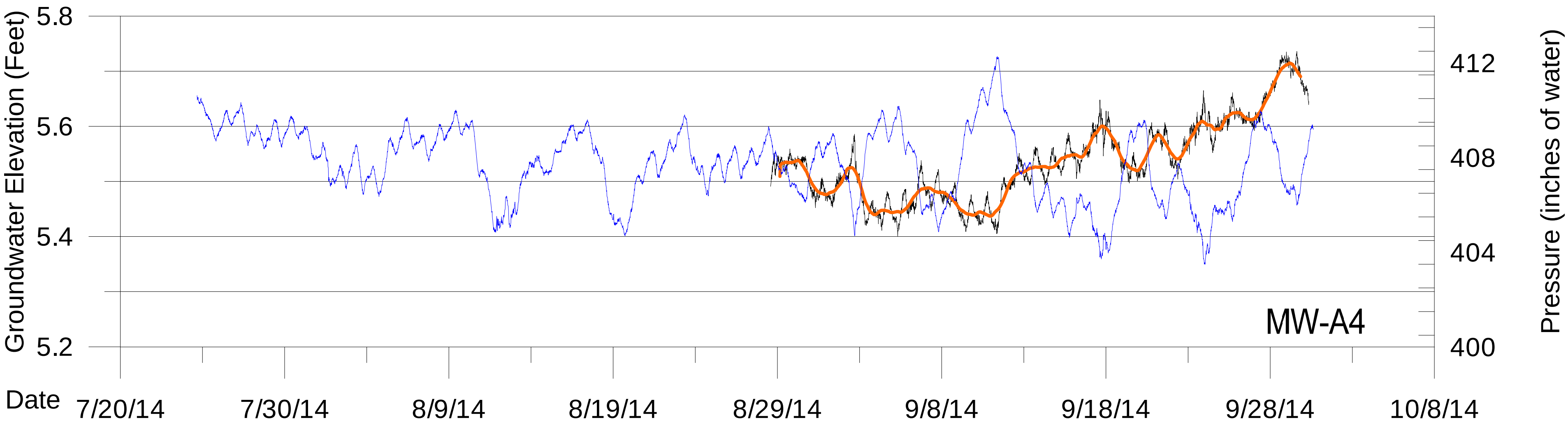
Project No.
6103140009

Figure 2-20



Notes:
1. Vertical datum is NAVD 88.

Legend
Groundwater Elevation
25-Hour Avg. Groundwater Elevation
Pressure (inches of water)

wood.

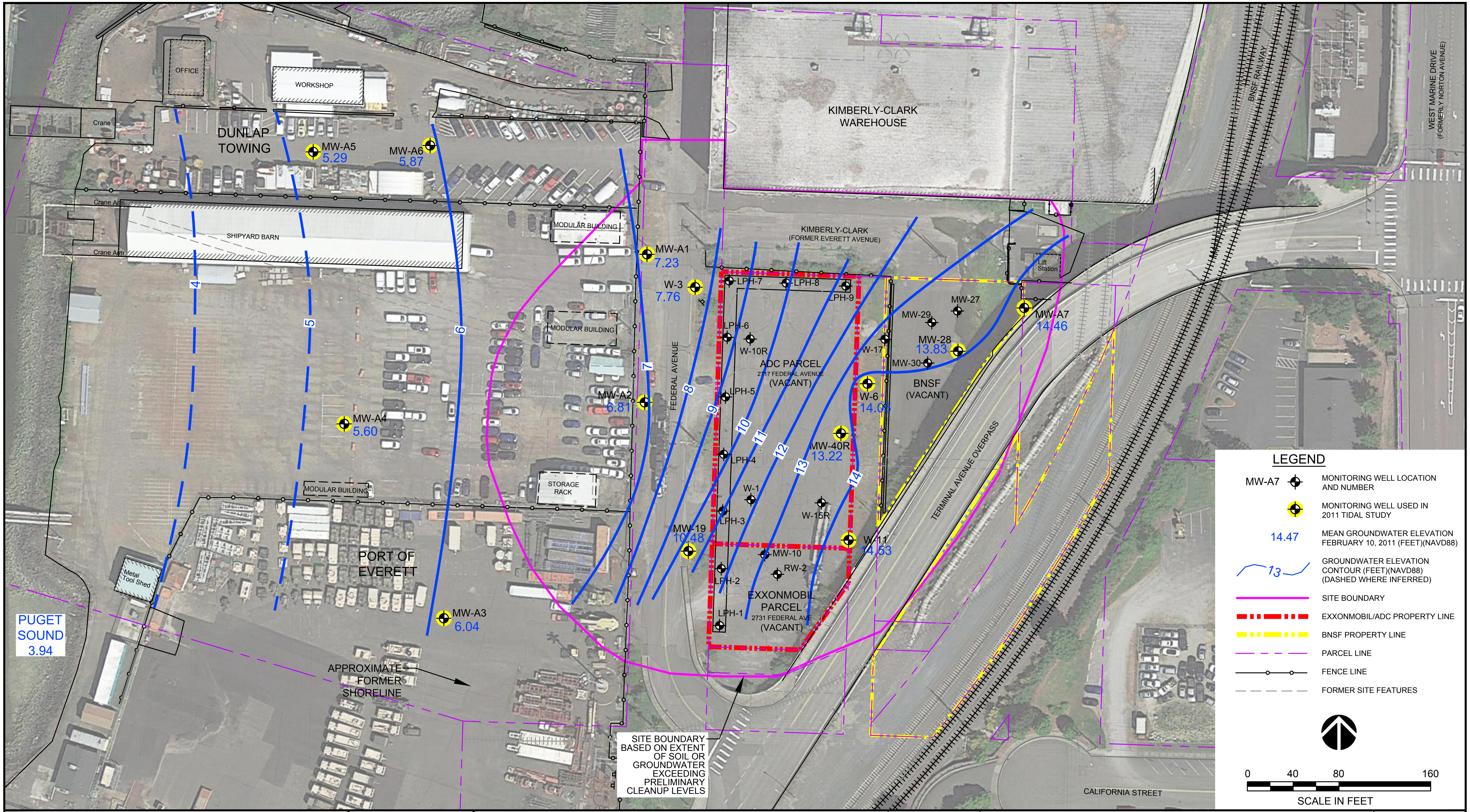
PLOT OF ATMOSPHERIC PRESSURE AND
GROUNDWATER HYDROGRAPH FOR MW-A4
ExxonMobil/ADC Everett, Washington

Prepared By:
JB

10/10/14

Project No.
6103140009

Figure 2-21



SOURCE: Base map modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolutions, Inc.

NOTE:

AVERAGE WATER LEVELS WERE CALCULATED FROM AUTOMATED WATER LEVEL MEASUREMENTS RECORDED BY TRANSDUCERS USING THE METHOD PRESENTED BY SERFES FOR THE MEDIAN TIME AT HOUR 36 OF THE TIDAL STUDY, WHICH CORRESPONDS TO 3:00 AM ON FEBRUARY 10, 2011.

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DATUM:	NAD 83 N FT
PROJECTION:	WASP
SCALE:	AS SHOWN

PROJECT

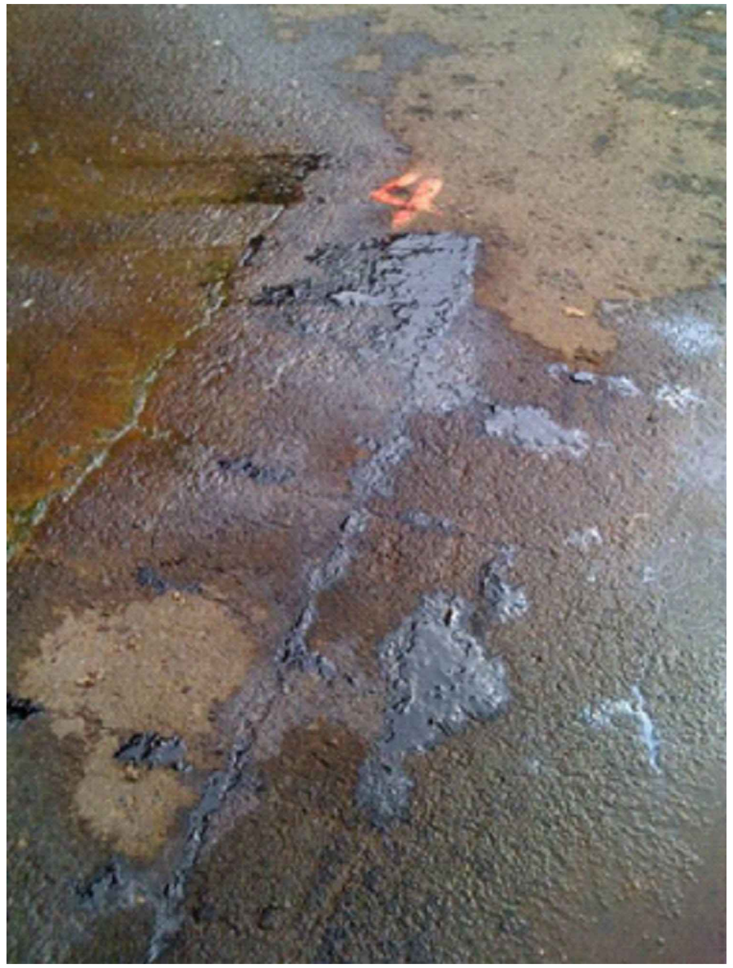
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

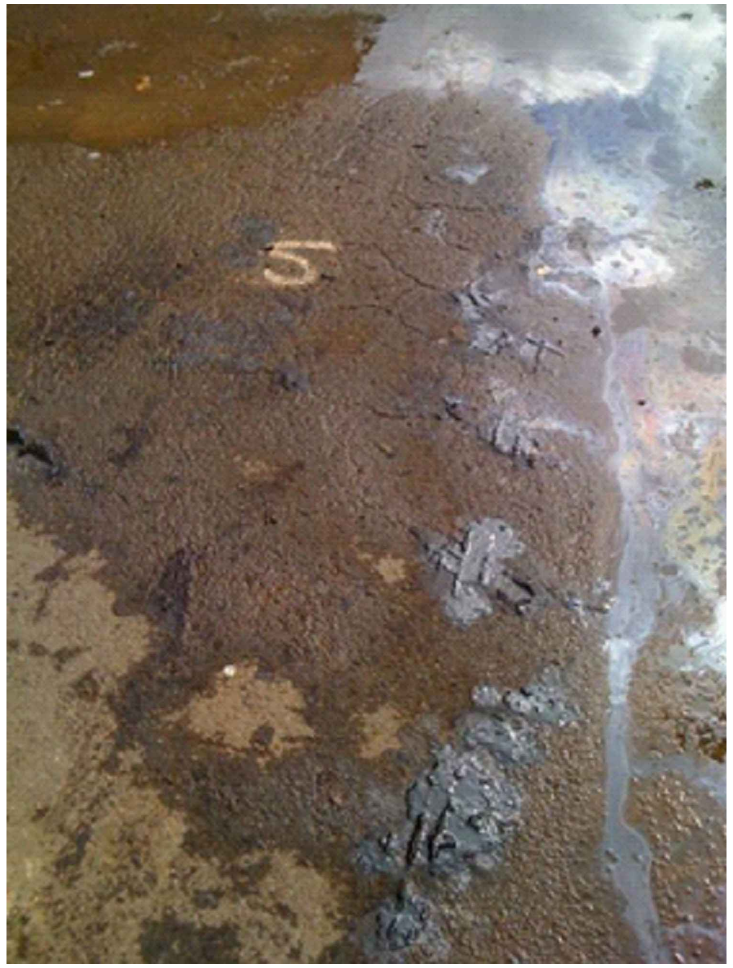
TITLE

MEAN GROUNDWATER ELEVATIONS
FEBRUARY 2011

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	
FIGURE No.	3-1

S:\6103-0009\001_DataInvestigationReport\Everett_EXM_GWDataFeb2011_091218.dwg – ContourMap – Sep. 12, 2018 7:33pm – adam.stenberg





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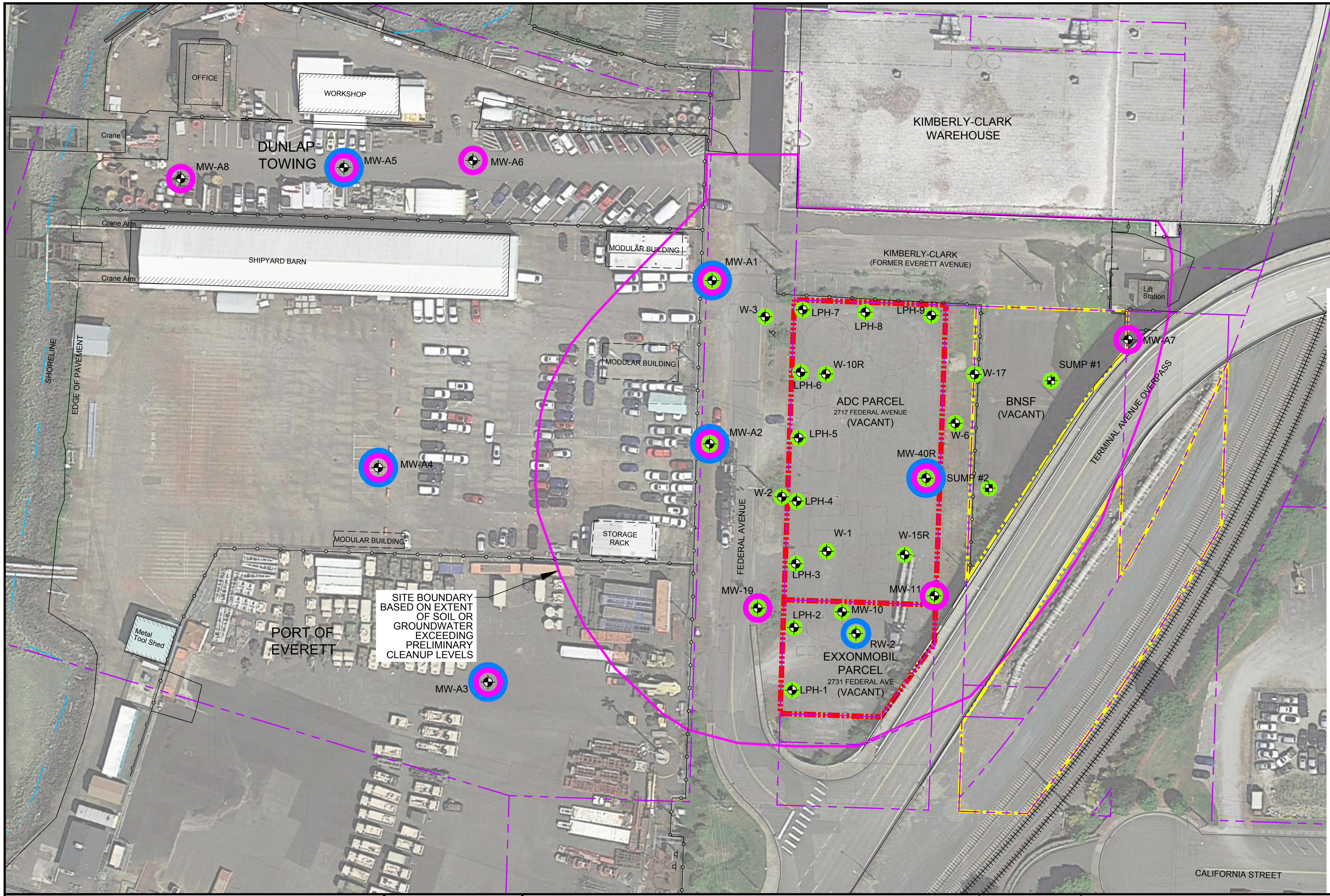
CHK'D BY: LV/AS/MS
DATUM: NAD 83 N FT
PROJECTION: WASP
SCALE: AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
PHOTOGRAPHS OF EXAMPLE SEEPS
OBSERVED ON FEDERAL AVENUE
APRIL 28, 2011

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 3-2



LEGEND

MW-A2 ⊕	MONITORING WELL LOCATION AND NUMBER
LPH-4 ⊕	LIQUID-PHASE HYDROCARBON RECOVERY WELL AND NUMBER
●	MONTHLY GAUGING
○	SEMIANNUAL SAMPLING AND MANUAL WATER LEVEL MEASUREMENTS
○	RECORDING WATER LEVEL TRANSDUCERS INSTALLED JULY 2014
───	SITE BOUNDARY
━ ━ ━	EXXONMOBIL/ADC PROPERTY LINE
━ ━ ━	BNSF PROPERTY LINE
— — —	PARCEL LINE
─o─o─	FENCE LINE
— — — —	FORMER SITE FEATURES

NOTES:

1. Monthly measurements of LPH thickness and depth-to-water are performed for LPH recovery wells LPH-1, LPH-2, LPH-3, LPH-4, LPH-5, LPH-6, LPH-7, LPH-8, LPH-9, and RW-2; monitoring wells W-1, W-2, W-3, W-6, MW-10, W-10R, MW-11, W-15R, W-17, MW-19, MW-40R, MW-A1, MW-A2; and Sumps 1 and 2.
2. Semiannual groundwater samples and manual water level measurements are collected in February and August from monitoring wells MW-11, MW-19, MW-40R, MW-A1, MW-A2, MW-A3, MW-A4, MW-A5, MW-A6, MW-A7, and MW-8A.
3. Recording water level transducers were installed in monitoring wells MW-A1, MW-A2, MW-A3, MW-A4, MW-A5, MW-40R, and RW-2 on July 24, 2014.
4. LPH is removed when observed during monthly gauging events, and sorbent oleophilic socks are deployed as needed in wells where hydrocarbon product is observed.

0 40 80 160
SCALE IN FEET

wood.

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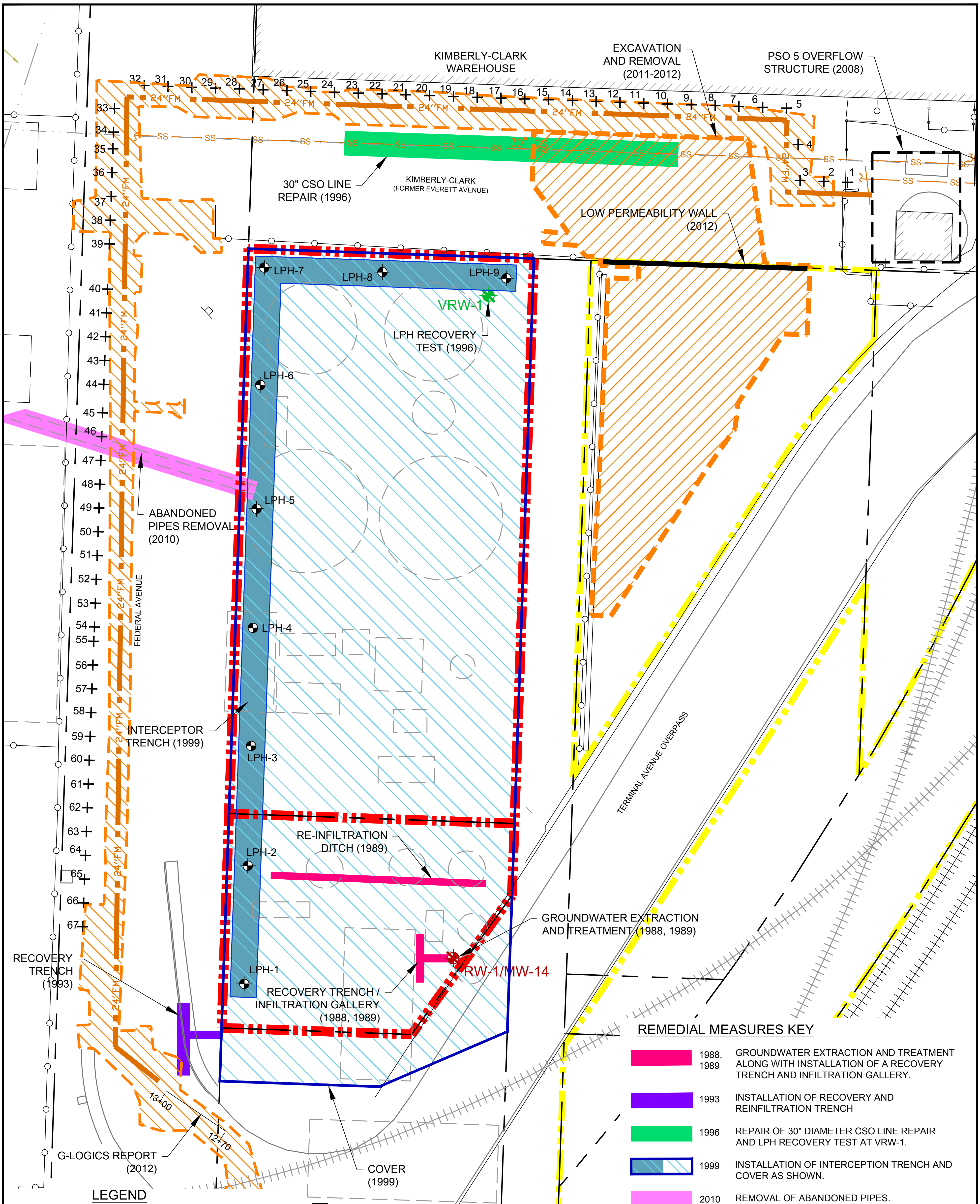
DATUM:	NAD 83 N FT
PROJECTION:	WASP
SCALE:	AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
CURRENT GROUNDWATER
MONITORING NETWORK

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	
FIGURE No.	3-3

S:\6103-0009\001_DataInvestigationReport\EXM-GW-Network_091218.dwg – Figure 3-3 – Sep. 12, 2018 6:42pm – adam.stenberg



REMEDIAL MEASURES KEY

🟥	1988, 1989	GROUNDWATER EXTRACTION AND TREATMENT ALONG WITH INSTALLATION OF A RECOVERY TRENCH AND INFILTRATION GALLERY.
🟪	1993	INSTALLATION OF RECOVERY AND REINFILTRATION TRENCH
🟩	1996	REPAIR OF 30" DIAMETER CSO LINE REPAIR AND LPH RECOVERY TEST AT VRW-1.
▨	1999	INSTALLATION OF INTERCEPTION TRENCH AND COVER AS SHOWN.
🟪	2010	REMOVAL OF ABANDONED PIPES.
▨	2011-2012	EXCAVATION OF AFFECTED SOIL AND DEWATERING OF BNSF PARCEL AND DURING CITY OF EVERETT (COE) INSTALLATION OF 24-INCH DIAMETER SEWER FORCE MAIN. COE EXCAVATION LOCATION IS APPROXIMATE.

LEGEND

━ · · ━	EXXONMOBIL/ADC PROPERTY LINE
━ · · ━	BNSF PROPERTY LINE
━ — ━	PARCEL LINE
— — —	FORMER FEATURES
┼┼┼┼┼┼	RAILROAD TRACKS
—— SS ——	30" CSO SEWER LINE
LPH-1 ⊕	LPH RECOVERY WELL LPH RECOVERY AS NEEDED (2002-PRESENT)
32 +	DEWATERING POINT

NOTE:

1. MAP SHOWS APPROXIMATED LOCATIONS OF POST INTERIM REMEDIAL MEASURES ESTIMATED BASED ON HISTORICAL DRAWINGS AND DOCUMENTS.

PSO 5 PUGET SOUND OUTFALL 5 OVERFLOW STRUCTURE PROJECT

0 20 40 80

SCALE IN FEET

CLIENT

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PROJECT

EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

SUMMARY OF PAST INTERIM
REMEDIAL MEASURES

DATE
SEPTEMBER 2018

PROJECT NO.
6103180009

REV NO.
1

FIGURE No.
4-1

DRAWN BY: APS CHECKED BY: LV

S:\6103-0009\001_DataInvestigationReport\EXM-PastInterimRemMeasures_091218.dwg – Figure 4-1 – Sep. 12, 2018 5:11pm – adam.stenberg

FIGURE 4-2

PHOTOGRAPHS OF 2011-2012 EXCAVATION ON BNSF PROPERTY

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

FIGURE 4-3

PHOTOGRAPHS OF SOIL AND DEBRIS FROM 2011-2012 EXCAVATION
DECEMBER, 2011

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

FIGURE 4-4

PHOTOGRAPHS OF BARRIER WALL CONSTRUCTION ALONG BNSF PROPERTY BOUNDARY
FEBRUARY, 2012

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

FIGURE 4-5

PHOTOGRAPHS KC PROPERTY EXCAVATION
MARCH, 2012

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

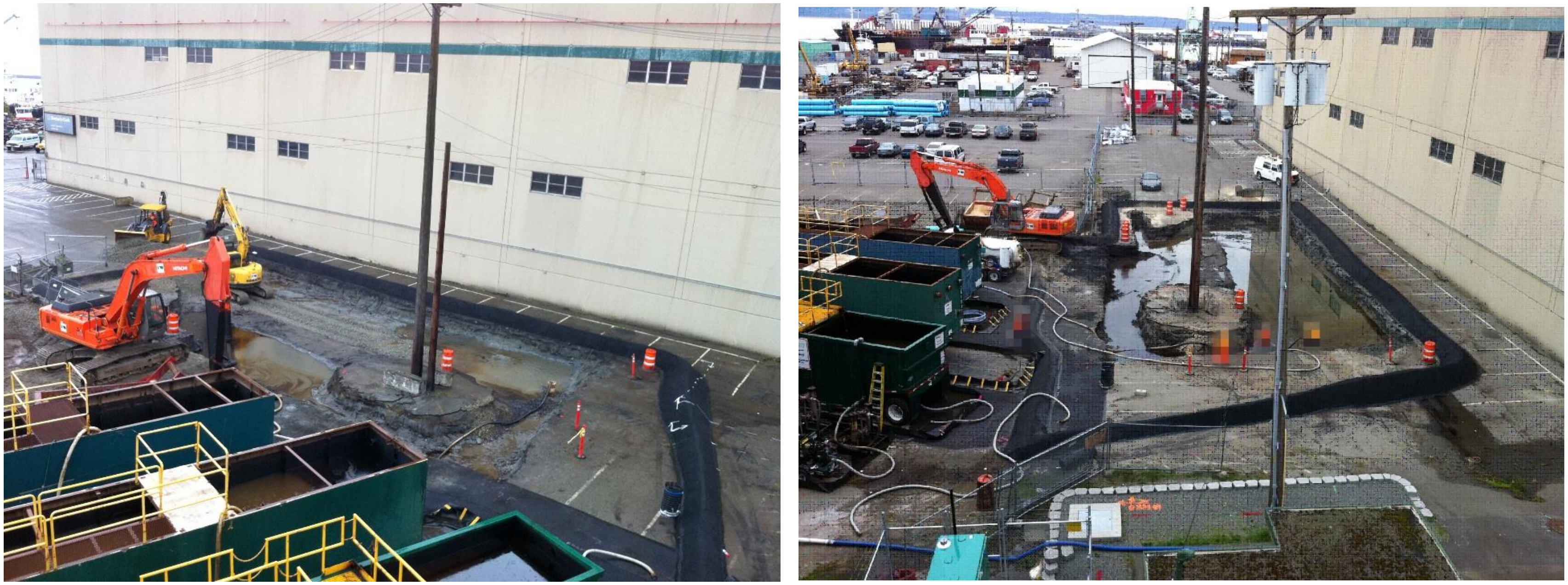
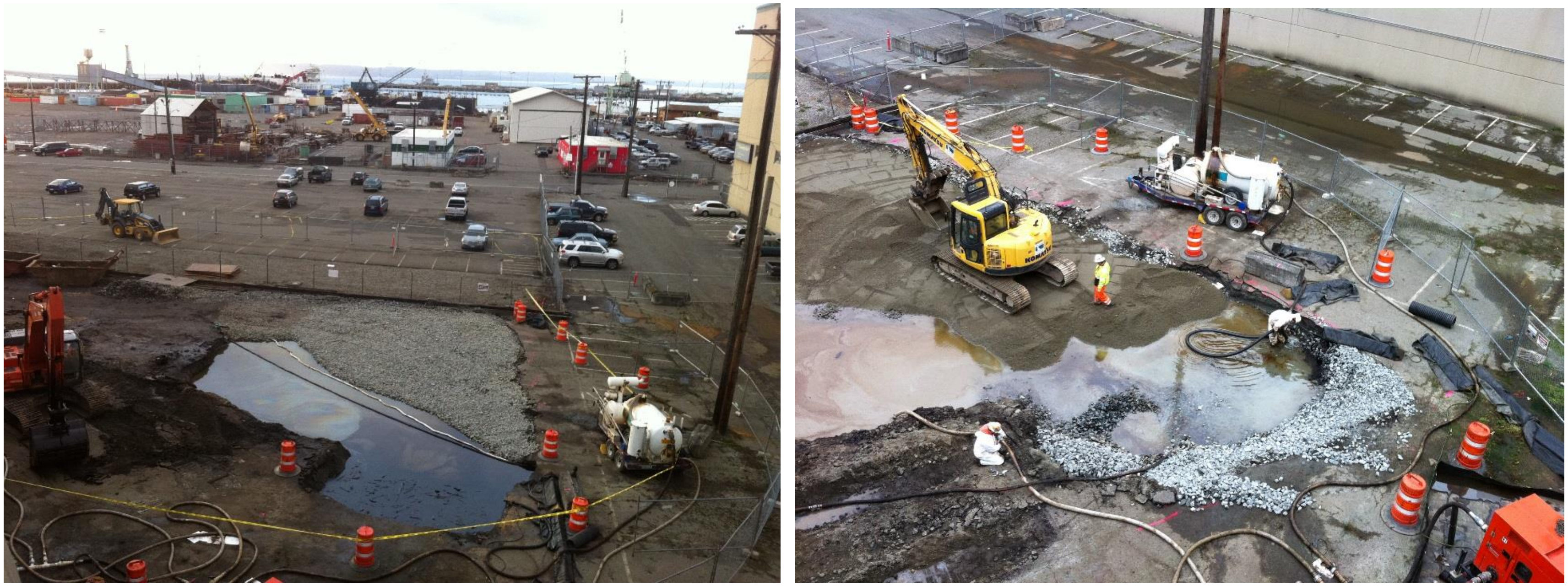
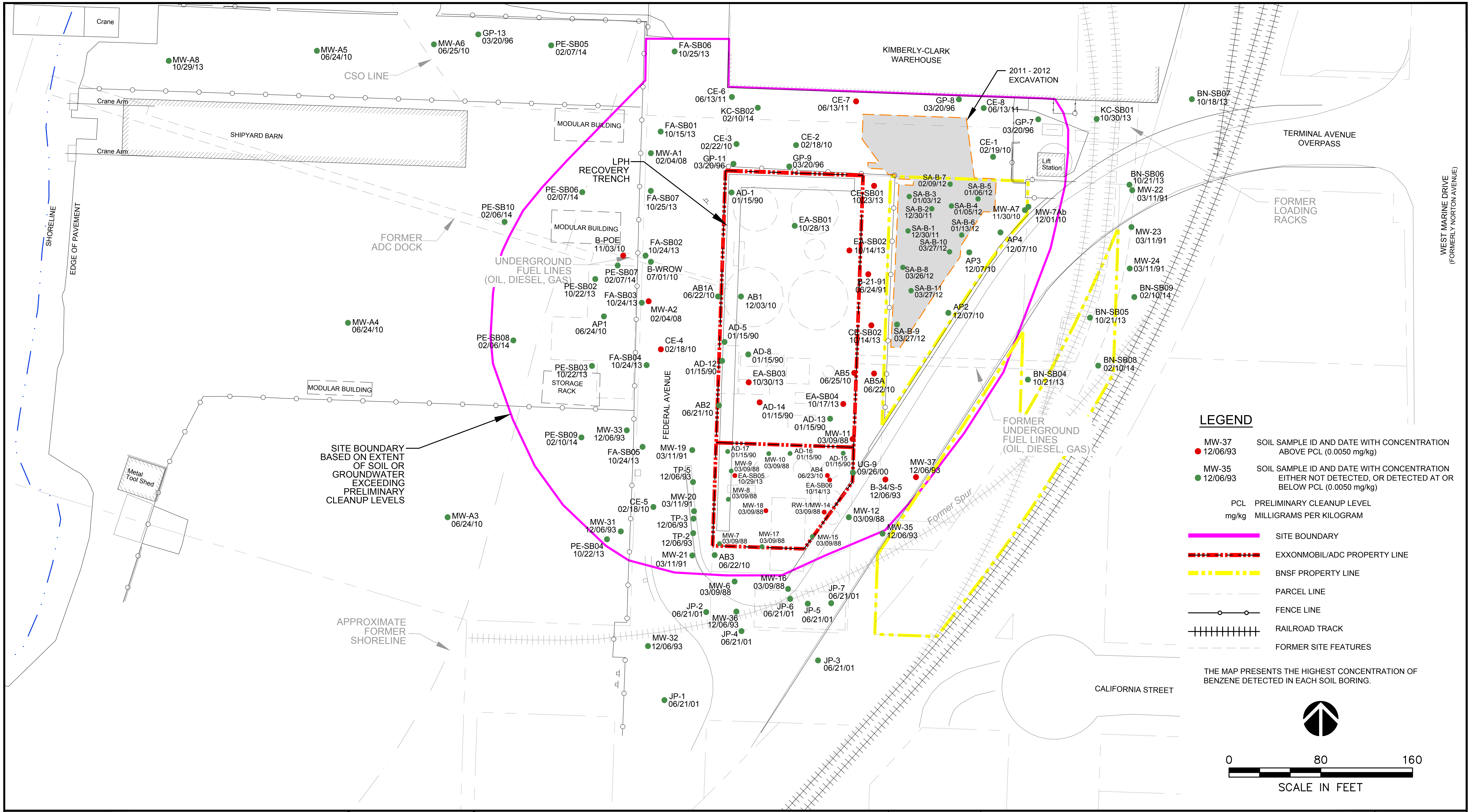


FIGURE 4-6

PHOTOGRAPHS OF BACKFILLING THE BNSF EXCAVATION
JANUARY, 2012

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington





SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

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DWN BY:	APS
CHK'D BY:	LV
DATUM:	NONE
PROJECTION:	NONE
SCALE:	1" = 80'

PROJECT

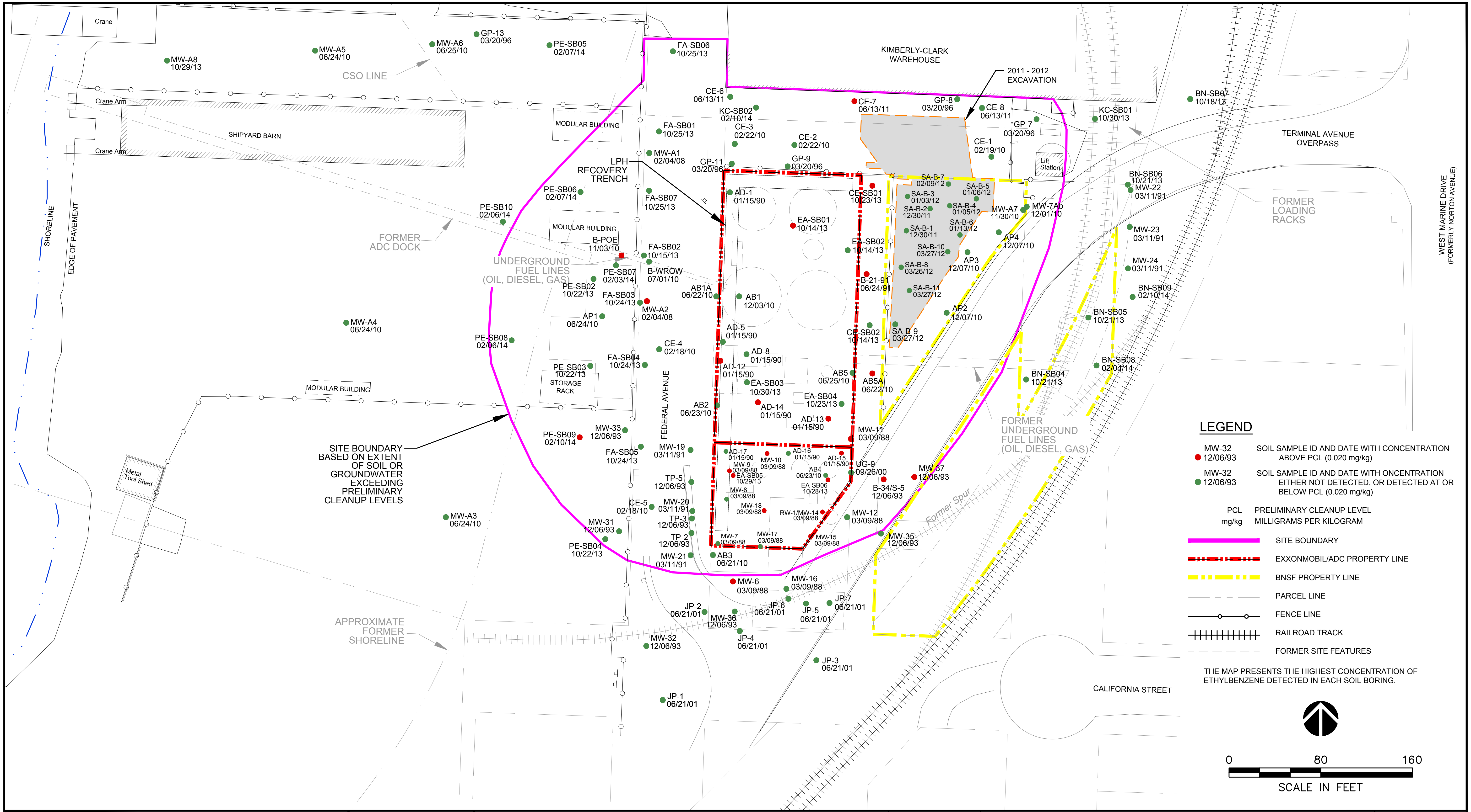
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION
OF BENZENE IN SOIL

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	1
FIGURE No.	6-1

S:\6103-0009\001_DataInvestigationReport\EXM-SoilDistribution_091218.dwg – Fig6-1 Benzene – Sep. 12, 2018 2:21pm – adam.stenberg



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

wood.

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DWN BY:	APS
CHK'D BY:	LV
DATUM:	NONE
PROJECTION:	NONE
SCALE:	1" = 80'

PROJECT

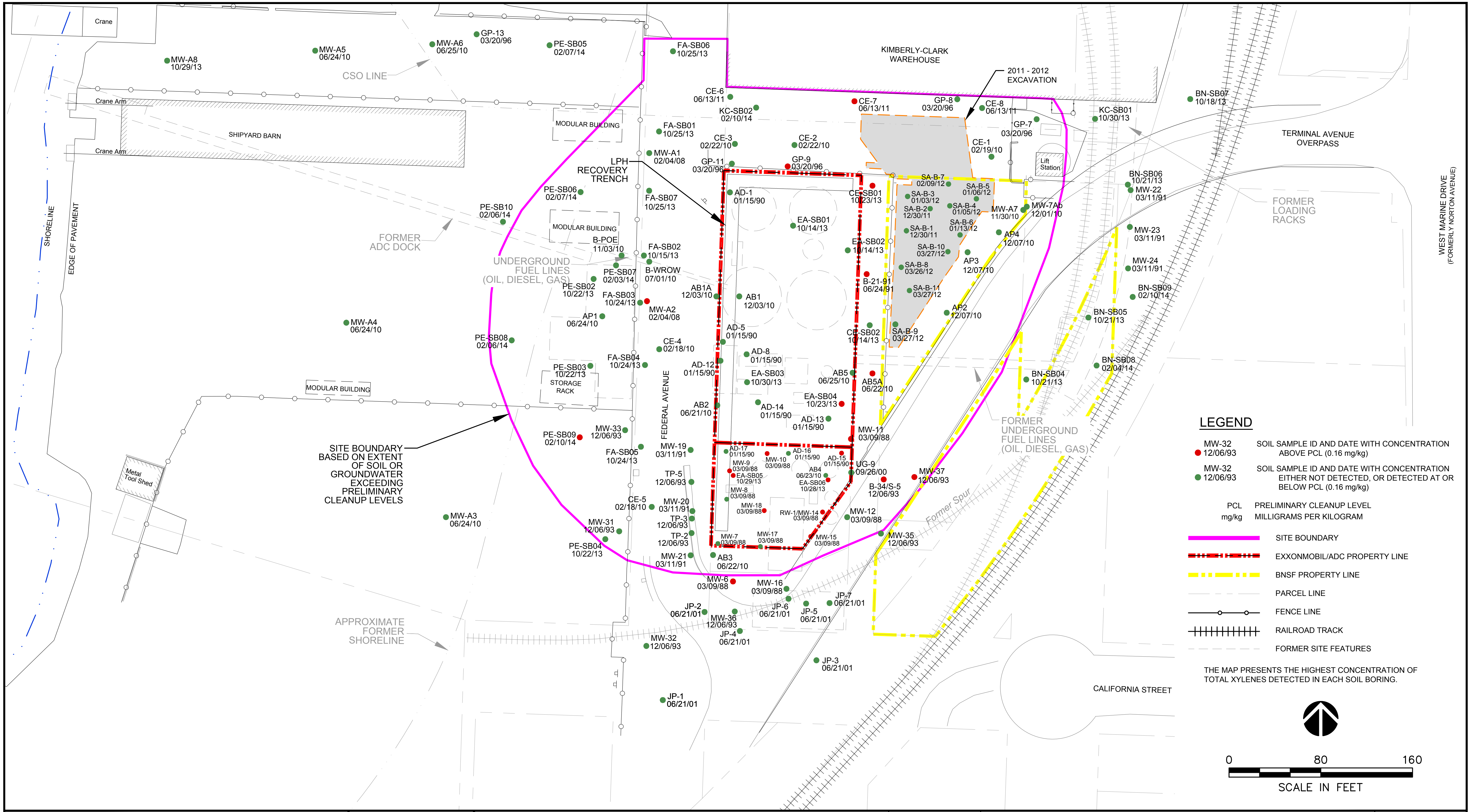
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION
OF ETHYLBENZENE IN SOIL

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	1
FIGURE No.	6-2

S:\6103-0009\001_DataInvestigationReport\EXM-SoilDistribution_091218.dwg – Figure 6-2 Ethylbenzene – Sep. 12, 2018 2:21pm – adam.stenberg



LEGEND

● MW-32 12/06/93	SOIL SAMPLE ID AND DATE WITH CONCENTRATION ABOVE PCL (0.16 mg/kg)
● MW-32 12/06/93	SOIL SAMPLE ID AND DATE WITH CONCENTRATION EITHER NOT DETECTED, OR DETECTED AT OR BELOW PCL (0.16 mg/kg)
PCL	PRELIMINARY CLEANUP LEVEL
mg/kg	MILLIGRAMS PER KILOGRAM
▬	SITE BOUNDARY
▬	EXXONMOBIL/ADC PROPERTY LINE
▬	BNSF PROPERTY LINE
— —	PARCEL LINE
—○—○	FENCE LINE
┼┼┼┼┼┼┼┼	RAILROAD TRACK
	FORMER SITE FEATURES

THE MAP PRESENTS THE HIGHEST CONCENTRATION OF TOTAL XYLENES DETECTED IN EACH SOIL BORING.

SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

wood.

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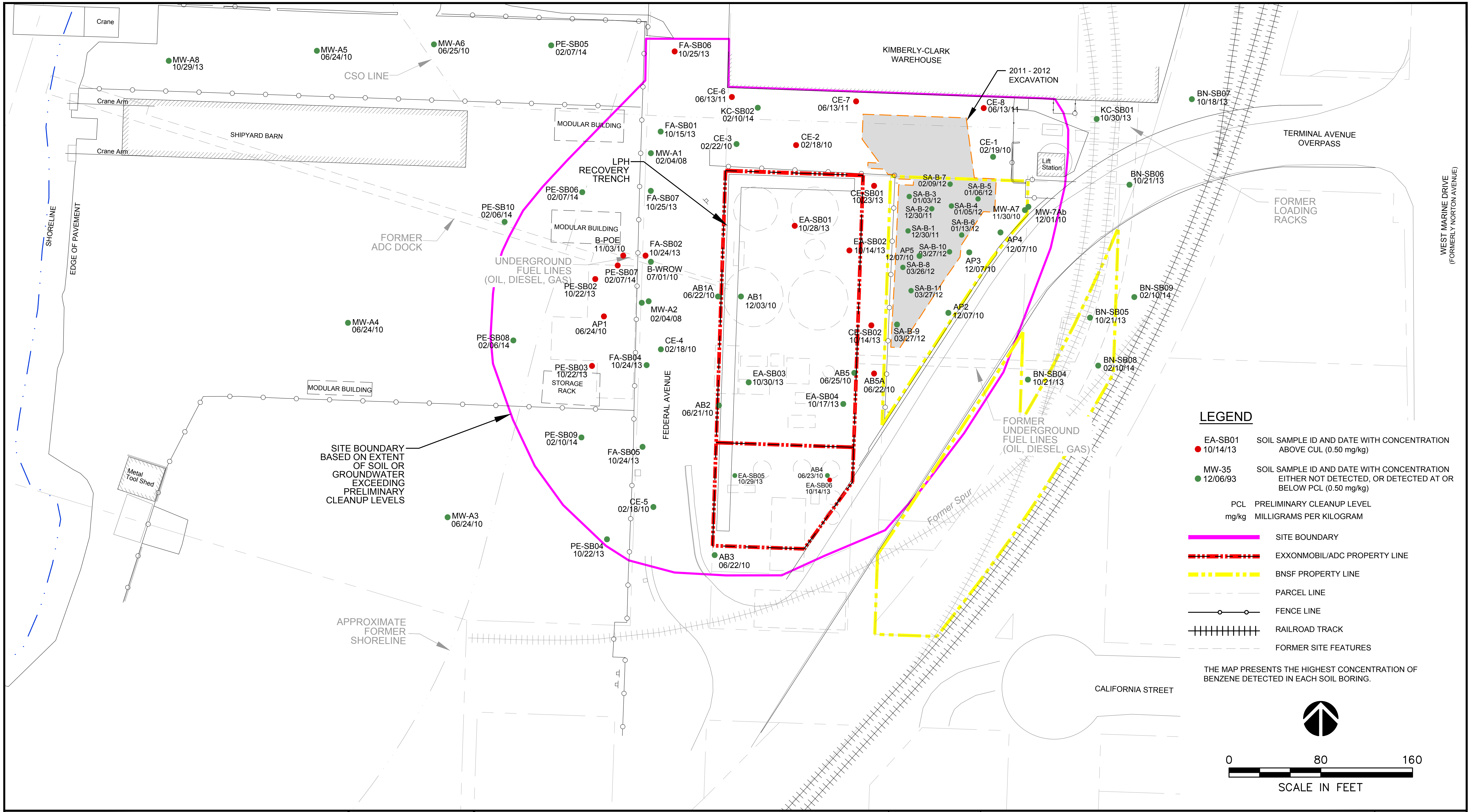
DWN BY: APS
CHK'D BY: LV
DATUM: NONE
PROJECTION: NONE
SCALE: 1" = 80'

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
DISTRIBUTION
OF TOTAL XYLENES IN SOIL

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.: 1
FIGURE No. 6-3

S:\6103-0009\001_DataInvestigationReport\EXM-SoilDistribution_091218.dwg – Figure 6-3 Total Xylene – Sep. 12, 2018 2:21pm – adam.stenberg



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

wood.

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DWN BY:	APS
CHK'D BY:	LV
DATUM:	NONE
PROJECTION:	NONE
SCALE:	1" = 80'

PROJECT

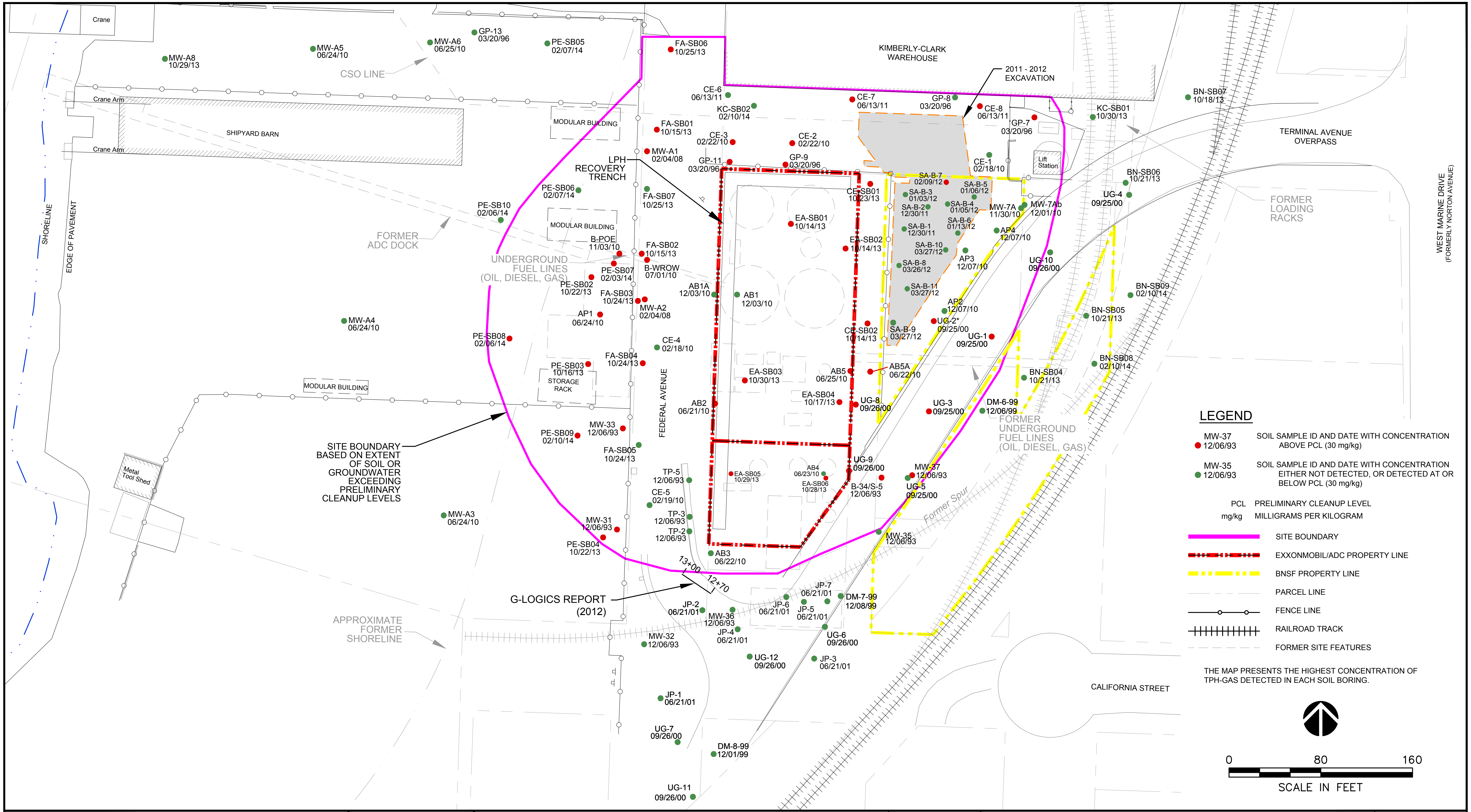
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION
OF 1-METHYLNAPHTHALENE IN SOIL

DATE:	SEPTEMBER 2018
PROJECT NO.:	6103180009
REV. NO.:	1
FIGURE No.	6-4

S:\6103-0009\001_DataInvestigationReport\EXM-SoilDistribution_091218.dwg – Fig6-4 1-Methylnaphthalene – Sep. 12, 2018 2:21pm – adam.stenberg



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

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DWN BY:	APS
CHK'D BY:	CN
DATUM:	NONE
PROJECTION:	NONE
SCALE:	1" = 80'

PROJECT

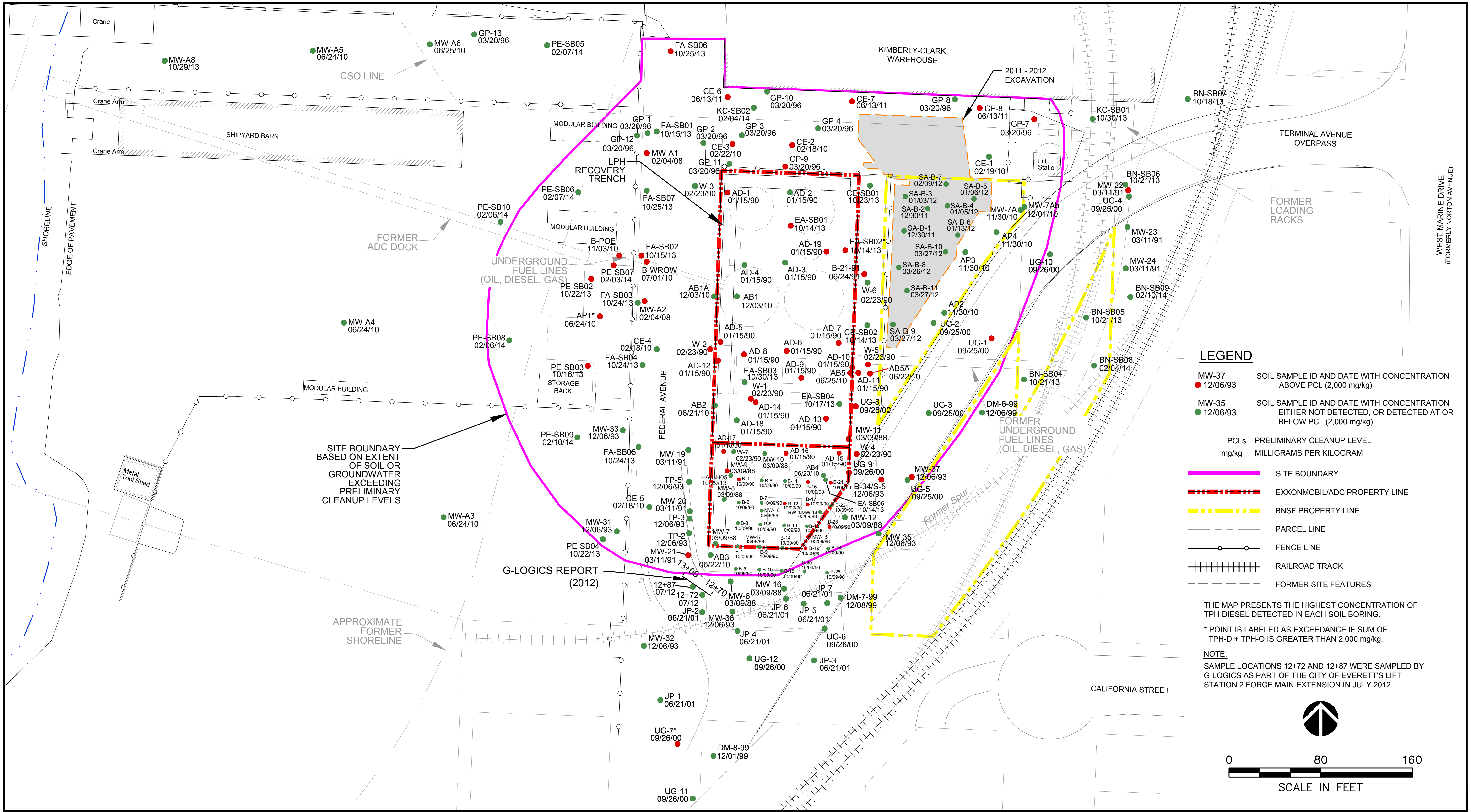
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION OF
TPH-G IN SOIL

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	1
FIGURE No.	6-5

S:\6103-0009\001_DataInvestigationReport\EXM-SoilDistribution_091218.dwg – Fig6-5 TPH-Gas – Sep. 12, 2018 2:21pm – adam.stenberg



LEGEND

MW-37 🔴 12/06/93	SOIL SAMPLE ID AND DATE WITH CONCENTRATION ABOVE PCL (2,000 mg/kg)
MW-35 🟢 12/06/93	SOIL SAMPLE ID AND DATE WITH CONCENTRATION EITHER NOT DETECTED, OR DETECTED AT OR BELOW PCL (2,000 mg/kg)
PCLs	PRELIMINARY CLEANUP LEVEL
mg/kg	MILLIGRAMS PER KILOGRAM
▬	SITE BOUNDARY
‒·‒	EXXONMOBIL/ADC PROPERTY LINE
‒·‒	BNSF PROPERTY LINE
— —	PARCEL LINE
—○—	FENCE LINE
┼┼┼┼	RAILROAD TRACK
– – –	FORMER SITE FEATURES

THE MAP PRESENTS THE HIGHEST CONCENTRATION OF TPH-DIESEL DETECTED IN EACH SOIL BORING.

* POINT IS LABELED AS EXCEEDANCE IF SUM OF TPH-D + TPH-O IS GREATER THAN 2,000 mg/kg.

NOTE:

SAMPLE LOCATIONS 12+72 AND 12+87 WERE SAMPLED BY G-LOGICS AS PART OF THE CITY OF EVERETT'S LIFT STATION 2 FORCE MAIN EXTENSION IN JULY 2012.

SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

wood.

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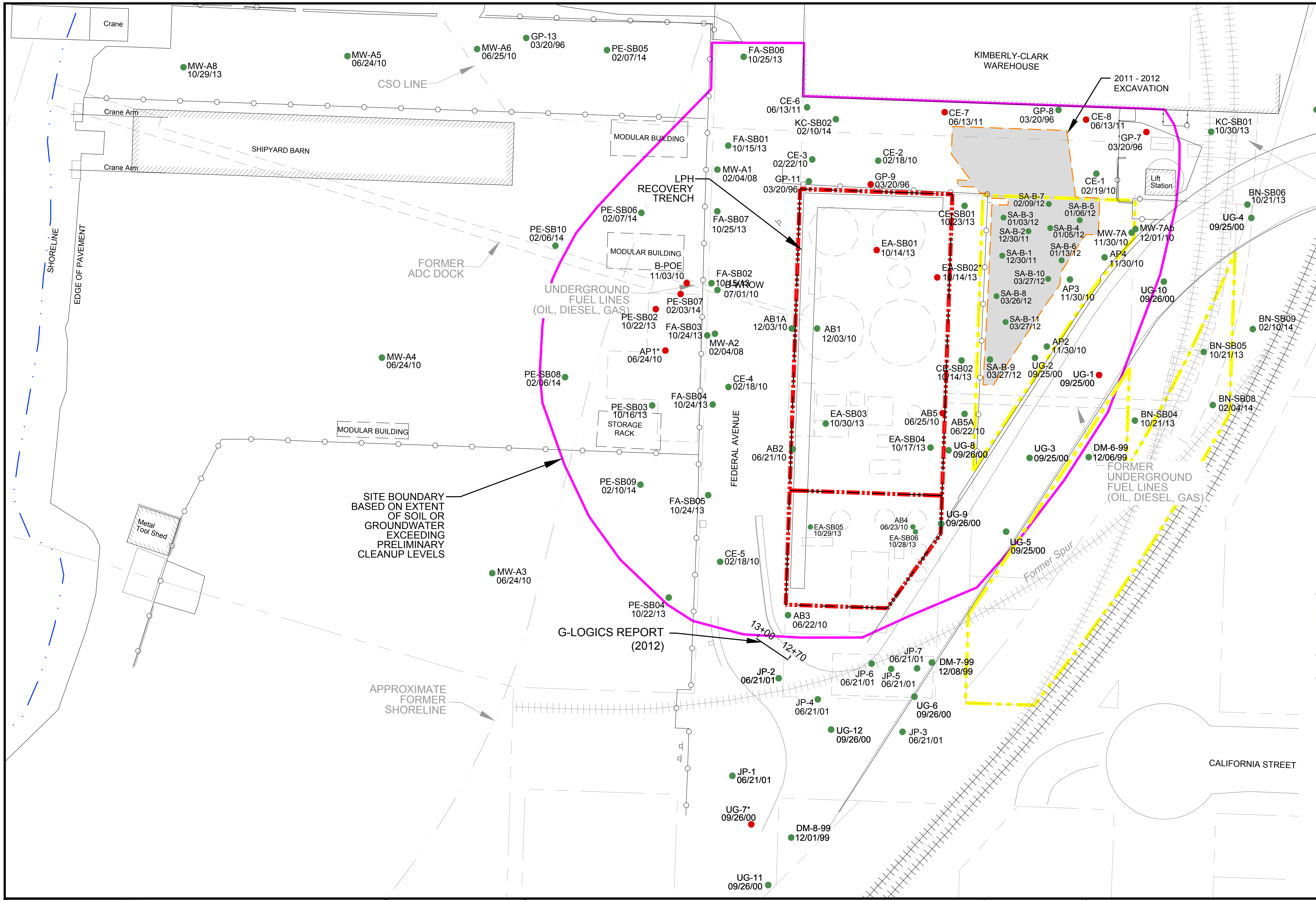
CHK'D BY: LV
DATUM: NONE
PROJECTION: NONE
SCALE: 1" = 80'

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
DISTRIBUTION OF TPH-D
AND UNDIFFERENTIATED TPH IN SOIL

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.: 1
FIGURE No. 6-6

S:\6103-0009\001_DataInvestigationReport\EXM-SoilDistribution_091218.dwg – Fig6-6 TPH-Diesel – Sep. 12, 2018 2:21pm – adam.stenberg

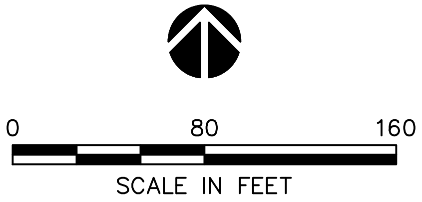


LEGEND

UG-1 09/25/00 ●	SOIL SAMPLE ID AND DATE WITH CONCENTRATION ABOVE PCL (2,000 mg/kg)
UG-3 09/25/00 ●	SOIL SAMPLE ID AND DATE WITH CONCENTRATION EITHER NOT DETECTED, OR DETECTED AT OR BELOW PCL (2,000 mg/kg)
PCL	PRELIMINARY CLEANUP LEVEL
mg/kg	MILLIGRAMS PER KILOGRAM
▬	SITE BOUNDARY
▬	EXXONMOBIL/ADC PROPERTY LINE
▬	BNSF PROPERTY LINE
— —	PARCEL LINE
—○—○—	FENCE LINE
┼┼┼┼┼┼	RAILROAD TRACK
— —	FORMER SITE FEATURES

THE MAP PRESENTS THE HIGHEST CONCENTRATION OF TPH-DIESEL DETECTED IN EACH SOIL BORING.

* POINT IS LABELED AS EXCEEDANCE IF SUM OF TPH-D + TPH-O IS GREATER THAN 2,000 mg/kg.



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

wood.

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CHK'D BY:	CN
DATUM:	NONE
PROJECTION:	NONE
SCALE:	1" = 80'

PROJECT

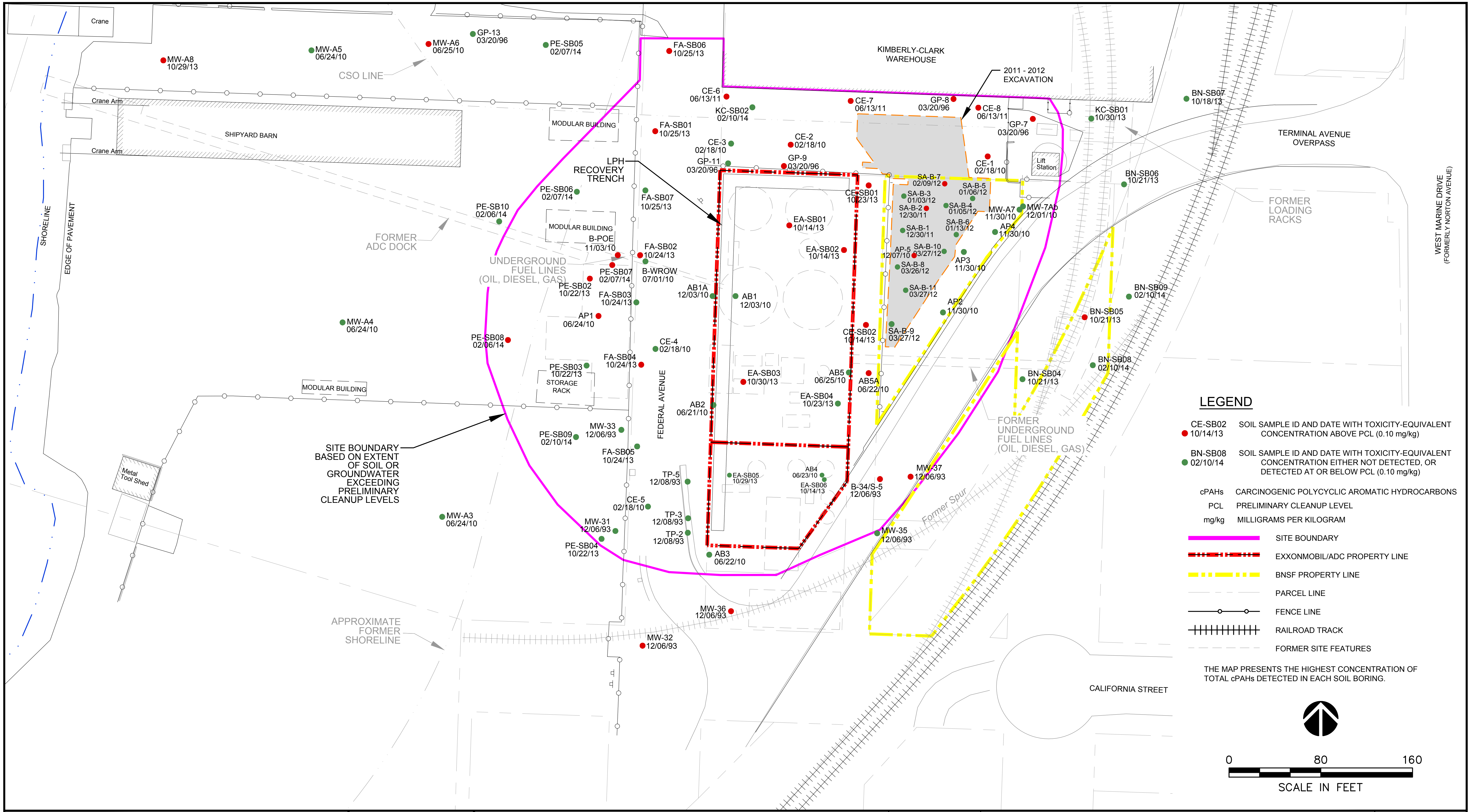
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION OF TPH-O IN SOIL

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	1
FIGURE No.	6-7

S:\6103-0009\001_DataInvestigationReport\EXM-SoilDistribution_091218.dwg – Fig6-7 TPH-Oil – Sep. 12, 2018 2:21pm – adam.stenberg



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

wood.

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Seattle, WA, U.S.A. 98101

DWN BY:	APS
CHK'D BY:	CN
DATUM:	NONE
PROJECTION:	NONE
SCALE:	1" = 80'

PROJECT

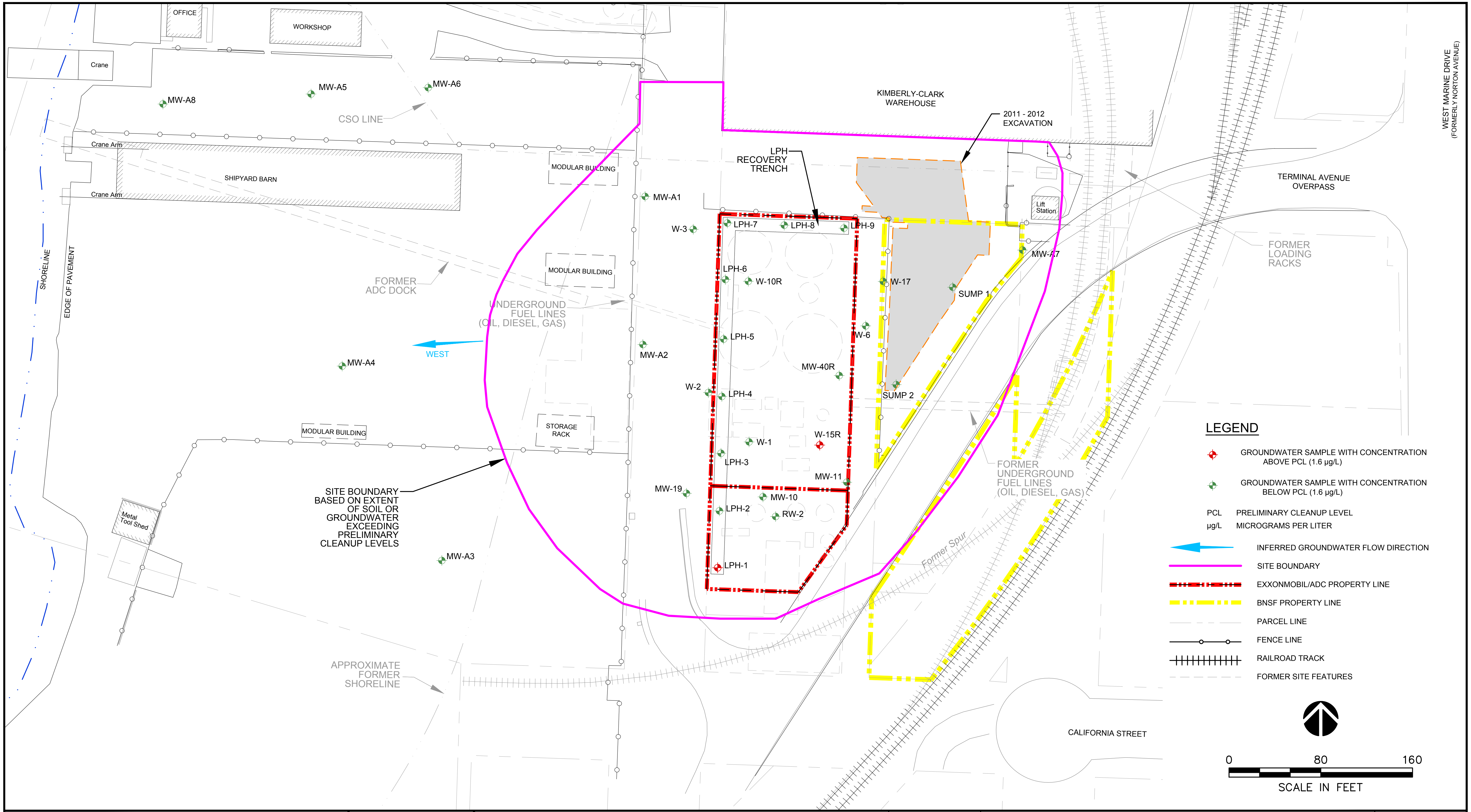
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION OF cPAHs IN SOIL

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	1
FIGURE No.	6-8

S:\6103-0009\001_DataInvestigationReport\EXM-SoilDistribution_091218.dwg – Fig6-8 cPAH – Sep. 12, 2018 2:21pm – adam.stenberg



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

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DWN BY: APS

CHK'D BY: LV

DATUM: NONE

PROJECTION: NONE

SCALE: 1" = 80'

PROJECT

EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION OF BENZENE IN GROUNDWATER
BASED ON JANUARY 2015 RESULTS

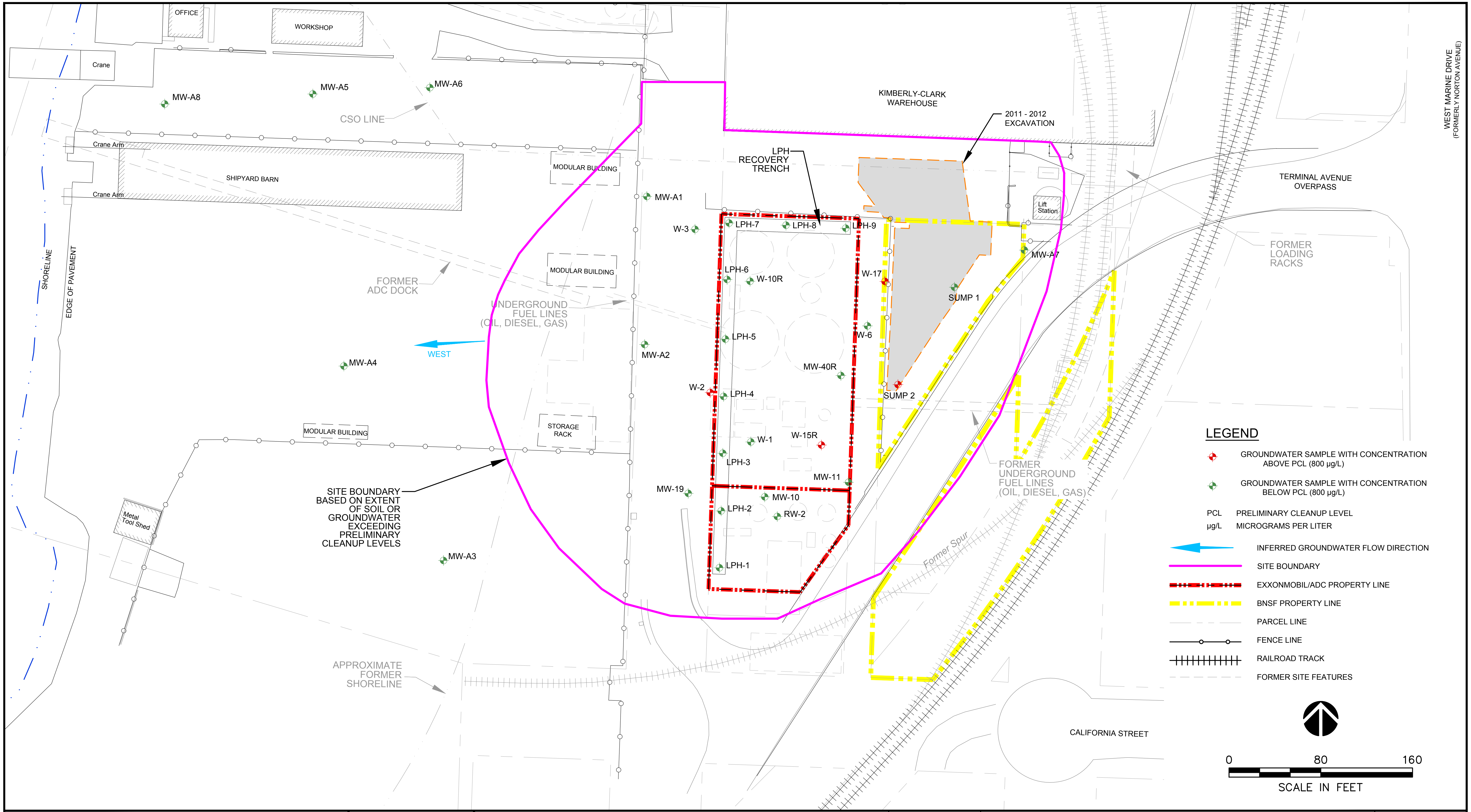
DATE: SEPTEMBER 2018

PROJECT NO.: 6103180009

REV. NO.: 1

FIGURE No. 6-9

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_9936\EXM-GWDistribution_091218.dwg – Figure 6-9 Benzene – Sep. 12, 2018 3:59pm – adam.stenberg



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

wood.

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DWN BY:	AS
CHK'D BY:	LV
DATUM:	NONE
PROJECTION:	NONE
SCALE:	1" = 80'

PROJECT

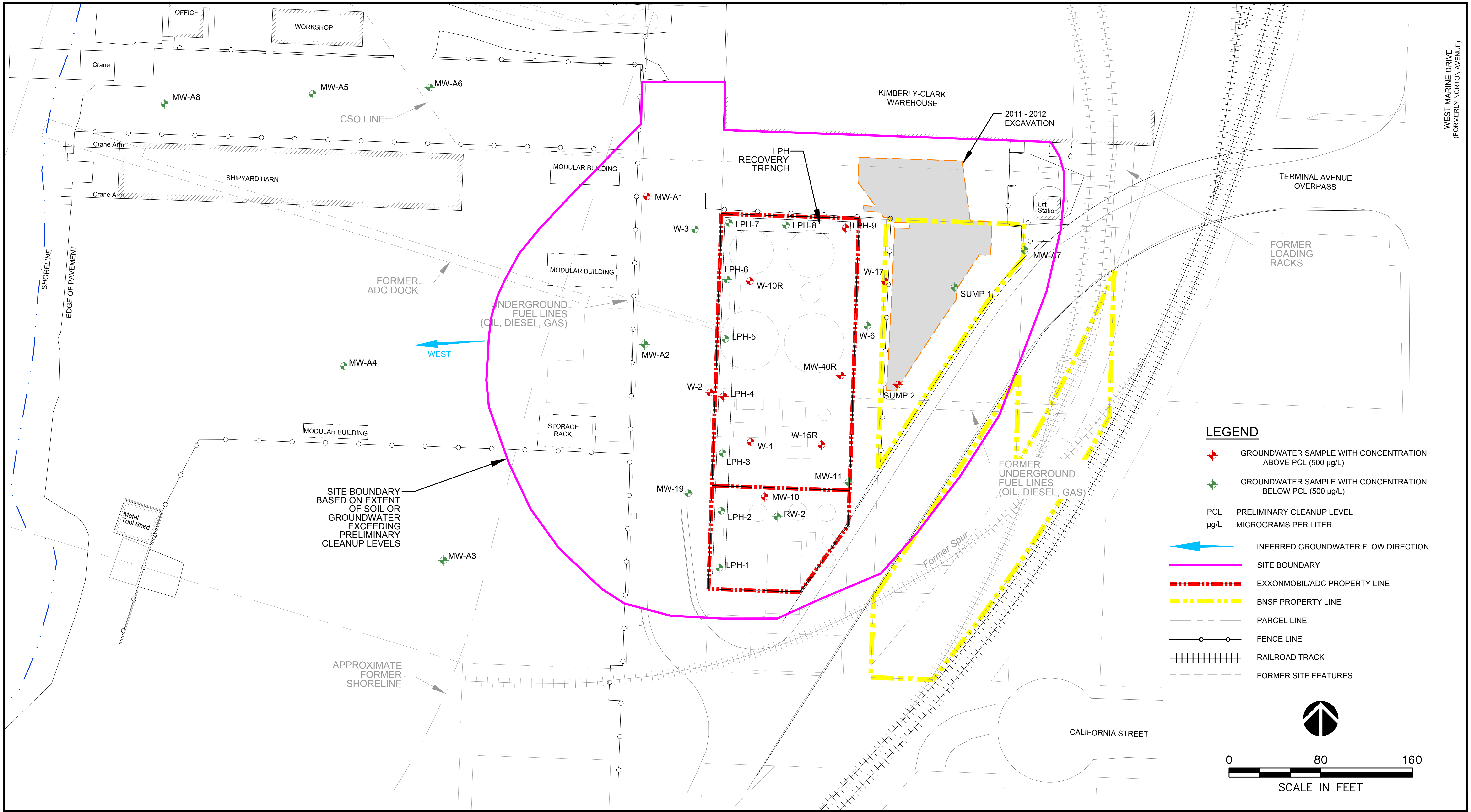
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION OF TPH-G IN GROUNDWATER
BASED ON JANUARY 2015 RESULTS

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	1
FIGURE No.	6-10

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_9936\EXM-GWDistribution_091218.dwg – Figure 6-10 TPH-Gas – Sep. 12, 2018 3:59pm – adam.stenberg



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

wood.

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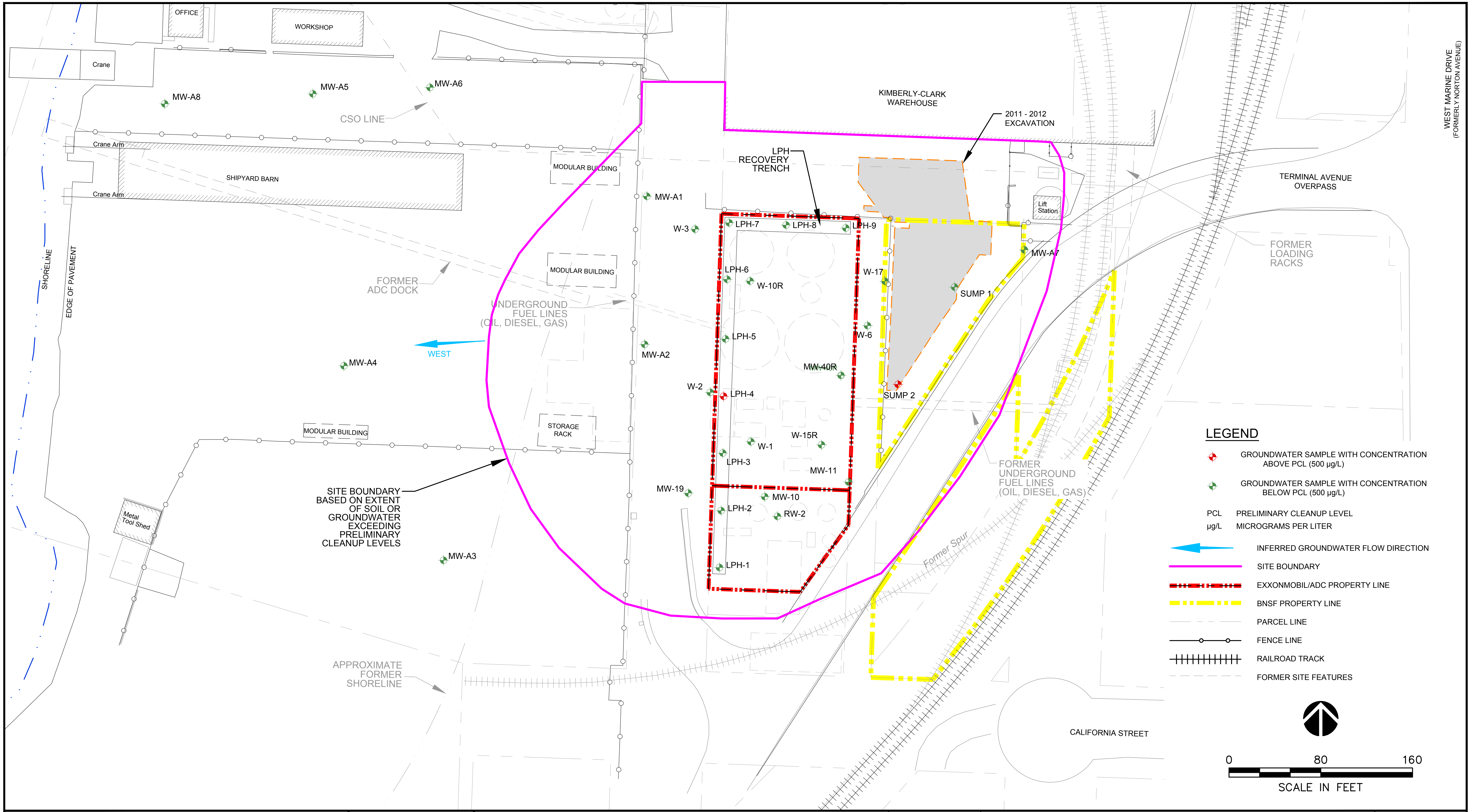
DWN BY: APS
CHK'D BY: LV
DATUM: NONE
PROJECTION: NONE
SCALE: 1" = 80'

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
DISTRIBUTION OF TPH-D IN GROUNDWATER
BASED ON JANUARY 2015 RESULTS

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.: 1
FIGURE No. 6-11

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_9936\EXM-GWDistribution_091218.dwg — Figure 6-11 TPH-Diesel and TPH — Sep. 12, 2018 3:59pm — adam.stenberg



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

wood.

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DWN BY:	APS
CHK'D BY:	LV
DATUM:	NONE
PROJECTION:	NONE
SCALE:	1" = 80'

PROJECT

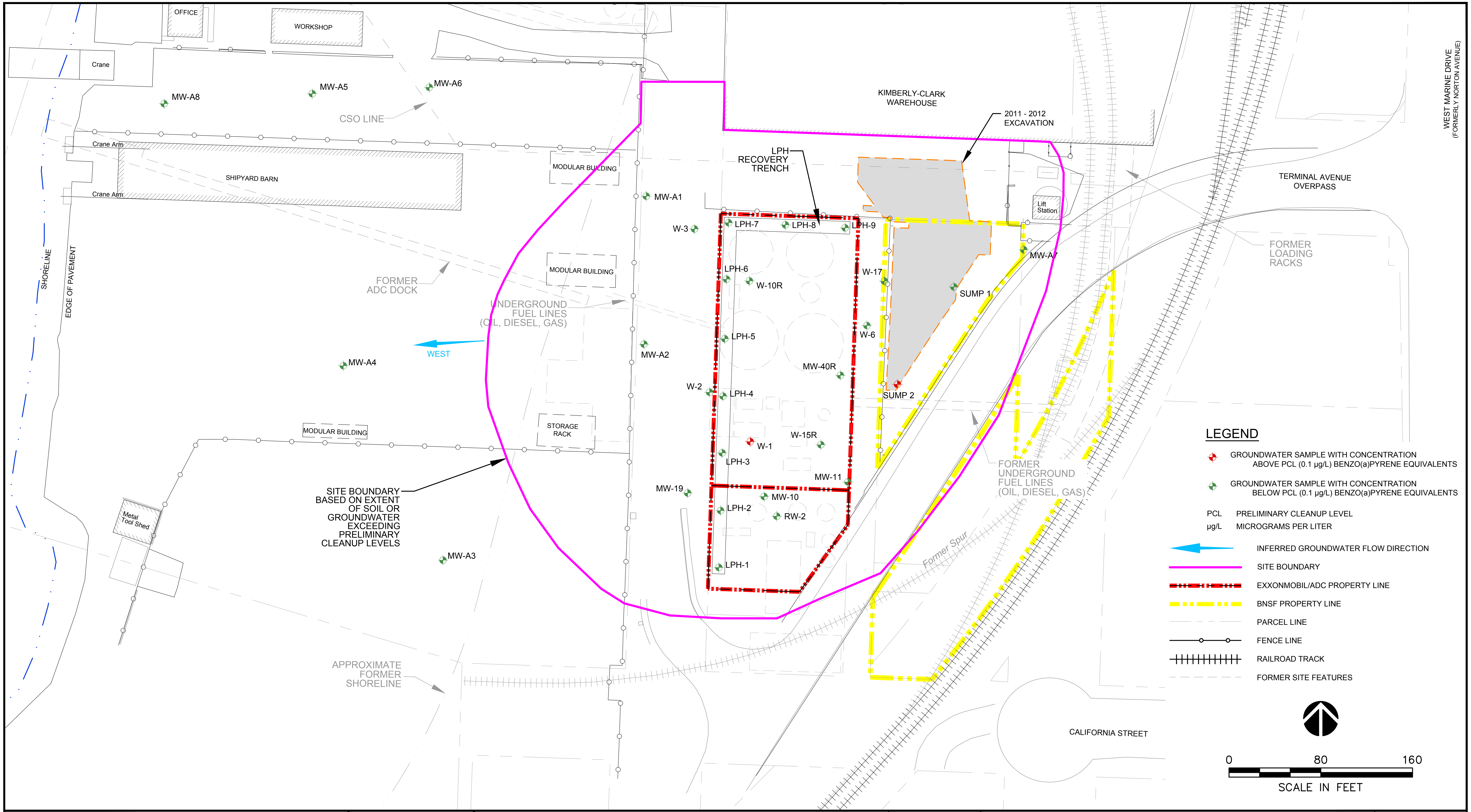
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION OF TPH-O IN GROUNDWATER
BASED ON JANUARY 2015 RESULTS

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	1
FIGURE No.	6-12

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_9936\EXM-GWDistribution_091218.dwg – Figure 6-12 TPH-Oil – Sep. 12, 2018 3:59pm – adam.stenberg



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

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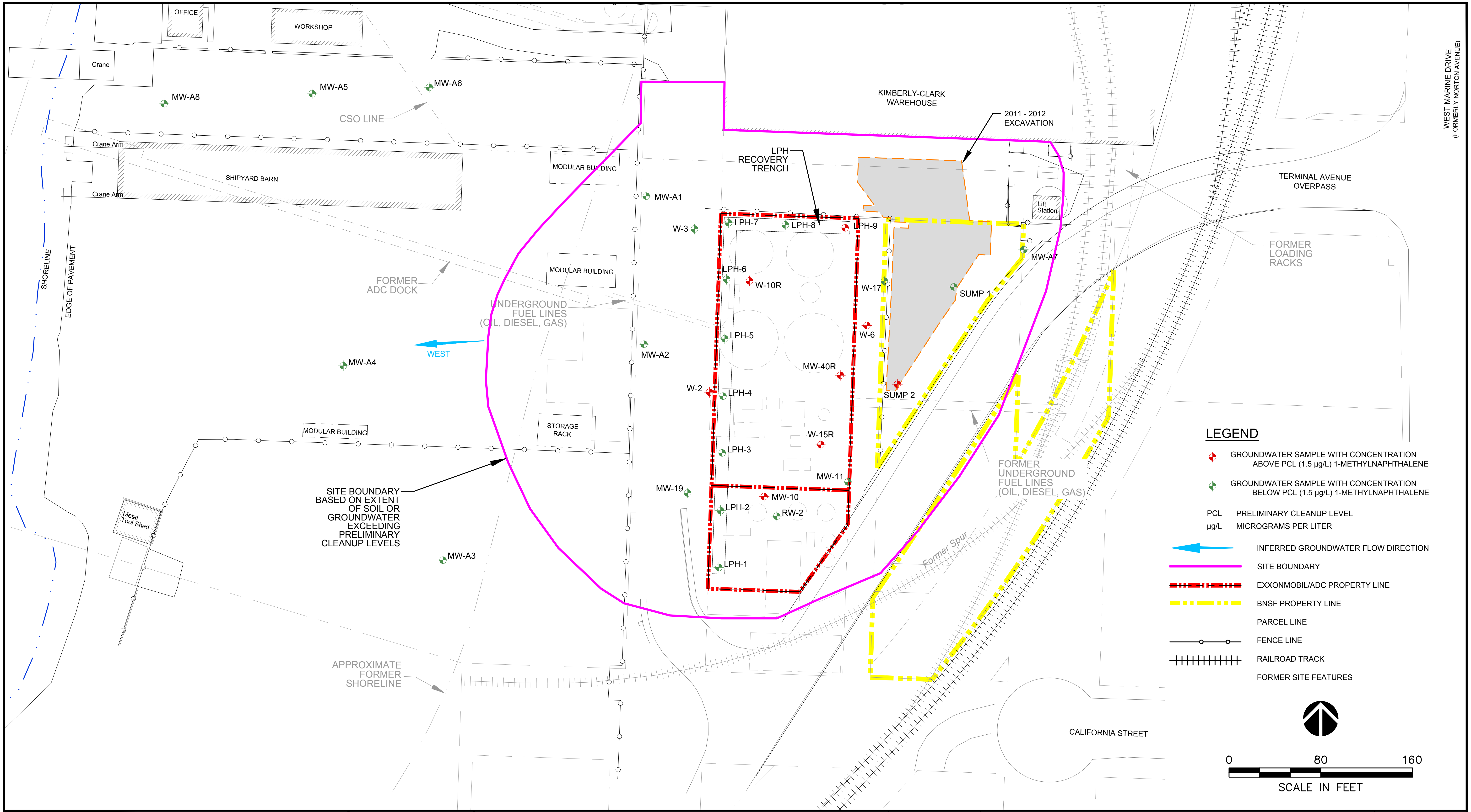
Seattle, WA, U.S.A. 98101

DWN BY: APS
CHK'D BY: LV
DATUM: NONE
PROJECTION: NONE
SCALE: 1" = 80'

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
DISTRIBUTION OF ADJUSTED TOTAL cPAHs
IN GROUNDWATER BASED ON
JANUARY 2015 RESULTS

DATE: SEPTEMBER 2018
PROJECT NO.: 6103180009
REV. NO.: 1
FIGURE No. 6-13



SOURCE: Modified from a map provided by City of Everett, ExxonMobil Oil Corporation and Environmental Resolution, Inc.

wood.

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DWN BY:	APS
CHK'D BY:	LV
DATUM:	NONE
PROJECTION:	NONE
SCALE:	1" = 80'

PROJECT

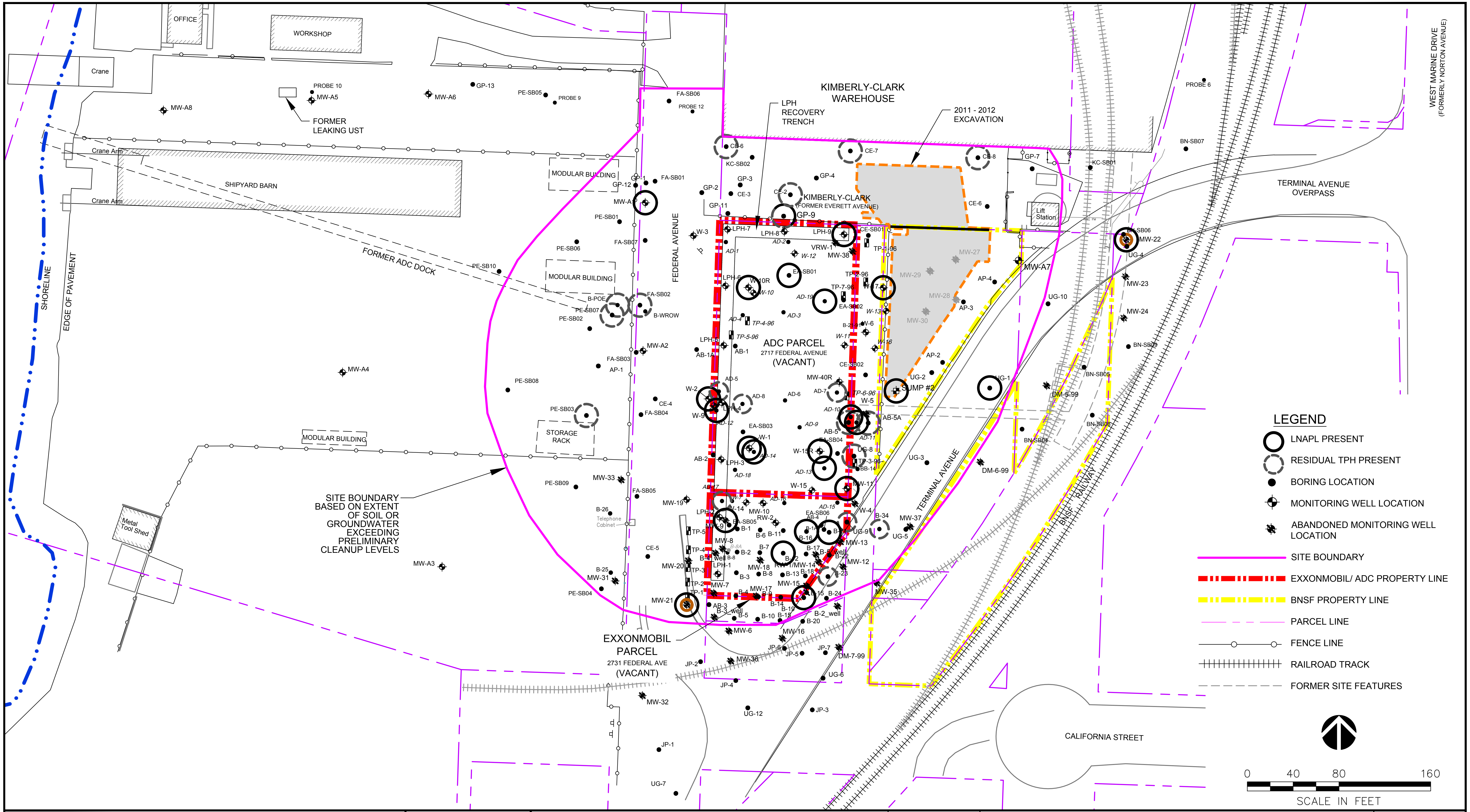
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION OF 1-METHYLNAPHTHALENE IN GROUNDWATER BASED ON JANUARY 2015 RESULTS

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	1
FIGURE No.	6-14

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_9936\EXM-GWDistribution_091218.dwg – Figure 6-14 1-Methynl – Sep. 12, 2018 3:59pm – adam.stenberg



wood.

CLIENT:

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Wood Environment &
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600 University Street, Suite 600
Seattle, WA, U.S.A. 98101

DWN BY:	APS
CHK'D BY:	LV
DATUM:	NAD 83 N FT
PROJECTION:	WASP
SCALE:	AS SHOWN

PROJECT

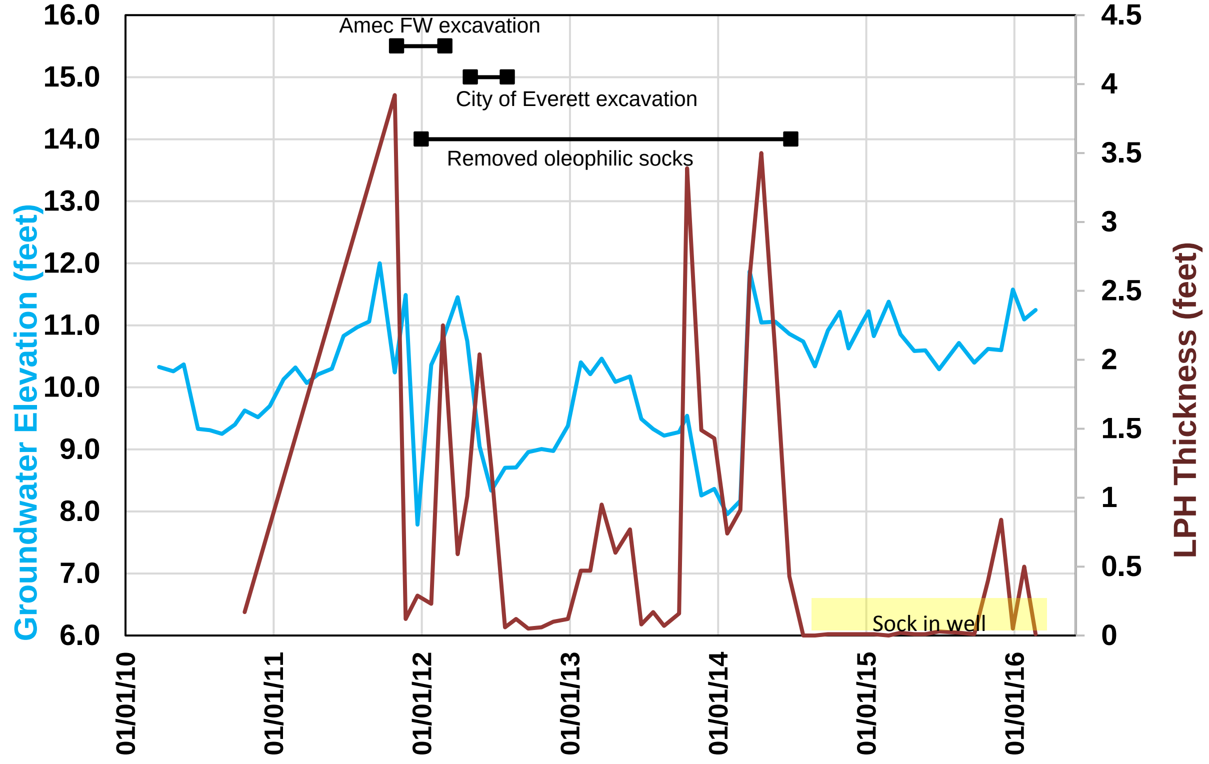
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

DISTRIBUTION OF LPH

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	
FIGURE No.	6-15

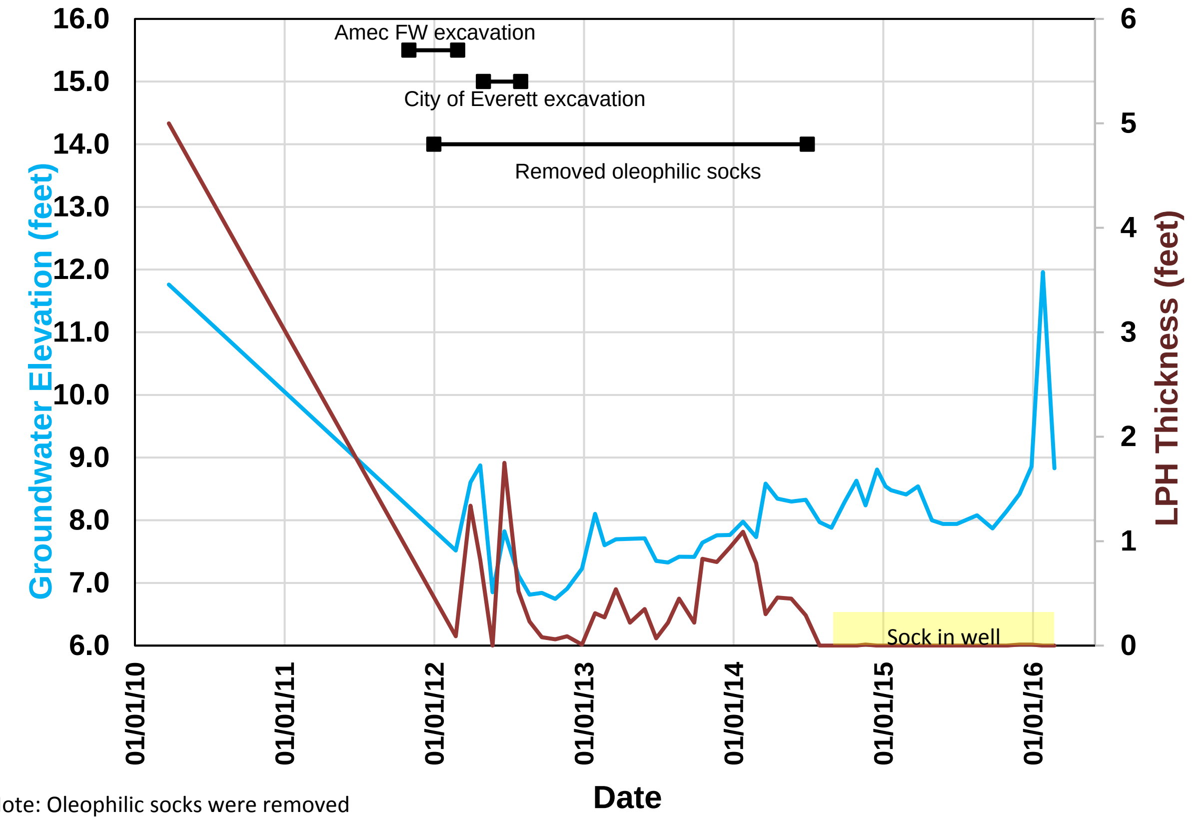
C:\Users\adam.stenberg\appdata\local\temp\AcPublish_9936\Everett_EXM-Figures_091118.dwg – Fig6-15_DistLPH – Sep. 12, 2018 4:12pm – adam.stenberg



Note: Oleophilic socks were removed to study baseline product recharge.

W-1 GROUNDWATER ELEVATION AND
LPH THICKNESS
ExxonMobil/ADC Property
Everett, Washington

By: KK	Date: 03/01/2017	Project No. 6103170009
wood.		Figure 6-16

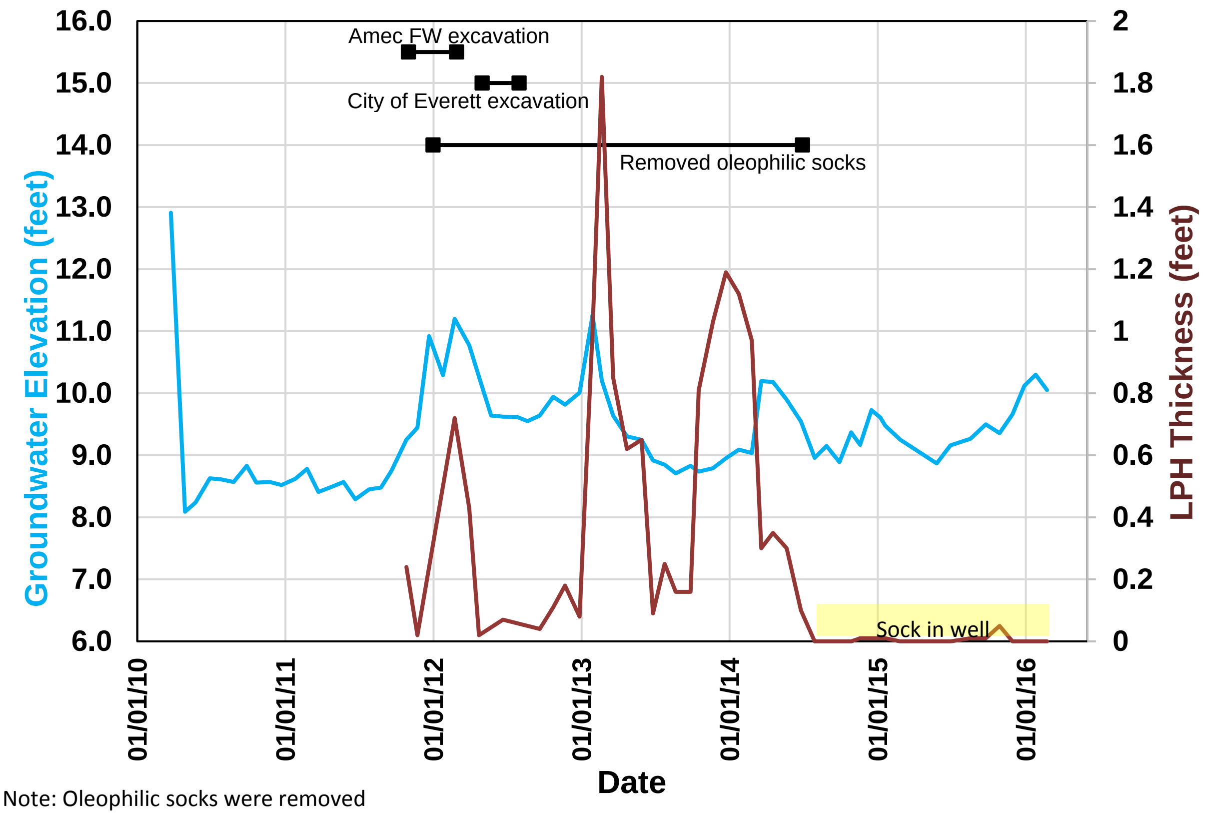


Note: Oleophilic socks were removed to study baseline product recharge.

W-2 GROUNDWATER ELEVATION AND
LPH THICKNESS
ExxonMobil/ADC Property
Everett, Washington

By: KK	Date: 03/01/2017	Project No. 6103180009
wood.		Figure 6-17

Non GDS

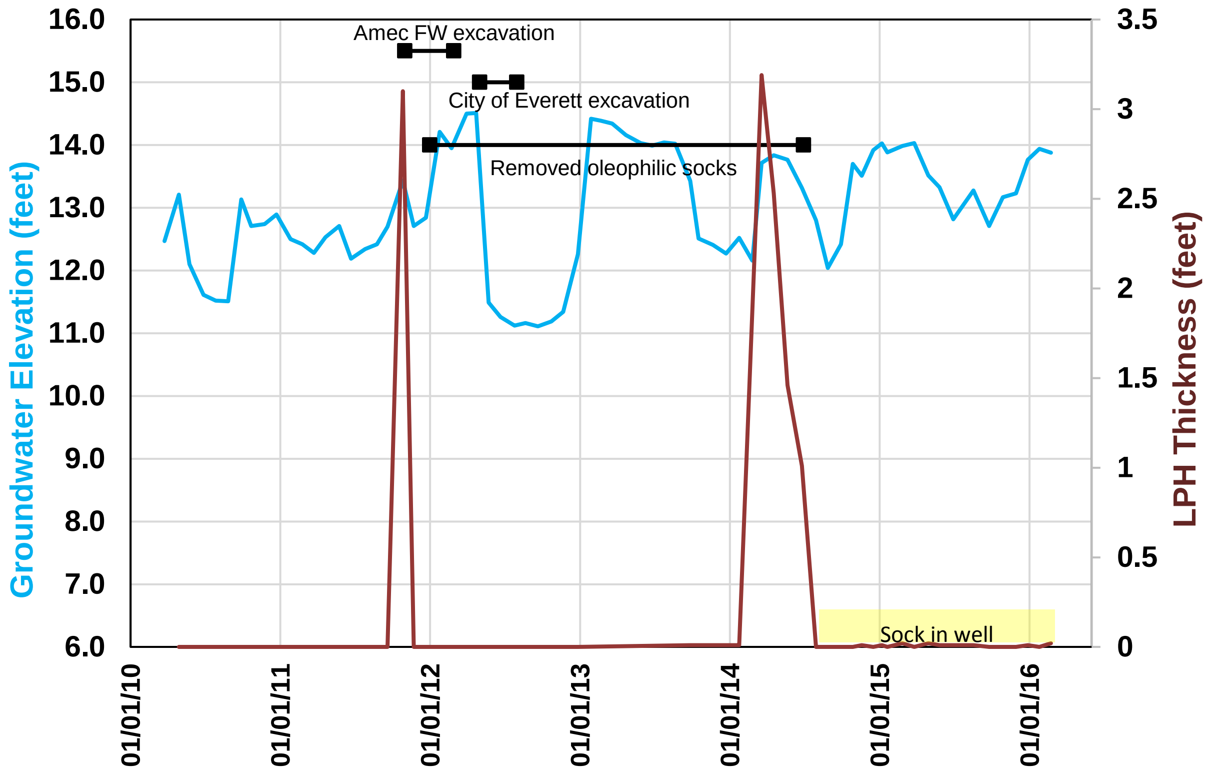


Note: Oleophilic socks were removed to study baseline product recharge.

W-10R GROUNDWATER ELEVATION AND
LPH THICKNESS
ExxonMobil/ADC Property
Everett, Washington

By: KK	Date: 03/01/2017	Project No. 6103180009
wood.		Figure 6-18

Non GDS

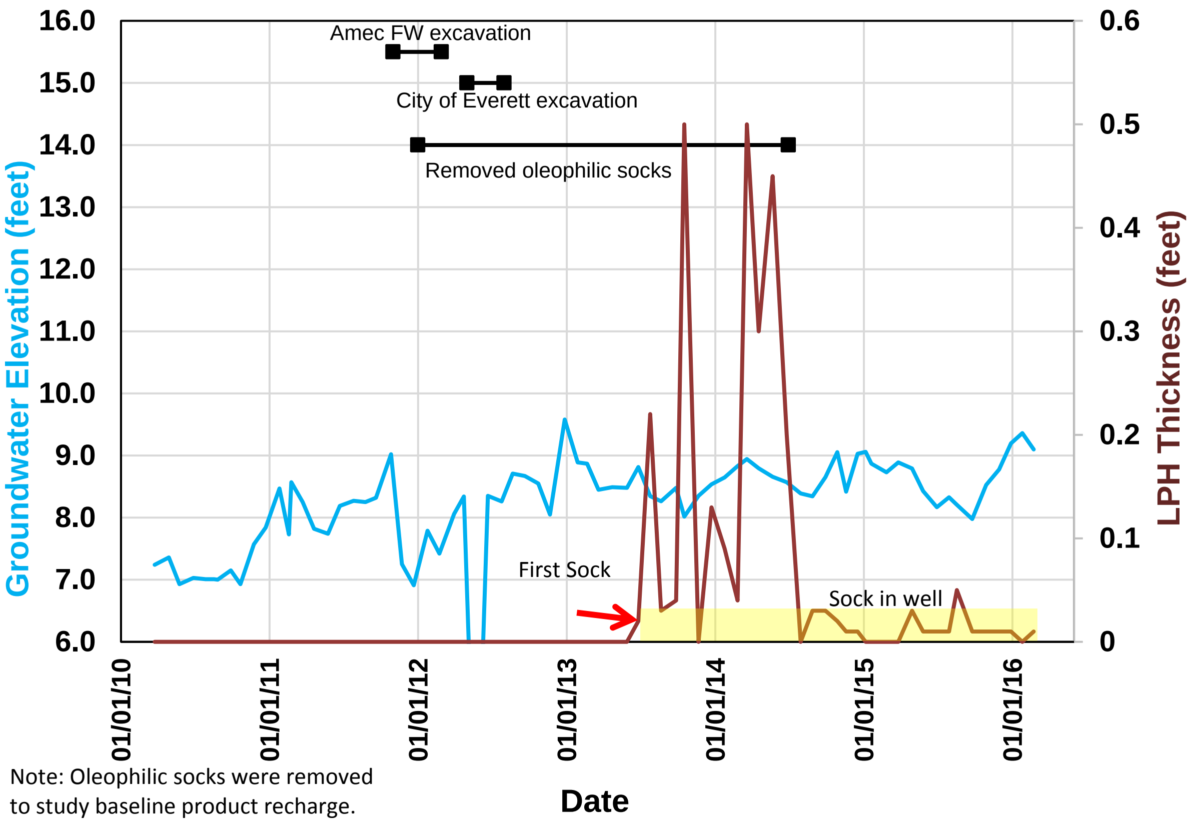


Note: Oleophilic socks were removed
to study baseline product recharge.

W-15R GROUNDWATER ELEVATION AND
LPH THICKNESS
ExxonMobil/ADC Property
Everett, Washington

By: KK	Date: 03/01/2017	Project No. 6103150009
wood.		Figure 6-19

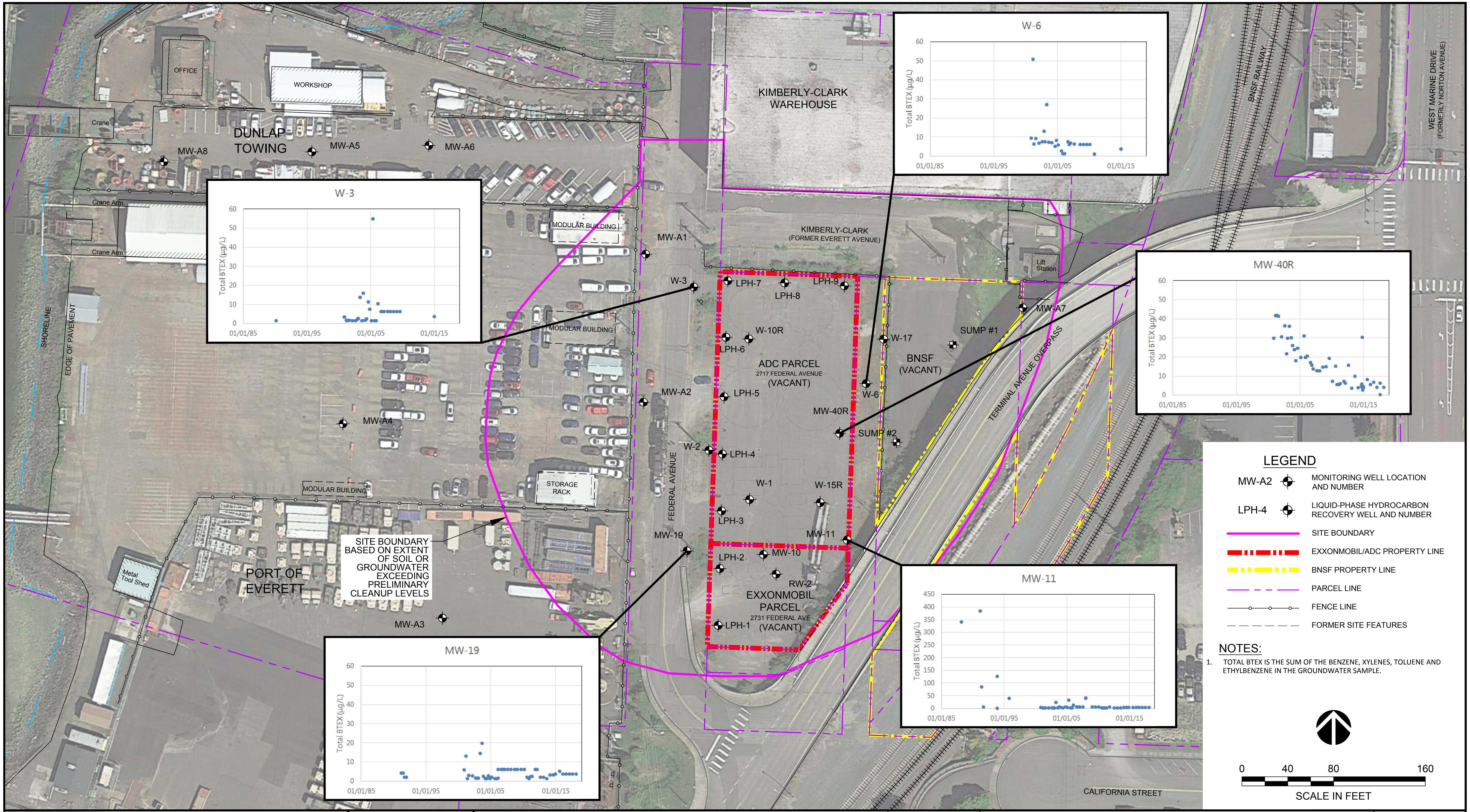
Non GDS



Note: Oleophilic socks were removed to study baseline product recharge.

MW-A1 GROUNDWATER ELEVATION AND
LPH THICKNESS
ExxonMobil/ADC Property
Everett, Washington

By: KK	Date: 03/01/2017	Project No. 6103150009
wood.		Figure 6-20



NOTES:

1. TOTAL BTEX IS THE SUM OF THE BENZENE, XYLENES, TOLUENE AND ETHYLBENZENE IN THE GROUNDWATER SAMPLE.

wood.

CLIENT:

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Wood Environment &
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Seattle, WA, U.S.A. 98101

DWN BY:	APS
CHK'D BY:	LV
DATUM:	NAD 83 N FT
PROJECTION:	WASP
SCALE:	AS SHOWN

PROJECT

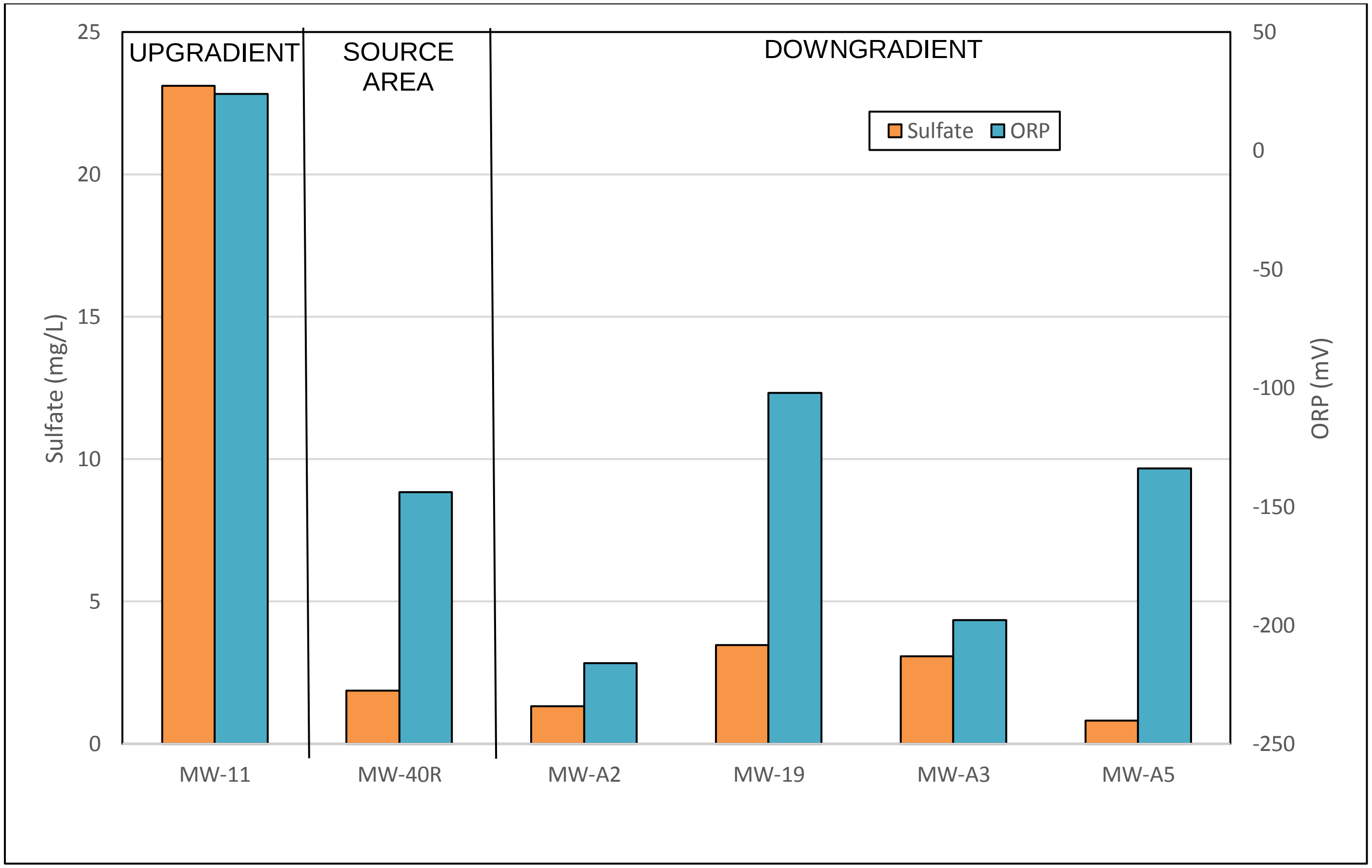
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

NATURAL DEGRADATION OF
SITE CONSTITUENTS

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 6-21

Non GDS



Notes

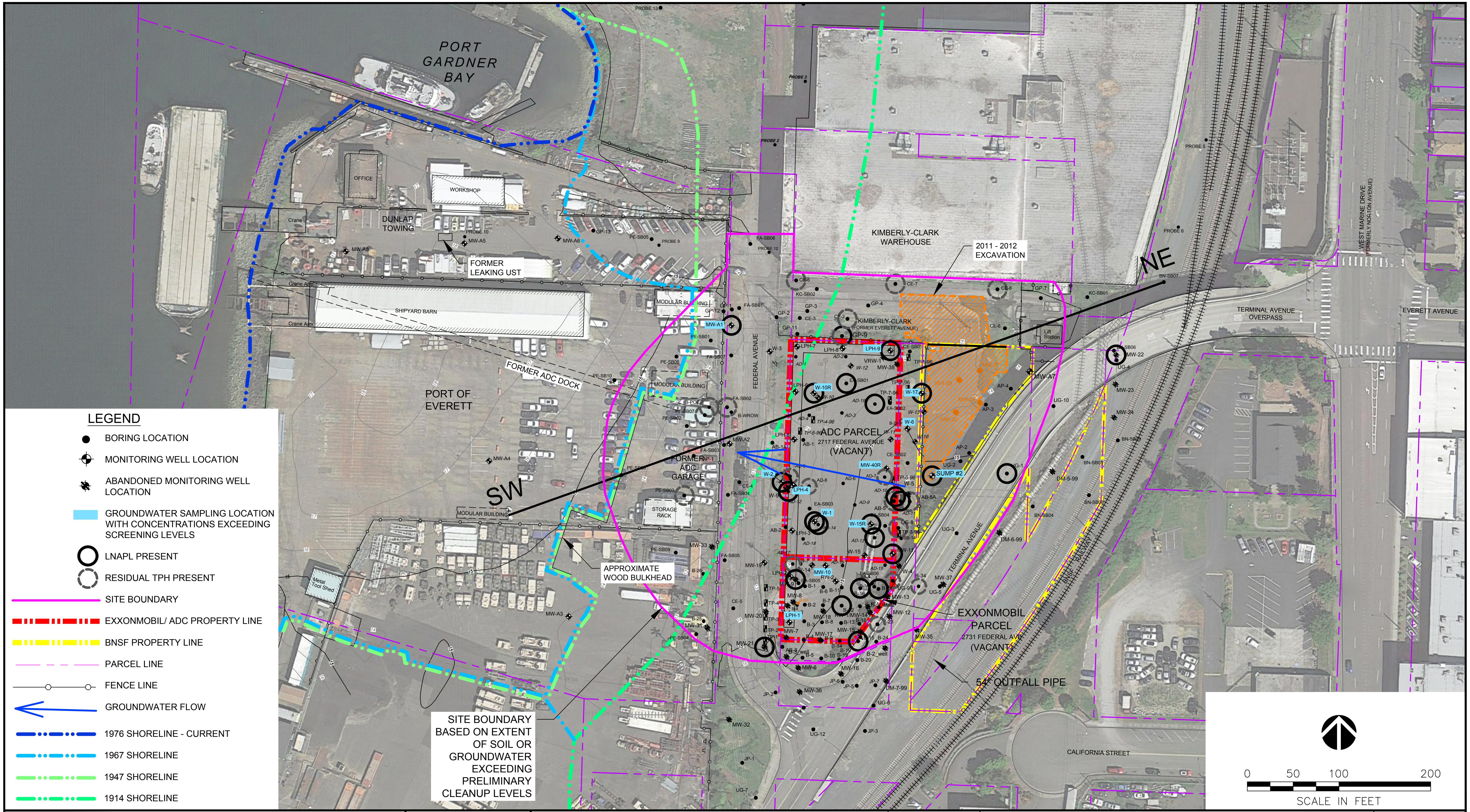
1. Data from November 2010 Data Gaps sampling event.

Abbreviations

mg/L = milligrams per liter
mV = millivolts
ORP = oxidation-reduction potential

NATURAL ATTENUATION PARAMETERS
ExxonMobil/ADC Property
Everett, Washington

By: WY	Date: 9/21/2018	Project No. 6103180009
wood.		Figure 6-22



LEGEND

- ● BORING LOCATION
- MONITORING WELL LOCATION
- ABANDONED MONITORING WELL LOCATION
- GROUNDWATER SAMPLING LOCATION WITH CONCENTRATIONS EXCEEDING SCREENING LEVELS
- ○ LNAPL PRESENT
- ◌ RESIDUAL TPH PRESENT
- SITE BOUNDARY
- EXXONMOBIL/ ADC PROPERTY LINE
- BNSF PROPERTY LINE
- PARCEL LINE
- FENCE LINE
- GROUNDWATER FLOW
- 1976 SHORELINE - CURRENT
- 1967 SHORELINE
- 1947 SHORELINE
- 1914 SHORELINE

W	WATER LINE
	24-INCH FORCE MAIN
SS	SANITARY SEWER LINE
24"SS	24-INCH SANITARY SEWER LINE
SD	STORM DRAIN LINE
T	UNDERGROUND TELEPHONE

wood.

CLIENT:

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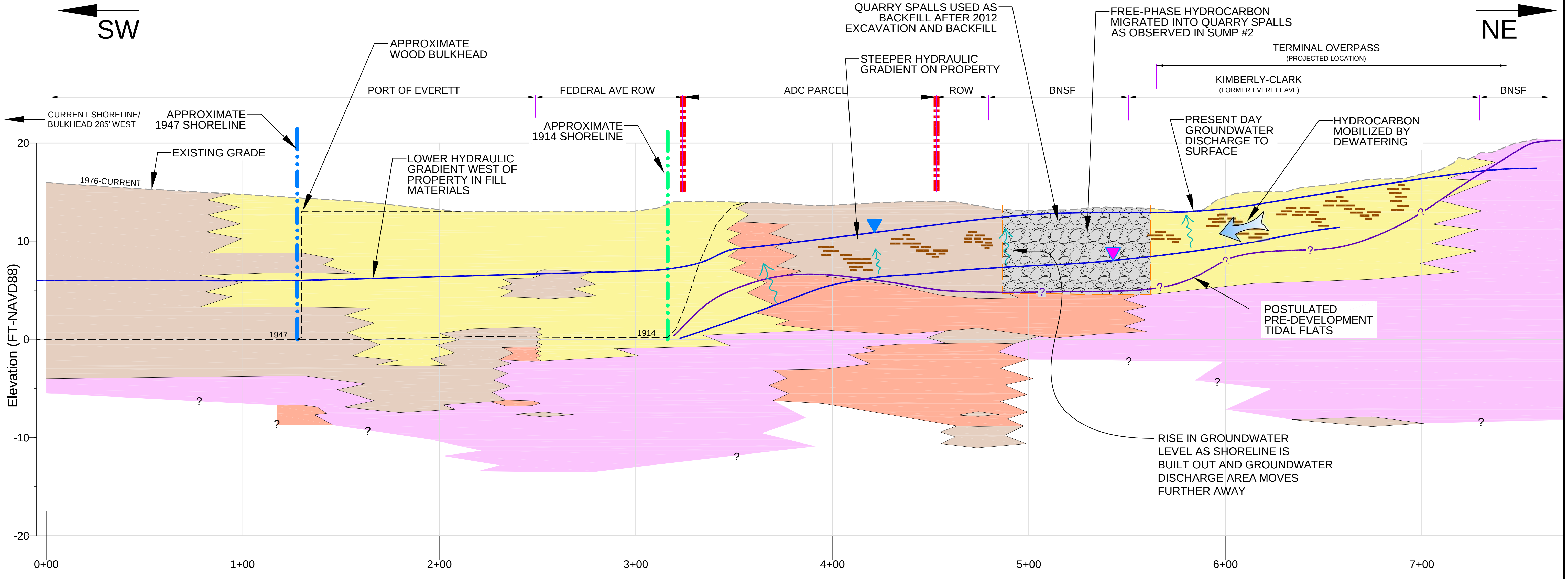
DWN BY: APS
CHK'D BY: LV
DATUM: NAD 83 N FT
PROJECTION: WASP
SCALE: AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
PLAN VIEW OF
CONCEPTUAL SITE MODEL

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 8-1

S:\6103-0009\001_DataInvestigationReport\Everett_EXM-Figures_091118.dwg – Fig8-1_ConceptSiteModel – Sep. 12, 2018 1:39pm – adam.stenberg

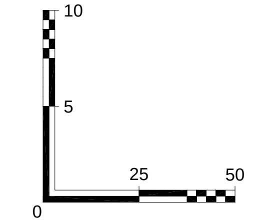


KEY

▨	SILTY SAND, SILT
▨	PEAT
▨	VERY LOOSE TO LOOSE, POORLY GRADED AND WELL-GRADED SAND
▨	MEDIUM DENSE TO DENSE, POORLY GRADED AND WELL-GRADED SAND
▨	ENGINEERED FILL (QUARRY SPALLS)

LEGEND

═	RESIDUAL OF FREE-PHASE HYDROCARBON TRAPPED IN FILL
▼	MEAN GROUNDWATER ELEVATION FEBRUARY 2011
▼	POSTULATED GROUNDWATER TABLE SHORTLY AFTER FILLING IN EARLY 1890s
▮	APPROXIMATE LOCATION OF PROPERTY BOUNDARY



APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

wood.

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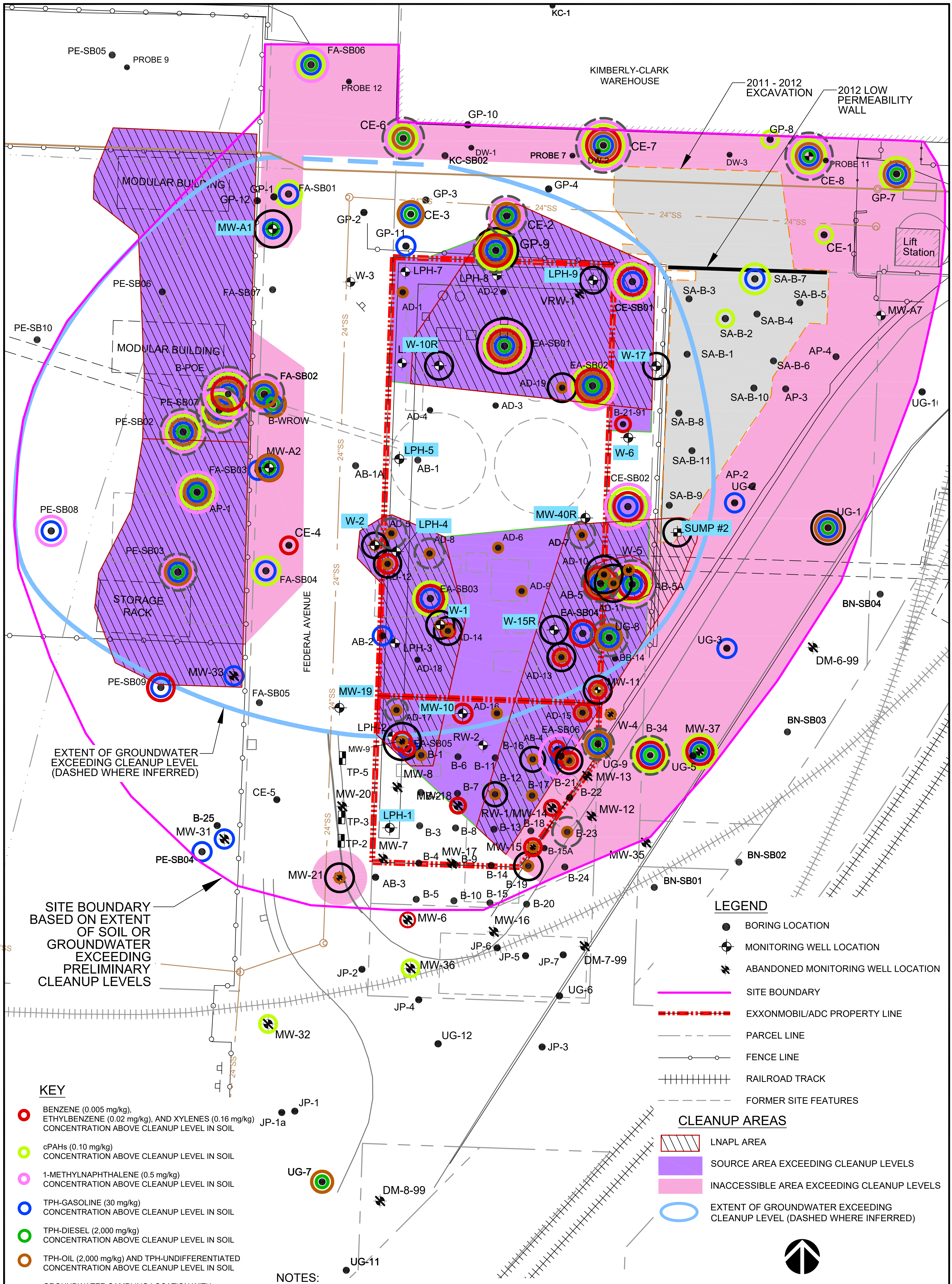
DWN BY:	APS
CHK'D BY:	LV
DATUM:	NAD 83 N FT
PROJECTION:	WASP
SCALE:	AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
CONCEPTUAL SITE MODEL
CROSS SECTION VIEW

DATE:	SEPTEMBER 2018
PROJECT NO:	6103180009
REV. NO.:	
FIGURE No.	8-2



KEY

- 🔴 BENZENE (0.005 mg/kg), ETHYLBENZENE (0.02 mg/kg), AND XYLENES (0.16 mg/kg) CONCENTRATION ABOVE CLEANUP LEVEL IN SOIL
- ○ cPAHs (0.10 mg/kg) CONCENTRATION ABOVE CLEANUP LEVEL IN SOIL
- ○ 1-METHYLNAPHTHALENE (0.5 mg/kg) CONCENTRATION ABOVE CLEANUP LEVEL IN SOIL
- 🔵 TPH-GASOLINE (30 mg/kg) CONCENTRATION ABOVE CLEANUP LEVEL IN SOIL
- 🟢 TPH-DIESEL (2,000 mg/kg) CONCENTRATION ABOVE CLEANUP LEVEL IN SOIL
- 🟠 TPH-OIL (2,000 mg/kg) AND TPH-UNDIFFERENTIATED CONCENTRATION ABOVE CLEANUP LEVEL IN SOIL
- 🟦 GROUNDWATER SAMPLING LOCATION WITH CONCENTRATIONS EXCEEDING ANY CLEANUP LEVEL
- ○ LNAPL PRESENT
- ○ TPH PRESENT IN RESIDUAL SATURATION

LEGEND

- ● BORING LOCATION
- ⊕ MONITORING WELL LOCATION
- ✖ ABANDONED MONITORING WELL LOCATION
- SITE BOUNDARY
- EXXONMOBIL/ADC PROPERTY LINE
- PARCEL LINE
- FENCE LINE
- RAILROAD TRACK
- FORMER SITE FEATURES

CLEANUP AREAS

- ▨ LNAPL AREA
- 🟪 SOURCE AREA EXCEEDING CLEANUP LEVELS
- ▨ INACCESSIBLE AREA EXCEEDING CLEANUP LEVELS
- ○ EXTENT OF GROUNDWATER EXCEEDING CLEANUP LEVEL (DASHED WHERE INFERRED)

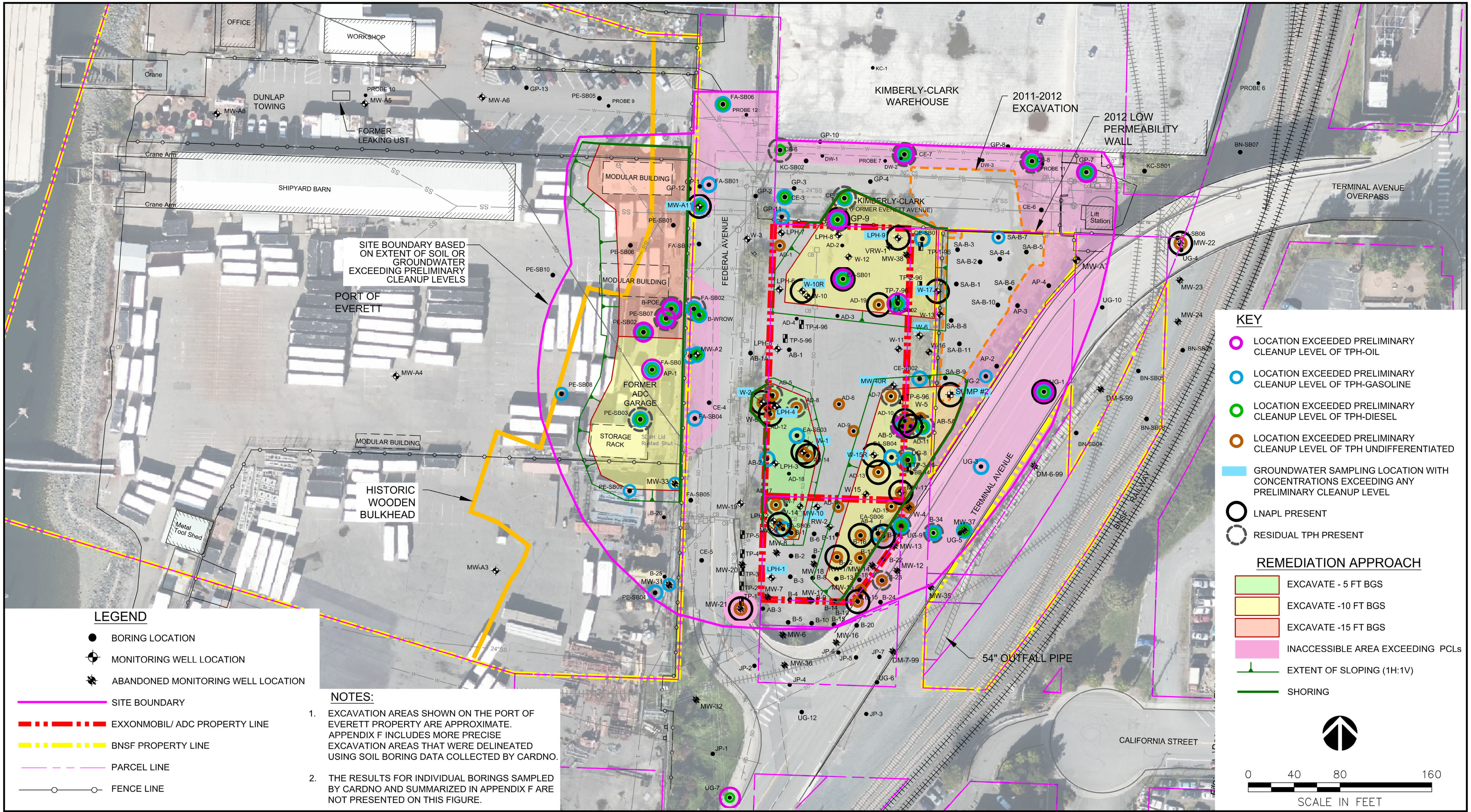
NOTES:

1. EXCAVATION AREAS SHOWN ON THE PORT OF EVERETT PROPERTY ARE APPROXIMATE. APPENDIX F INCLUDES MORE PRECISE EXCAVATION AREAS THAT WERE DELINEATED USING SOIL BORING DATA COLLECTED BY CARDNO.
2. THE RESULTS FOR INDIVIDUAL BORINGS SAMPLED BY CARDNO AND SUMMARIZED IN APPENDIX F ARE NOT PRESENTED ON THIS FIGURE.

CLIENT		PROJECT	DATE
EXXONMOBIL AND AMERICAN DISTRIBUTION COMPANY	wood.	EXXONMOBIL/ADC PROPERTY ECOLOGY SITE ID 2728	MAY 2021
			PROJECT NO. 6103180009
Wood Environment & Infrastructure Solutions, Inc. 4020 Lake Washington Blvd NE, Suite 200 Kirkland, Washington 98033		TITLE SOURCE AREAS	REV NO.
			FIGURE No. 12-1

DRAWN BY: APS CHECKED BY: LV

S:\6103-0009\001_DataInvestigationReport\Everett_EXM-SourceAreas_052521.dwg - Figure 12-1 - May. 25, 2021 3:29pm - adam.stenberg



LEGEND

- ● BORING LOCATION
- ⊕ MONITORING WELL LOCATION
- ✱ ABANDONED MONITORING WELL LOCATION
- SITE BOUNDARY
- EXXONMOBIL/ ADC PROPERTY LINE
- BNSF PROPERTY LINE
- PARCEL LINE
- FENCE LINE

NOTES:

1. EXCAVATION AREAS SHOWN ON THE PORT OF EVERETT PROPERTY ARE APPROXIMATE. APPENDIX F INCLUDES MORE PRECISE EXCAVATION AREAS THAT WERE DELINEATED USING SOIL BORING DATA COLLECTED BY CARDNO.
2. THE RESULTS FOR INDIVIDUAL BORINGS SAMPLED BY CARDNO AND SUMMARIZED IN APPENDIX F ARE NOT PRESENTED ON THIS FIGURE.

KEY

- ○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH-OIL
- ○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH-GASOLINE
- ○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH-DIESEL
- ○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH UNDIFFERENTIATED
- GROUNDWATER SAMPLING LOCATION WITH CONCENTRATIONS EXCEEDING ANY PRELIMINARY CLEANUP LEVEL
- ○ LNAPL PRESENT
- ○ RESIDUAL TPH PRESENT

REMEDIATION APPROACH

- 🟩 EXCAVATE - 5 FT BGS
- 🟨 EXCAVATE -10 FT BGS
- 🟥 EXCAVATE -15 FT BGS
- ▨ INACCESSIBLE AREA EXCEEDING PCLs
- EXTENT OF SLOPING (1H:1V)
- SHORING

- —W— WATER LINE
- — — — 24-INCH FORCE MAIN
- —SS— SANITARY SEWER LINE
- —24"SS— 24-INCH SANITARY SEWER LINE
- —SD— STORM DRAIN LINE
- —T— UNDERGROUND TELEPHONE

wood.

CLIENT:

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AMERICAN DISTRIBUTING CO.

Wood Environment &
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4020 Lake Washington Blvd NE, Suite 200
Kirkland, Washington 98033

DWN BY:	APS
CHK'D BY:	LV
DATUM:	NAD 83 N FT
PROJECTION:	WASP
SCALE:	AS SHOWN

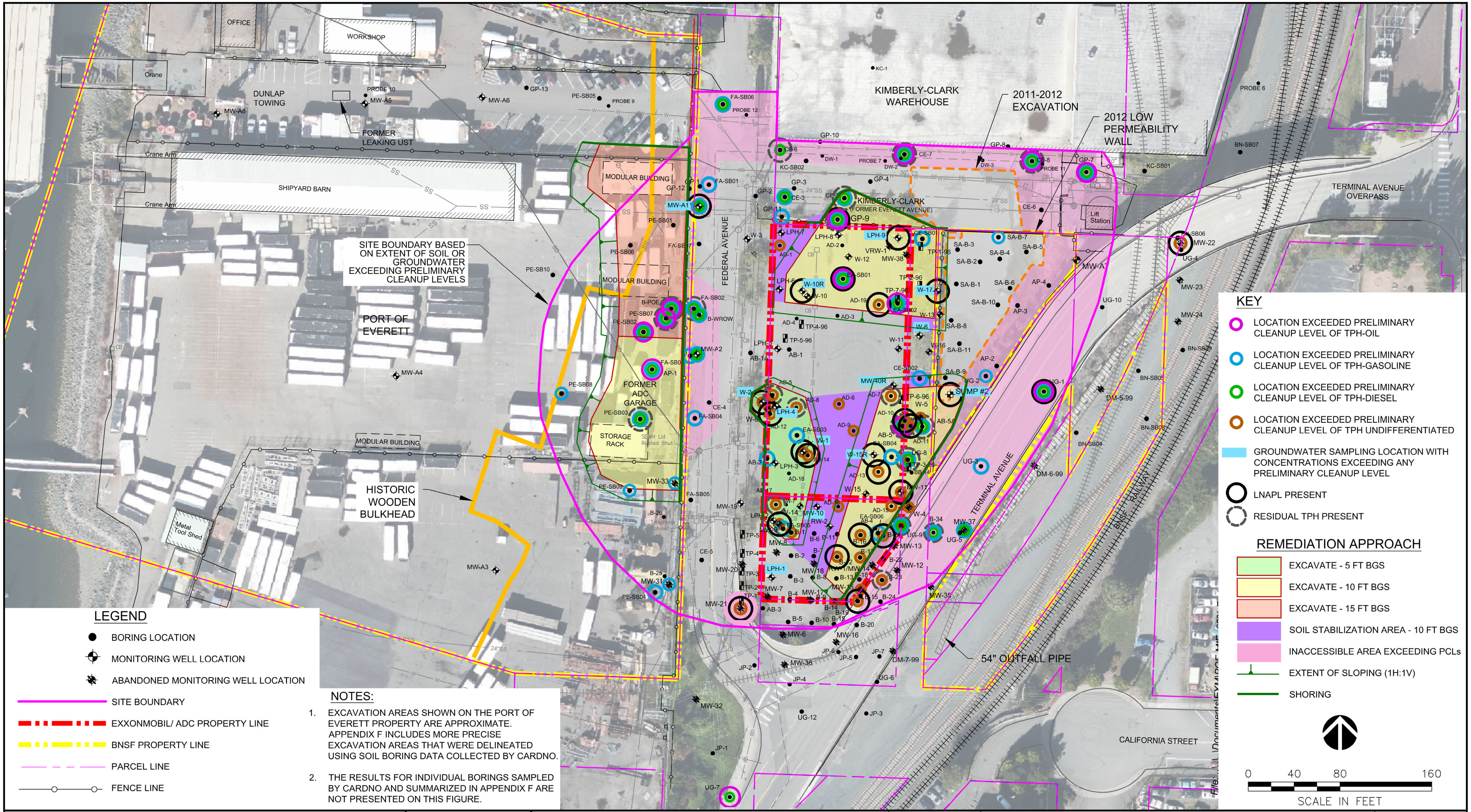
PROJECT

EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE

SOURCE AREA ALTERNATIVE 1:
LNAPL AREA EXCAVATION AND
NATURAL SOURCE ZONE ATTENUATION

DATE:	MAY 2021
PROJECT NO:	6103180009
REV. NO.:	
FIGURE No.	12-2



KEY

- ○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH-OIL
- ○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH-GASOLINE
- ○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH-DIESEL
- ○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH UNDIFFERENTIATED
- ▭ GROUNDWATER SAMPLING LOCATION WITH CONCENTRATIONS EXCEEDING ANY PRELIMINARY CLEANUP LEVEL
- ○ LNAPL PRESENT
- ○ RESIDUAL TPH PRESENT

REMEDIATION APPROACH

- 🟩 EXCAVATE - 5 FT BGS
- 🟨 EXCAVATE - 10 FT BGS
- 🟥 EXCAVATE - 15 FT BGS
- 🟪 SOIL STABILIZATION AREA - 10 FT BGS
- ▨ INACCESSIBLE AREA EXCEEDING PCLs
- EXTENT OF SLOPING (1H:1V)
- SHORING

LEGEND

- ● BORING LOCATION
- ⌖ MONITORING WELL LOCATION
- ✱ ABANDONED MONITORING WELL LOCATION
- SITE BOUNDARY
- EXXONMOBIL/ ADC PROPERTY LINE
- BNSF PROPERTY LINE
- PARCEL LINE
- FENCE LINE
- W WATER LINE
- 24-INCH FORCE MAIN
- SS SANITARY SEWER LINE
- 24"SS 24-INCH SANITARY SEWER LINE
- SD STORM DRAIN LINE
- T UNDERGROUND TELEPHONE

NOTES:

1. EXCAVATION AREAS SHOWN ON THE PORT OF EVERETT PROPERTY ARE APPROXIMATE. APPENDIX F INCLUDES MORE PRECISE EXCAVATION AREAS THAT WERE DELINEATED USING SOIL BORING DATA COLLECTED BY CARDNO.
2. THE RESULTS FOR INDIVIDUAL BORINGS SAMPLED BY CARDNO AND SUMMARIZED IN APPENDIX F ARE NOT PRESENTED ON THIS FIGURE.

wood.

CLIENT:
EXXONMOBIL
AMERICAN DISTRIBUTING CO.

Wood Environment &
Infrastructure Solutions, Inc.
4020 Lake Washington Blvd NE, Suite 200
Kirkland, Washington 98033

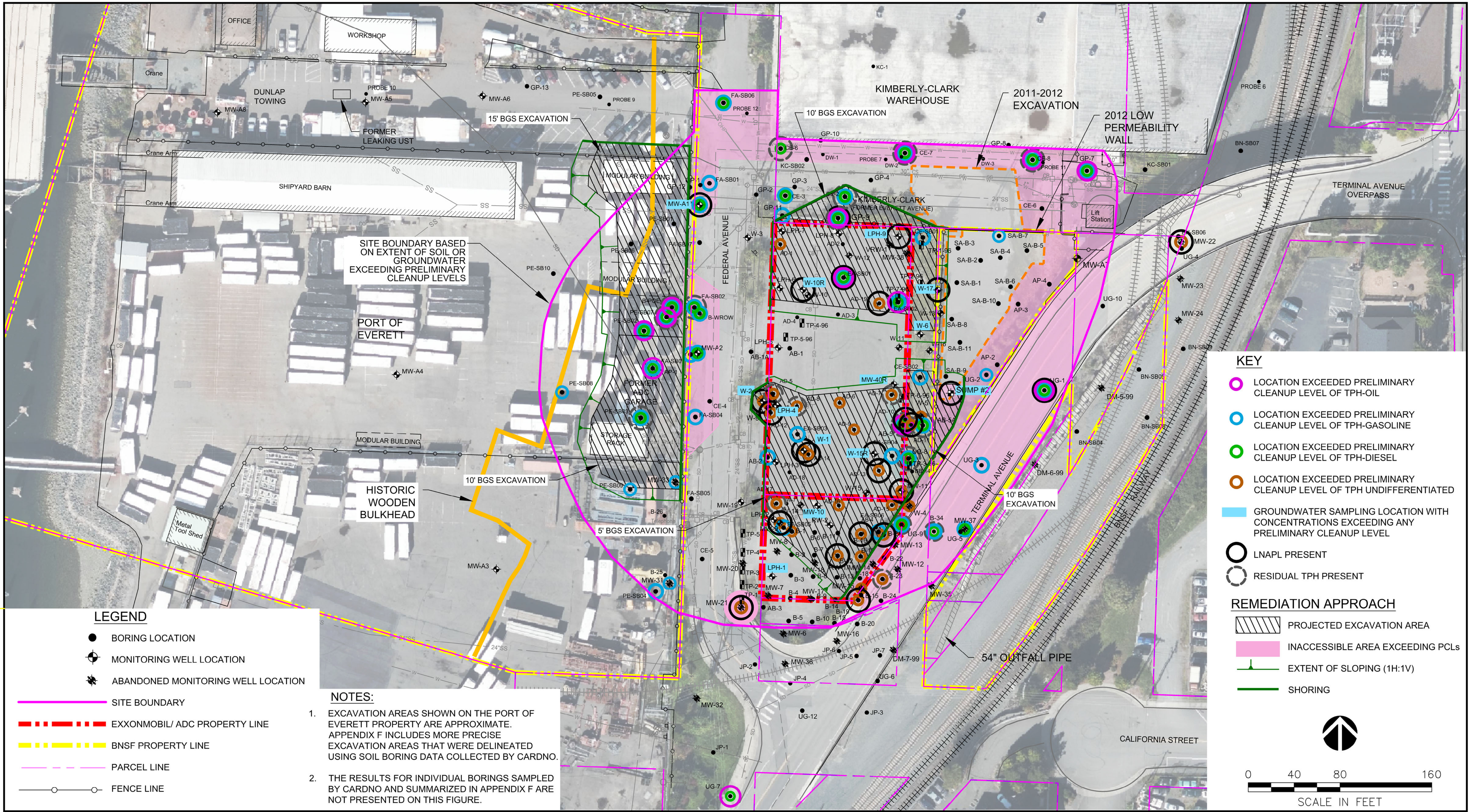
DWN BY:	APS
CHK'D BY:	LV
DATUM:	NAD 83 N FT
PROJECTION:	WASP
SCALE:	AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
SOURCE AREA ALTERNATIVE 2:
LNAPL AREA EXCAVATION AND
SOURCE AREA STABILIZATION

DATE:	MAY 2021
PROJECT NO:	6103180009
REV. NO.:	
FIGURE No.	12-3

S:\6103-0009\001_DataInvestigationReport\Everett_EXM-Figures_052521.dwg – Fig12-3_Alt2SourceArea – May. 25, 2021 3:33pm – adam.stenberg



KEY

○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH-OIL

○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH-GASOLINE

○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH-DIESEL

○ LOCATION EXCEEDED PRELIMINARY CLEANUP LEVEL OF TPH UNDIFFERENTIATED

▭ GROUNDWATER SAMPLING LOCATION WITH CONCENTRATIONS EXCEEDING ANY PRELIMINARY CLEANUP LEVEL

○ LNAPL PRESENT

○ RESIDUAL TPH PRESENT

REMEDIATION APPROACH

▨ PROJECTED EXCAVATION AREA

▭ INACCESSIBLE AREA EXCEEDING PCLs

EXTENT OF SLOPING (1H:1V)

SHORING

LEGEND

● BORING LOCATION

MONITORING WELL LOCATION

ABANDONED MONITORING WELL LOCATION

SITE BOUNDARY

EXXONMOBIL/ ADC PROPERTY LINE

BNSF PROPERTY LINE

PARCEL LINE

FENCE LINE

W WATER LINE

24-INCH FORCE MAIN

SS SANITARY SEWER LINE

24"SS 24-INCH SANITARY SEWER LINE

SD STORM DRAIN LINE

T UNDERGROUND TELEPHONE

NOTES:

1. EXCAVATION AREAS SHOWN ON THE PORT OF EVERETT PROPERTY ARE APPROXIMATE. APPENDIX F INCLUDES MORE PRECISE EXCAVATION AREAS THAT WERE DELINEATED USING SOIL BORING DATA COLLECTED BY CARDNO.
2. THE RESULTS FOR INDIVIDUAL BORINGS SAMPLED BY CARDNO AND SUMMARIZED IN APPENDIX F ARE NOT PRESENTED ON THIS FIGURE.

wood.

CLIENT:
EXXONMOBIL
AMERICAN DISTRIBUTING CO.

Wood Environment &
Infrastructure Solutions, Inc.
4020 Lake Washington Blvd NE, Suite 200
Kirkland, Washington 98033

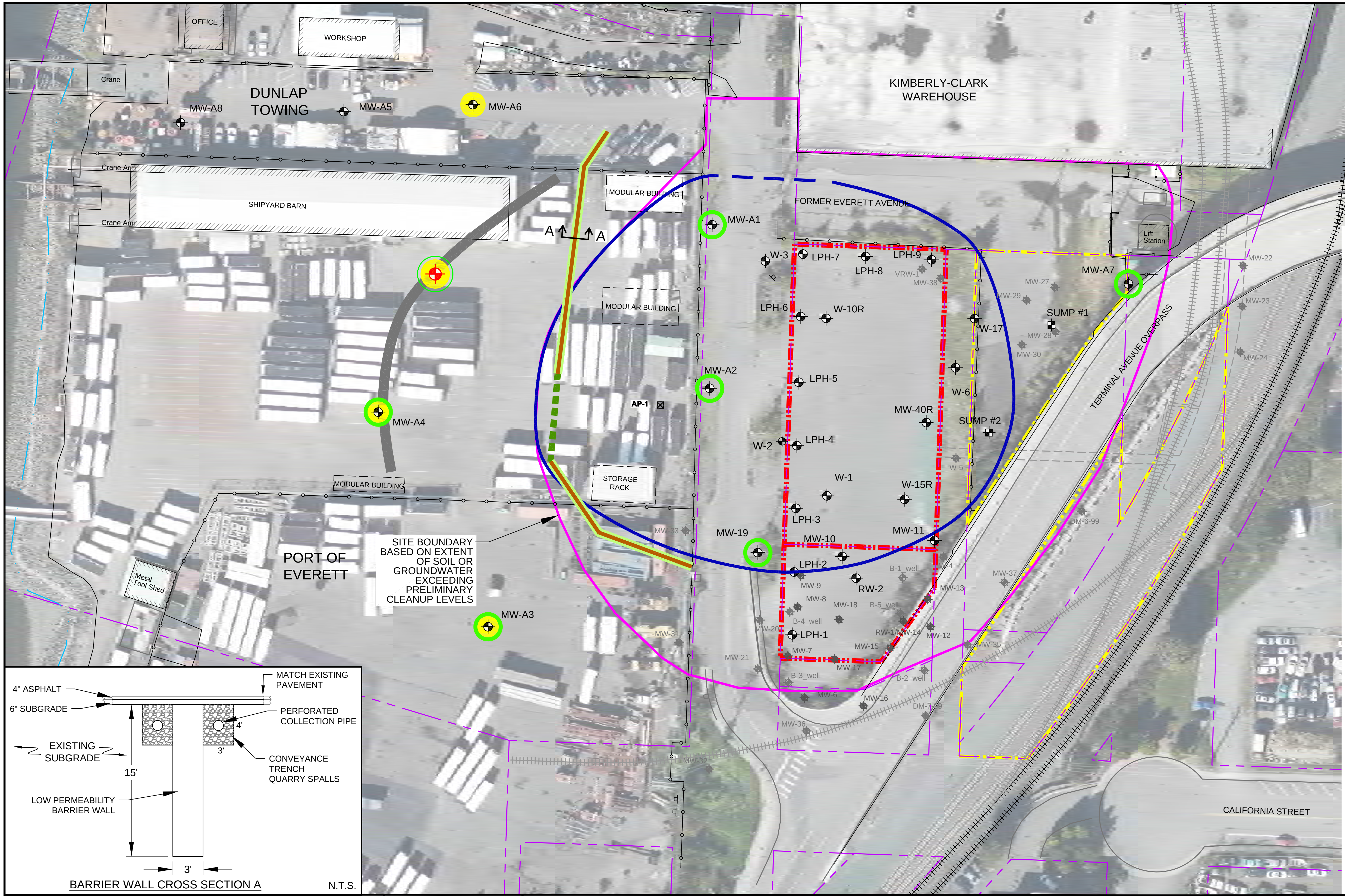
DWN BY: APS
CHK'D BY: LV
DATUM: NAD 83 N FT
PROJECTION: WASP
SCALE: AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
SOURCE AREA ALTERNATIVE 3:
SOURCE AREA EXCAVATION

DATE: MAY 2021
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. 12-4

S:\6103-0009\001_DataInvestigationReport\Everett_EXM-Figures_052521.dwg – Fig12-4_ALT3_sourceAreaExcav – May. 25, 2021 3:35pm – adam.stenberg



BARRIER WALL CROSS SECTION A

N.T.S.

LEGEND

MW-A7 ⌖	EXISTING MONITORING WELL LOCATION
LPH-4 ⌖	EXISTING LIQUID-PHASE HYDROCARBON RECOVERY WELL LOCATION
MW-37 ⌖	DECOMMISSIONED MONITORING WELL LOCATION
🟪	SITE BOUNDARY
🟥	EXXONMOBIL/ADC PROPERTY LINE
🟨	BNSF PROPERTY LINE
— —	PARCEL LINE
—○—	FENCE LINE
○	EXTENT OF GROUNDWATER EXCEEDING PRELIMINARY CLEANUP LEVEL (DASHED WHERE INFERRED)

REMEDIATION APPROACH

⌖	PROPOSED NEW MONITORING WELL
▬	CONDITIONAL POINT OF COMPLIANCE (CPOC)
●	CPOC MONITORING WELLS
○	GROUNDWATER WELLS PROPOSED FOR MNA NETWORK
▬	ALTERNATIVE GW2: BARRIER WALL WITH HIGH PERMEABILITY TRENCH
▬ ▬	ALTERNATIVE GW2: REACTIVE BARRIER

NOTES:

GW	GROUNDWATER
MNA	MONITORED NATURAL ATTENUATION

0 40 80 160

SCALE IN FEET

wood.	CLIENT: EXXONMOBIL AMERICAN DISTRIBUTING CO.	DWN BY: APS CHK'D BY: LV	PROJECT EXXONMOBIL/ADC PROPERTY ECOLOGY SITE ID 2728	DATE: MAY 2021 PROJECT NO: 6103150009
	Wood Environment & Infrastructure Solutions, Inc. 4020 Lake Washington Blvd NE, Suite 200 Kirkland, Washington 98033	DATUM: NAD 83 N FT PROJECTION: WASP SCALE: AS SHOWN	TITLE GROUNDWATER REMEDIATION ALTERNATIVES GW1: MNA GW2: FUNNEL AND GATE	REV. NO.: FIGURE No. 12-5

S:\6103-0009\001_DataInvestigationReport\EXM_GWAlt-MNA_052621.dwg – Fig12-5_GW (2) – May. 26, 2021 11:39am – adam.stenberg

APPENDIX A

HISTORICAL MAPS AND DOCUMENTATION

INSURANCE MAPS of

EVERETT

WASHINGTON

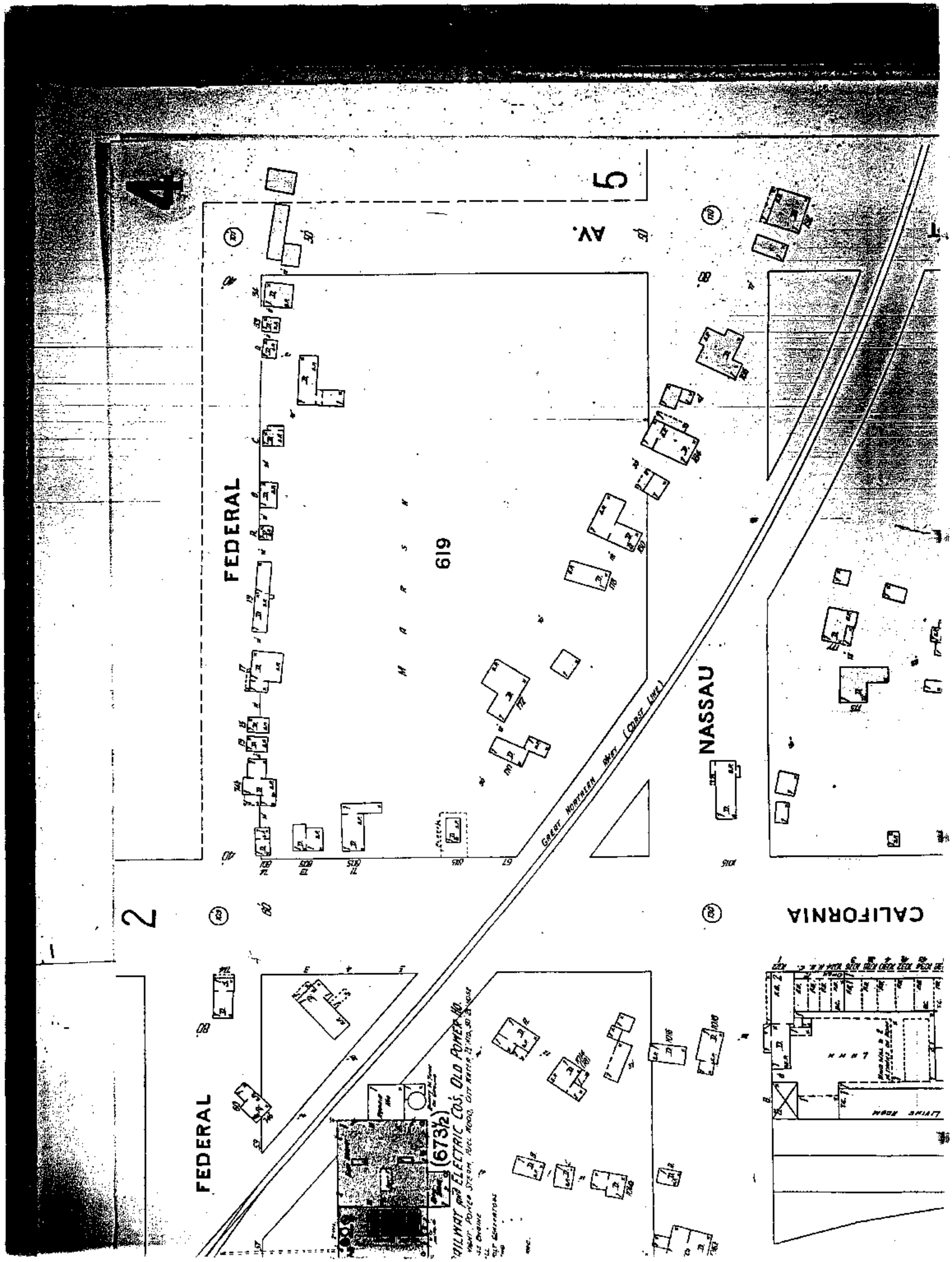
Published 1902 by the

SANBORN MAP COMPANY

Scale 50 Ft to an Inch

11 Broadway New York

INDEX.


4
5
2
FEDERAL
FEDERAL
AV.
NASSAU
CALIFORNIA
619
MARSH
GREAT NORTHERN RWY (COAST LINE)
(673½)
AILWAY AND ELECTRIC COS. OLD POWER HO.
LIVING ROOM

INSURANCE MAPS OF

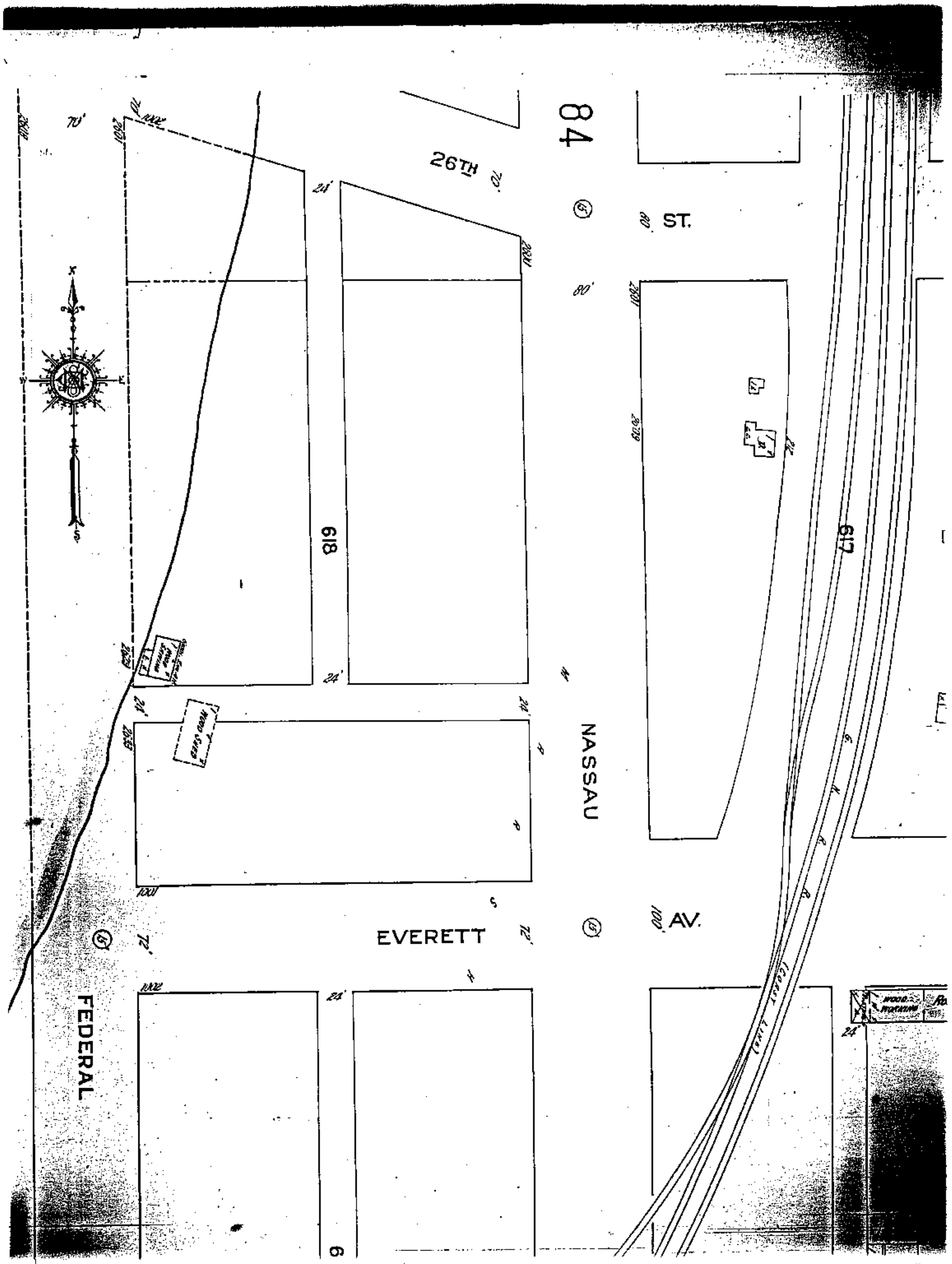
EVERETT

INCLUDING LOWELL

WASHINGTON

PUBLISHED BY THE
SANBORN MAP COMPANY
11 BROADWAY, NEW YORK

1914


84
26TH ST.
NASSAU
EVERETT AV.
FEDERAL
618
617
6
(Coast Line)
WOOD SHED
WOOD WORKING
80'
70'
72'
24'
100'

The regular Administrative Session of the City Council was held August 16, 1915, at 10:30 A.M.. with Mayor Clay in the Chair and Commissioners Clay, Kelly and Salter present at roll call.

On motion minutes approved as of record.

Moved by Kelly, seconded by Salter, that bills of A. C. Chilson for $6.00 and H. J. Linden for $11.65 for services as registration clerks be allowed and ordered paid.

Carried unanimously

Moved by Kelly, seconded by Salter that the City Attorney be instructed to prepare an ordinance covering the installation of oil tanks north of the G. N. Dock.

Carried unanimously

Moved by Kelly, seconded by Clay that the City Attorney be instructed to prepare an ordinance regulating the speed of Street Railway cars to conform to the speed allowed autos.

Carried unanimously

On motion Council adjourned at 11:00 A. M.

Louis Leel
City Clerk

EXHIBIT D

ORDINANCE NO. 1674

An ordinance granting to the Standard Oil Company, a corporation, a permit to locate, erect, operate and maintain a warehouse or tankage, or both, and other necessary buildings, on a certain tract of land in the city of Everett described as follows: Lot 1, block 619, Plat of Everett, at the corner of Everett Avenue and Federal Street, for the storage and distribution of petroleum and its products, and other kinds of merchandise , by said company, and declaring an emergency.

THE CITY OF EVERETT DOES ORDAIN:

Section 1: That the Standard Oil Company, a corporation, be and it is hereby granted permission to locate, erect, operate and maintain a warehouse or tankage, or both, and other necessary buildings, upon that certain tract of land in the city of Everett described as follows: Lot 1, block 619, Plat of Everett, at the corner of Everett Avenue and Federal Street, for the storage and distribution of petroleum and its products, and other kinds of merchandise handled by said company, said warehouse, tankage and buildings to be constructed in accordance with the plans and specifications therefor filed by said company with the city clerk of the city of Everett and now on file in the office of said clerk.

Section 2: WHEREAS, it is desirous to begin the construction of said warehouse, tankage and buildings immediately, an emergency is declared to exist, and this ordinance shall take effect upon its passage and publication.

W. H. Clay
Mayor.

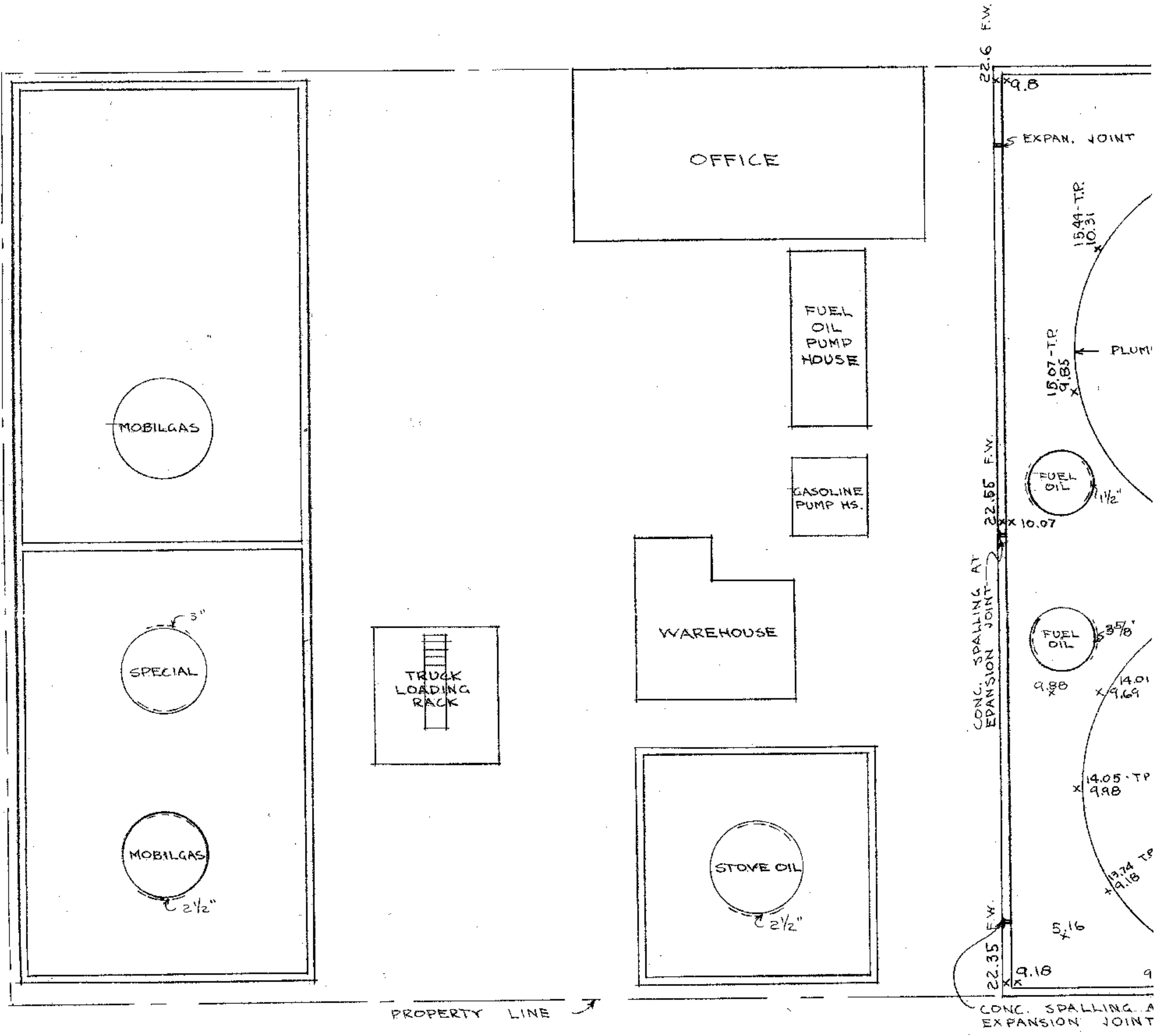
Passed AUG 24 1915

Attest Louis Lelf
City Clerk.

EXHIBIT E

Published AUG 25 1915

GEN. PET. ELEV.		EVERETT CITY DATUM ELEV.
B.M. 10.00	=	108.92
7.74	=	106.66 EXTREME HIGH WATER
4.24	=	103.16 MEAN HIGH WATER
-6.24	=	92.68 MEAN LOWER LOW WATER
-10.24	=	88.68 EXTREME LOW WATER



NOTES

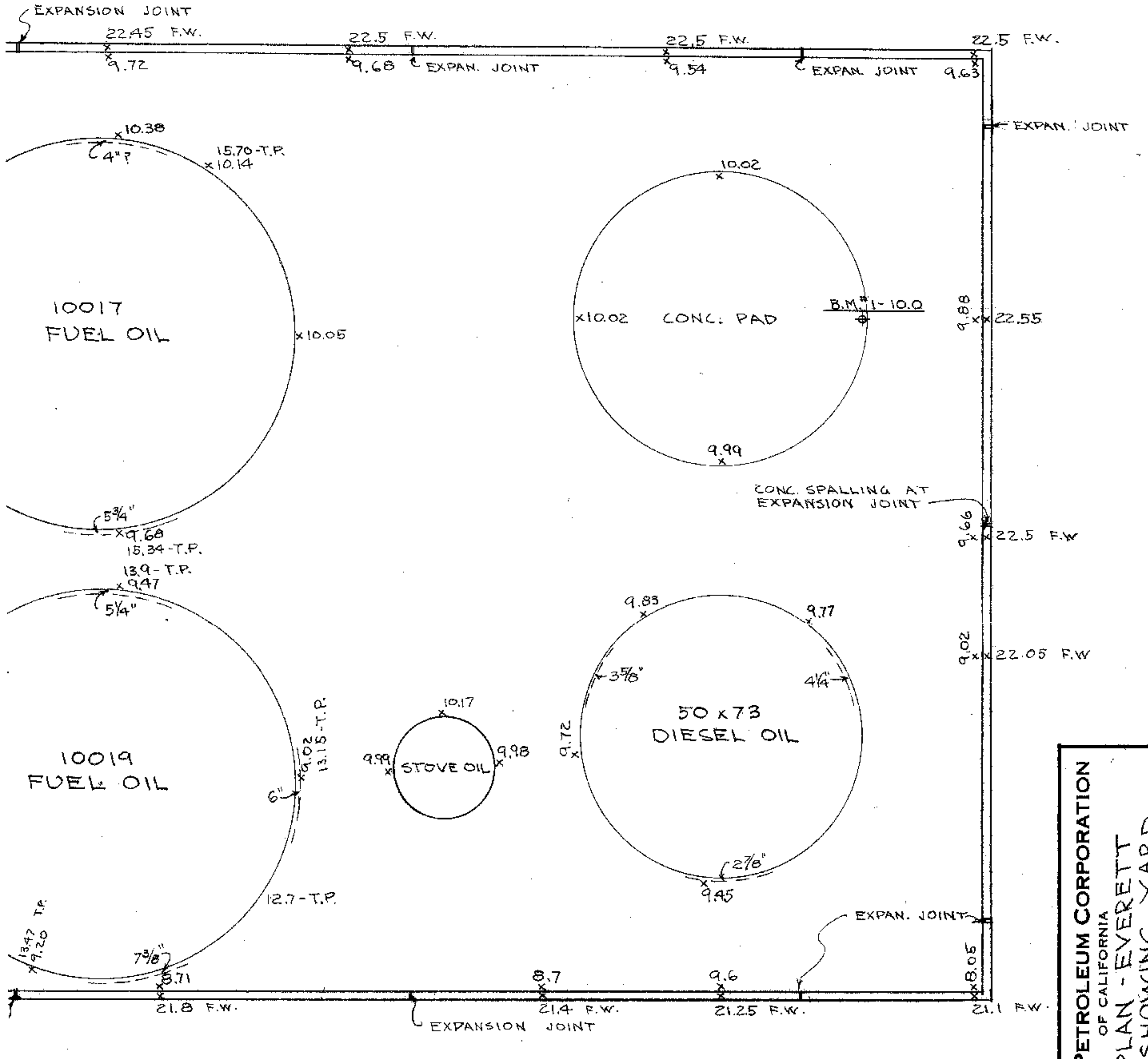
ELEVATIONS EXCEPT AS INDICATED BELOW ARE YARD GROUND LEVELS

T.P. INDICATES ELEVATION AT TOP OF BO 5' PLATE COURSE

F.W. INDICATES ELEVATION AT TOP OF F

ELEVATIONS SHOWN AROUND OUTSIDE EDG TANKS ARE TO TOP OF CONC. PAD EXCE TANK NO. 10019 WHERE ORIGINAL RING PA SUNK AND BEEN COVERED WITH DIRT

DOTTED LINES AND DIMENSIONS IN INCHE OUTSIDE EDGE OF TANKS INDICATE THE D AND DISTANCE IN WHICH THEY ARE OUT



TO
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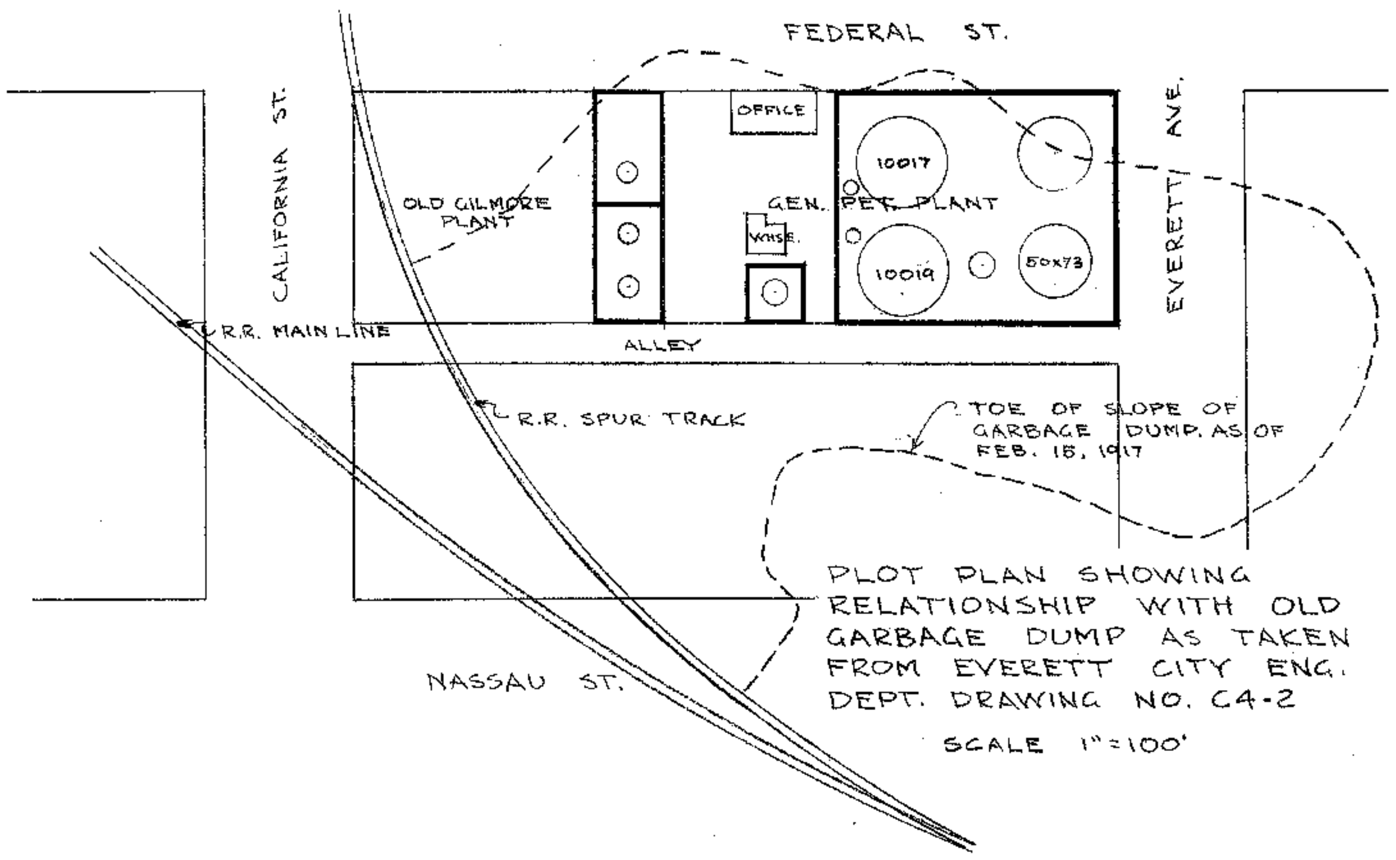
WALL
OF
AT
HAS
NEAR
CTION
PLUMB



PLOT PLAN SHOWING RELATIONSHIP WITH OLD GARBAGE DUMP AS TAKEN FROM EVERETT CITY ENG. DEPT. DRAWING NO. C4-2

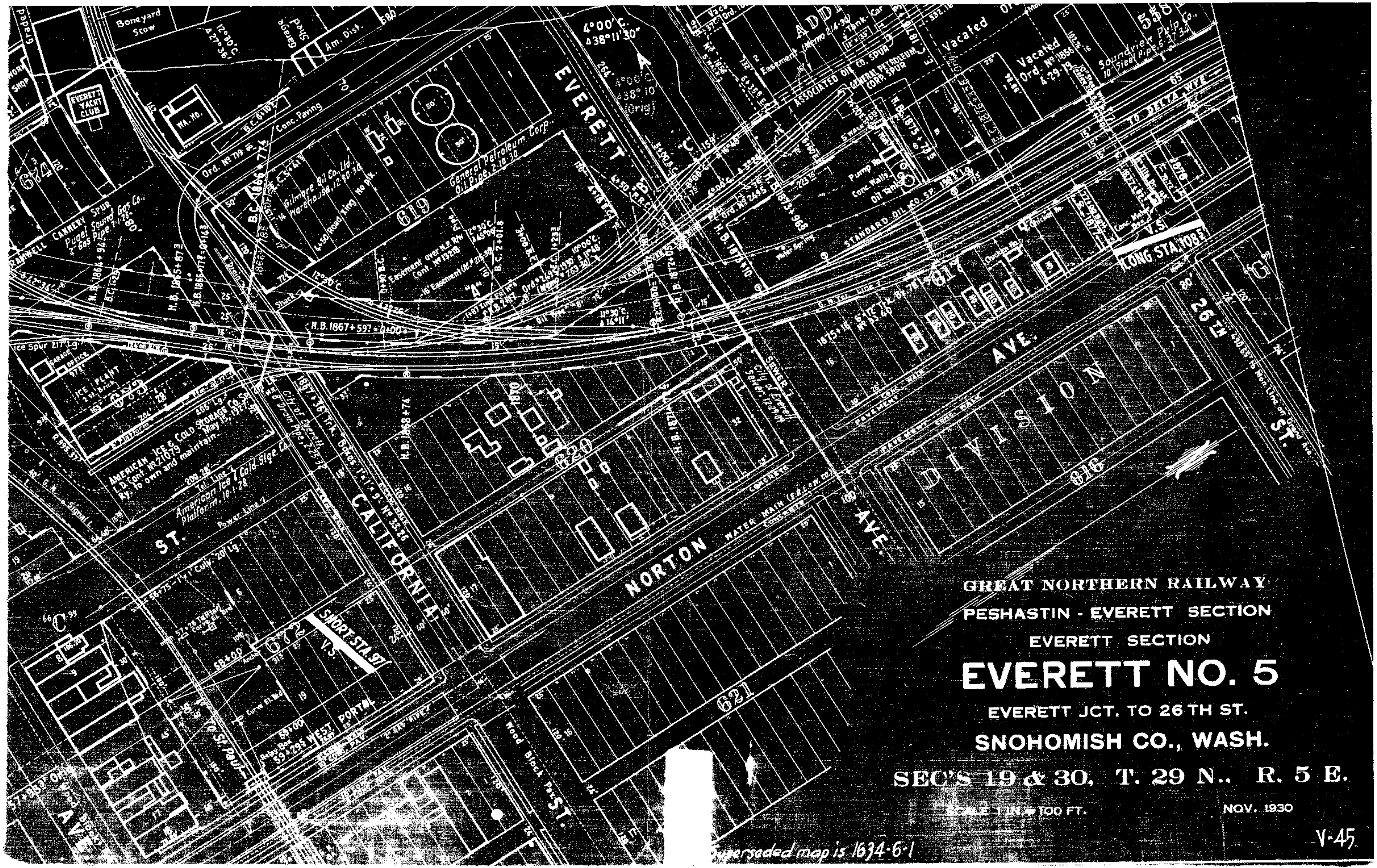
SCALE 1"=100'

GENERAL PETROLEUM CORPORATION
OF CALIFORNIA
PLOT PLAN - EVERETT PLANT - SHOWING YARD & TANK ELEVATIONS
WASHINGTON DIVISION SEATTLE, WASH.

SCALE	1/16"=1'0"
DRAWN	J.D.D.
DATE	4-8-46
CHECKED	
APPROVED	
APPROVED	

IND	DESCRIPTION	BY	DATE	APPROVED

DWG. NO. 2M-371



GREAT NORTHERN RAILWAY

PESHASTIN - EVERETT SECTION

EVERETT SECTION

EVERETT NO. 5

EVERETT JCT. TO 26 TH ST.

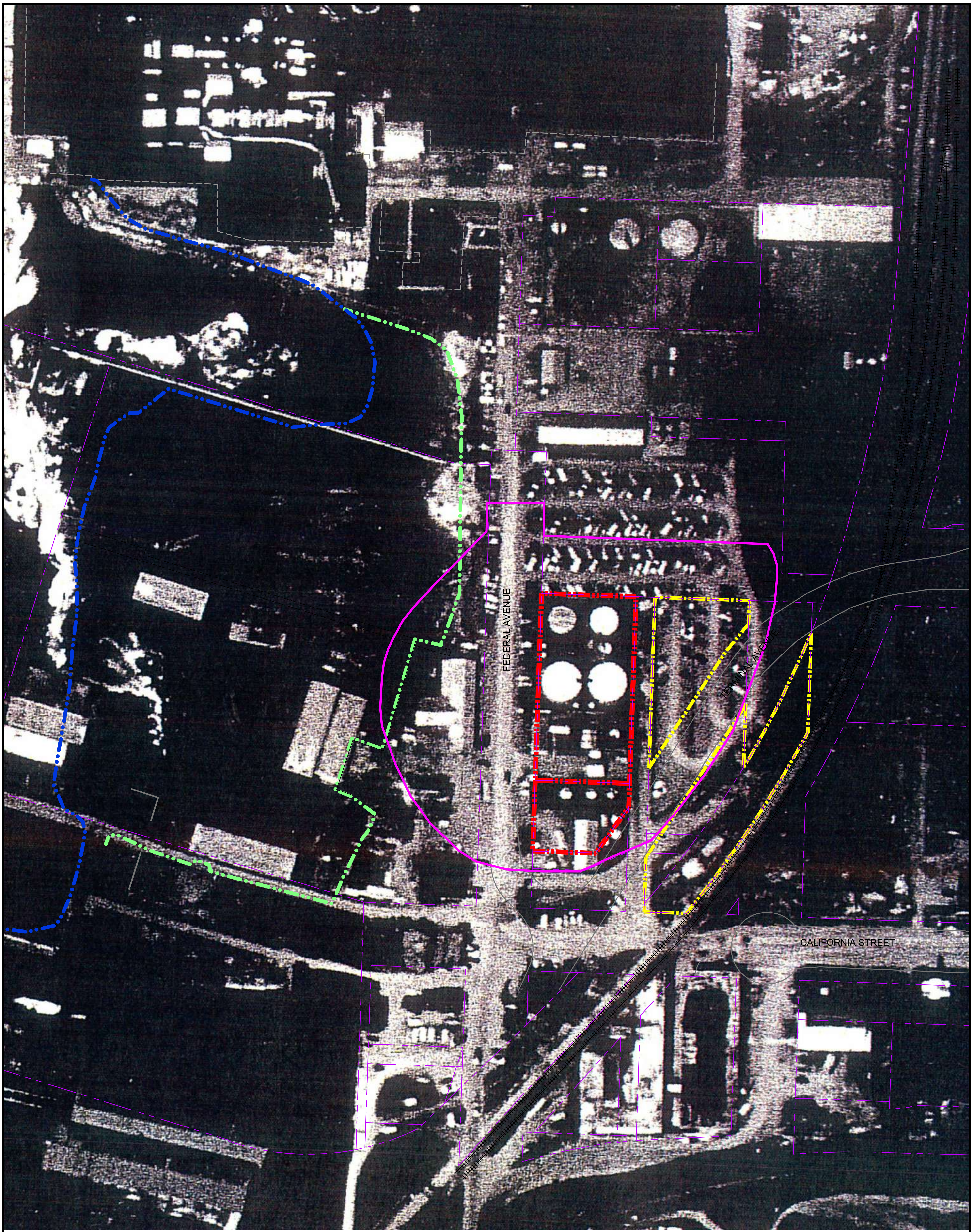
SNOHOMISH CO., WASH.

SEC'S 19 & 30. T. 29 N.. R. 5 E.

SCALE 1 IN. = 100 FT.

NOV. 1930

V-45



LEGEND

- SITE BOUNDARY
- PARCEL LINE
- EXXONMOBIL/ADC PROPERTY LINE
- BNSF PROPERTY LINE
- APPROXIMATE 1976 SHORELINE - CURRENT
- APPROXIMATE 1947 SHORELINE

0 60 120 240
SCALE IN FEET

CLIENT
EXXONMOBIL AND
AMERICAN DISTRIBUTION COMPANY

Wood Environment &
Infrastructure Solutions, Inc.
600 University Street, Suite 600
Seattle, Washington 98101

wood.

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
1955 AERIAL PHOTOGRAPH

DATE
SEPTEMBER 2018

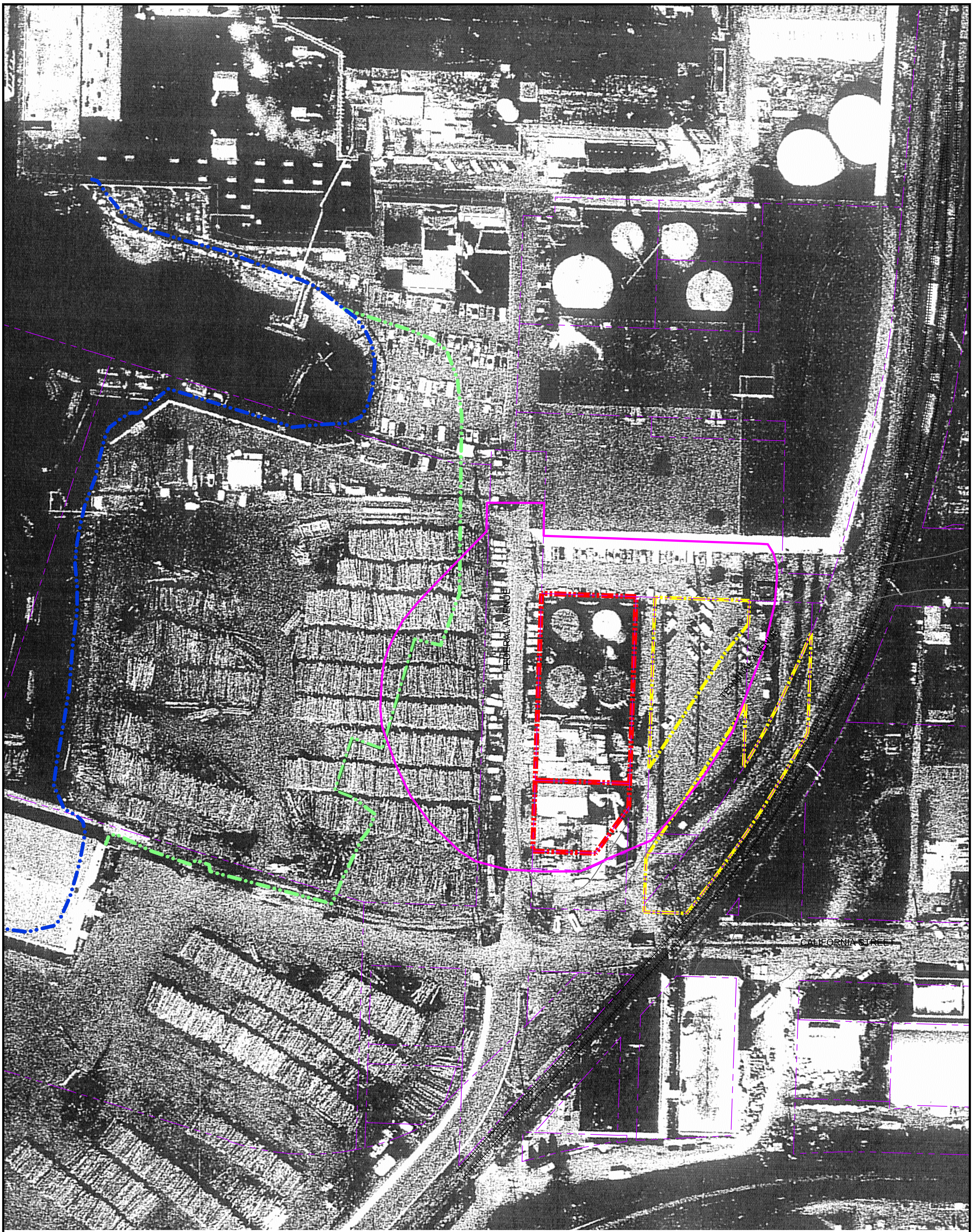
PROJECT NO.
6103150009

REV NO.
1

FIGURE No.
APPENDIX A

DRAWN BY: APS CHECKED BY: LV

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_5888\Everett_EXM-Figures_092518.dwg — Appendix A 1955 — Sep. 25, 2018 11:22am — adam.stenberg



LEGEND

SITE BOUNDARY
PARCEL LINE
EXXONMOBIL/ADC PROPERTY LINE
BNSF PROPERTY LINE
APPROXIMATE 1976 SHORELINE - CURRENT
APPROXIMATE 1947 SHORELINE

0 60 120 240
SCALE IN FEET

CLIENT
EXXONMOBIL AND
AMERICAN DISTRIBUTION COMPANY

Wood Environment &
Infrastructure Solutions, Inc.
600 University Street, Suite 600
Seattle, Washington 98101

wood.

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
1976 AERIAL PHOTOGRAPH

DATE
SEPTEMBER 2018

PROJECT NO.
6103150009

REV NO.
1

FIGURE No.
APPENDIX A

DRAWN BY: APS CHECKED BY: LV

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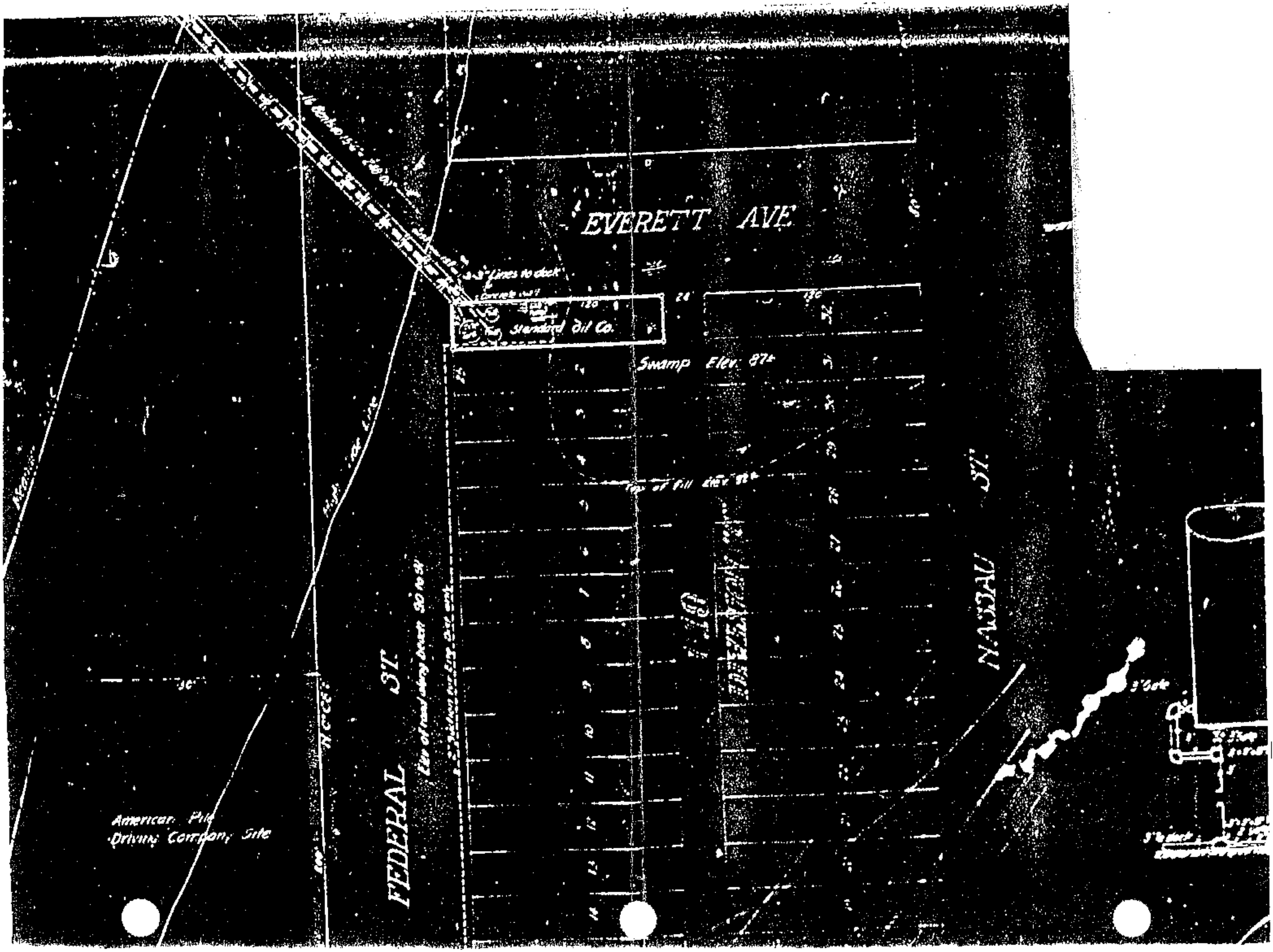
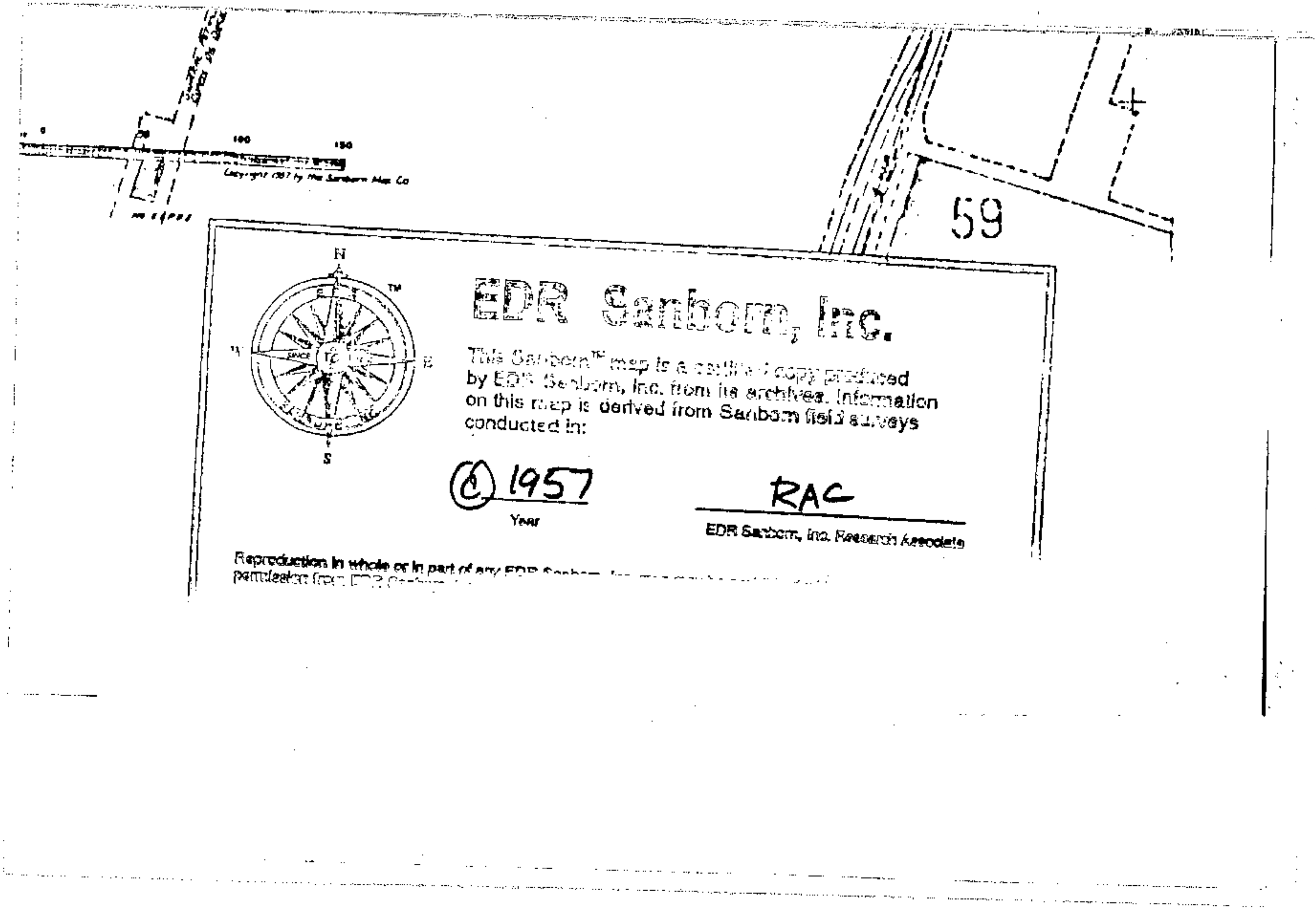

EVERETT AVE
3-3" Lines to dock
Standard Oil Co.
120
24
130
Swamp Elev. 87±
Top of fill Elev. 93±
FEDERAL ST.
NASSAU ST.
American Pile
Driving Company Site
3"Gate
3"to dock



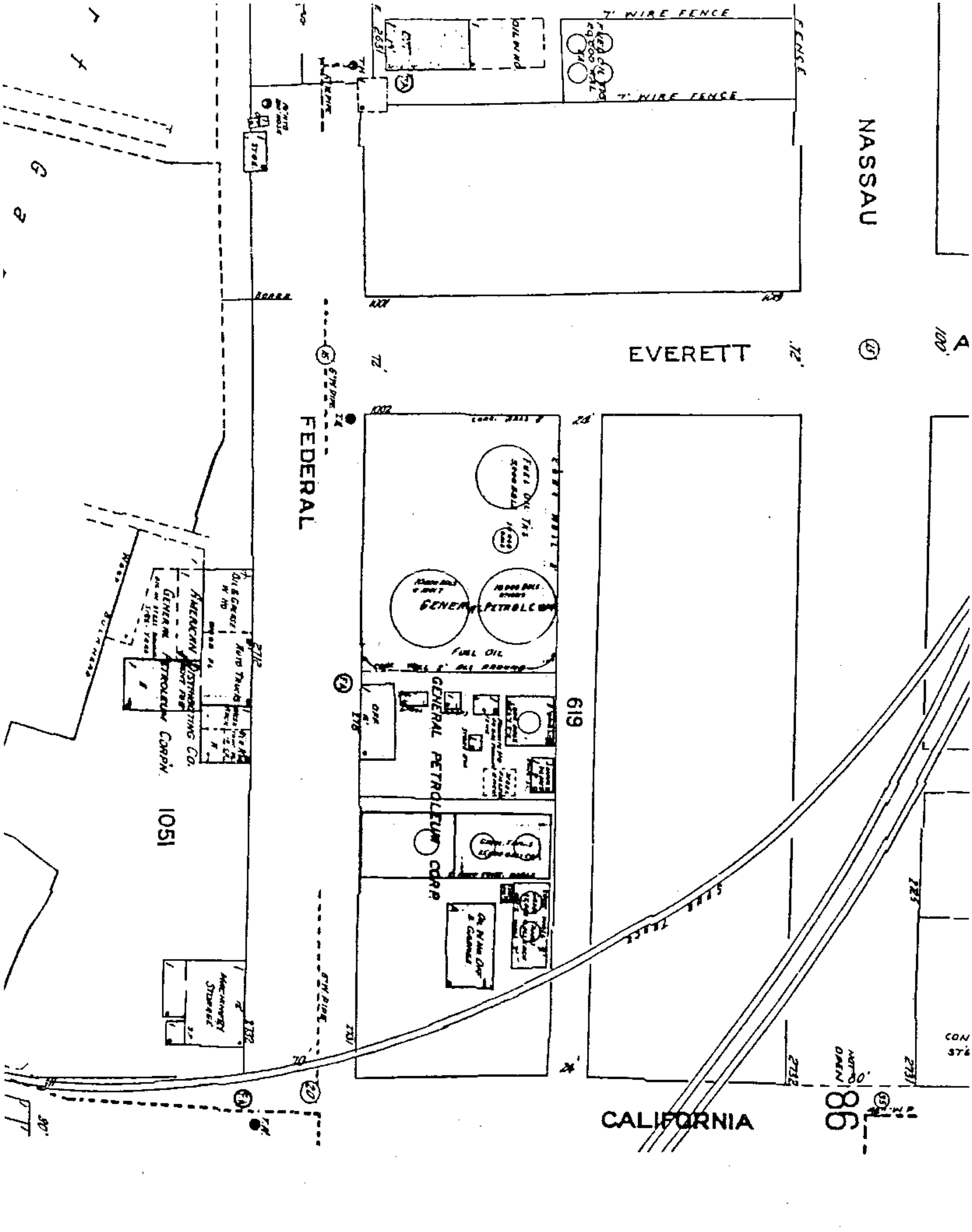
Copyright 1957 by the Sanborn Map Co

EDR Sanborn, Inc.

This Sanborn™ map is a certified copy produced by EDR Sanborn, Inc. from its archives. Information on this map is derived from Sanborn field surveys conducted in:

© 1957
Year

RAC
EDR Sanborn, Inc. Research Associate


NASSAU
EVERETT
FEDERAL
CALIFORNIA
1051
619
98
A
7' WIRE FENCE
7' WIRE FENCE
FENCE
OIL MIXING
GENERAL PETROLEUM CORP.
GENERAL PETROLEUM CORP.
AMERICAN DISTRIBUTING CO.
GENERAL PETROLEUM CORPN.
FUEL OIL
MACHINERY STORAGE
SPUR TRACK
6" W. PIPE
BULKHEAD
72'
72'
100'
80'
24'
24'
70'
80'
CON
STS

APPENDIX B

BORING LOGS AND MONITORING WELL LOGS

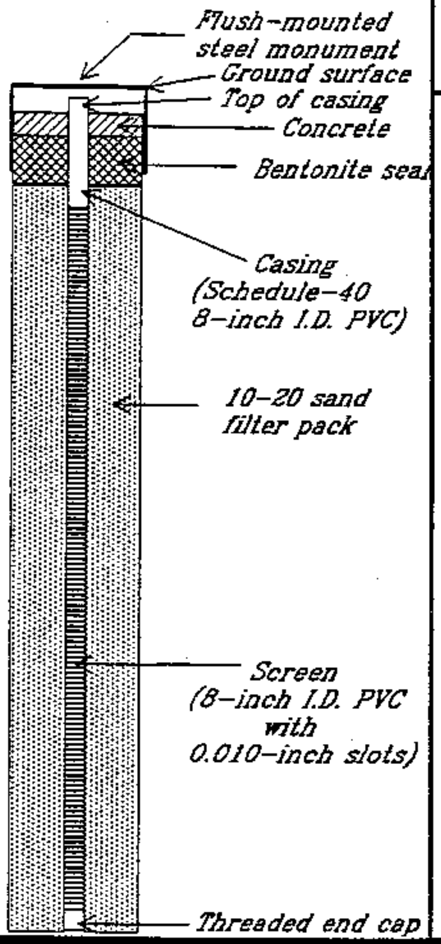
Appendix B

Lithologic Logs

PROJECT *Mobil Bulk Plant* W.O. *W-4558-3* WELL NO. *RW-2*

Elevation reference:
Ground surface elevation:
Well completed:
Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
0	*Inferred medium dense, moist, brown SILT with gravel and some sand. Slight odor noted.*							
	Inferred meium dense, moist, grey, SILT with some sand and gravel. Strong odor noted.							
5								
	Inferred, medium dense, wet, grey, SILT with sand and organics. Strong odor noted.					▼ ATD		
10	*Inferred, dense, wet, dark grey, organics (wood and peat) with some sand and silt.*							
15								
	Boring terminated at 18 feet.							
20								
25								
30								



LEGEND

▼ ATD Observed groundwater level (ATD = at time of drilling)

RITTENHOUSE-ZEMAN &
ASSOCIATES, INC.
Geotechnical &
Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Drilling started: *07 November 1991* Drilling completed: *07 November 1991* Logged by: *JK*

RZA RITTENHOUSE-ZEMAN & ASSOC., INC.
Geotechnical / Hydrogeological Consultants

BORING NUMBER MW-6 W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

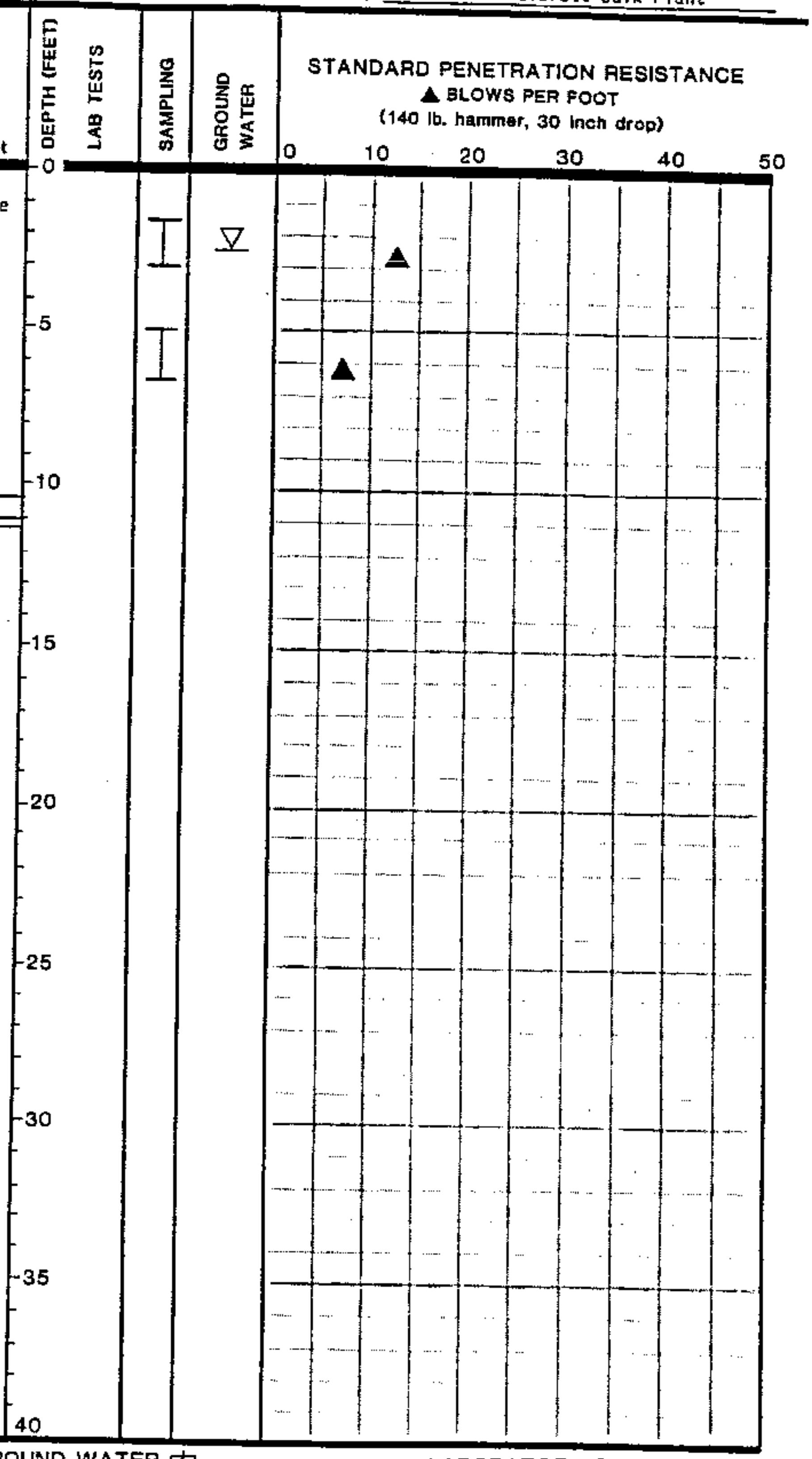
SOIL DESCRIPTION

Ground Surface Elevation Approximately Feet

Loose to medium dense, wet to saturated, gray and brown-gray, silty fine to coarse SAND with a trace of gravel and wood debris (Fill)

Soft, saturated, brown, silty PEAT

Total depth 11 feet
Boring completed 9 March 1988



SAMPLING
- I 2" OD SPLIT SPOON SAMPLE
- II 3" OD SHELBY SAMPLE
- 2.5" ID RING SAMPLE
- BULK SAMPLE
- * SAMPLE NOT RECOVERED

GROUND WATER
- ▨ SEAL
- DATE
- ▽ ATD WATER LEVEL AT TIME OF DRILLING
- OBSERVATION WELL TIP

LABORATORY TESTS
- ● % WATER CONTENT
- NP NON PLASTIC
- PLASTIC LIMIT ├──●──┤ LIQUID LIMIT, ● NATURAL WATER CONTENT

PROJECT *Mobil Bulk Plant* W.O. *W-4558-3* BORING NO. *B-1A*

SOIL DESCRIPTION

Approximate ground surface elevation:

Medium dense, moist, brown, SILT, with some sand and trace gravel

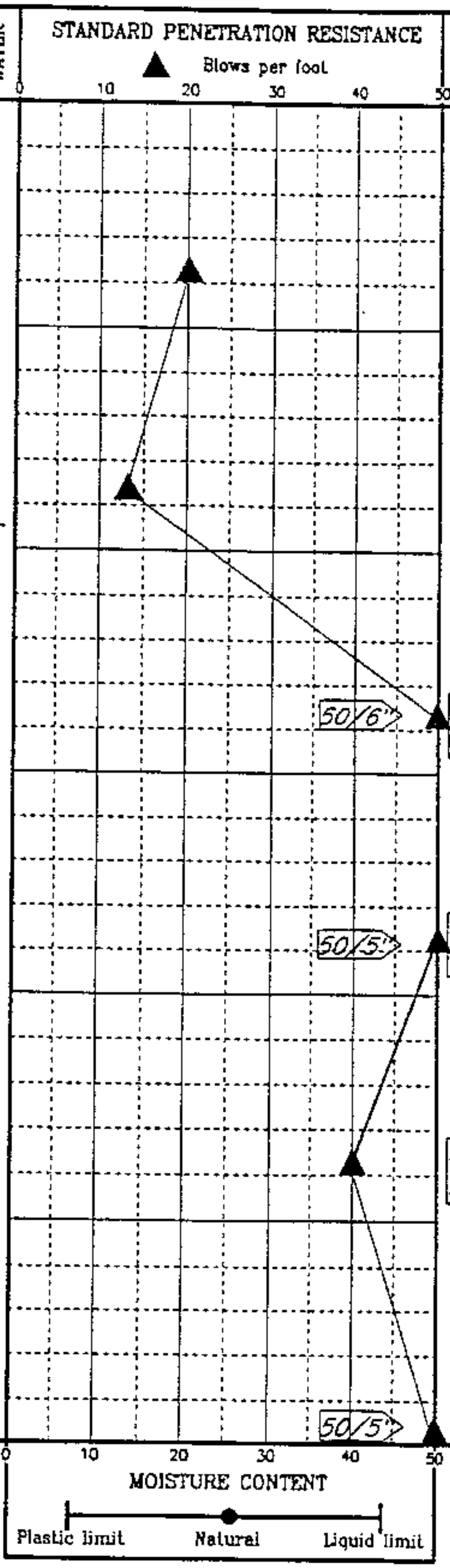
Medium dense, moist, grey, SILT, with some sand. Moderate odor noted.

Very dense (overstated), wet, grey and brown ORGANICS (wood and peat)

Dense, moist, mottled, (brown and yellowish brown), coarse SAND with trace silt and some organics

SAMPLE NUMBER	OVM READING	TESTING
S-1	0	
S-2	16	
S-3	214	WTPH-G BTEX WTPH-D
S-4	25	WTPH-G BTEX WTPH-D
S-5	1	WTPH-G BTEX WTPH-D

GROUND WATER: ATD



DEPTH (feet): 0, 5, 10, 15, 20, 25, 30

LEGEND

2-inch OD split-spoon sample

Groundwater level at time of drilling (ATD)

WTPH-G BTEX WTPH-D Soil analyses method

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Drilling started: *06 November 1991* Drilling completed: *06 November 1991* Logged by: *JK*

PROJECT *Mobil Bulk Plant* W.O. *W-4558-3* BORING NO. *B-1A*

PTH (feet)	SOIL DESCRIPTION Approximate ground surface elevation:	SAMPLE TYPE	SAMPLE NUMBER	OVM READING	GROUND WATER	STANDARD PENETRATION RESISTANCE ▲ Blows per foot 0 10 20 30 40 50	TESTING
0		I	*S-6*	*0*			
	Boring terminated at approximately 31 feet						
5							
10							
15							
20				*1*			
25							
30						0 10 20 30 40 50	

LEGEND

I 2-inch OD split-spoon sample

MOISTURE CONTENT

Plastic limit ●Natural Liquid limit

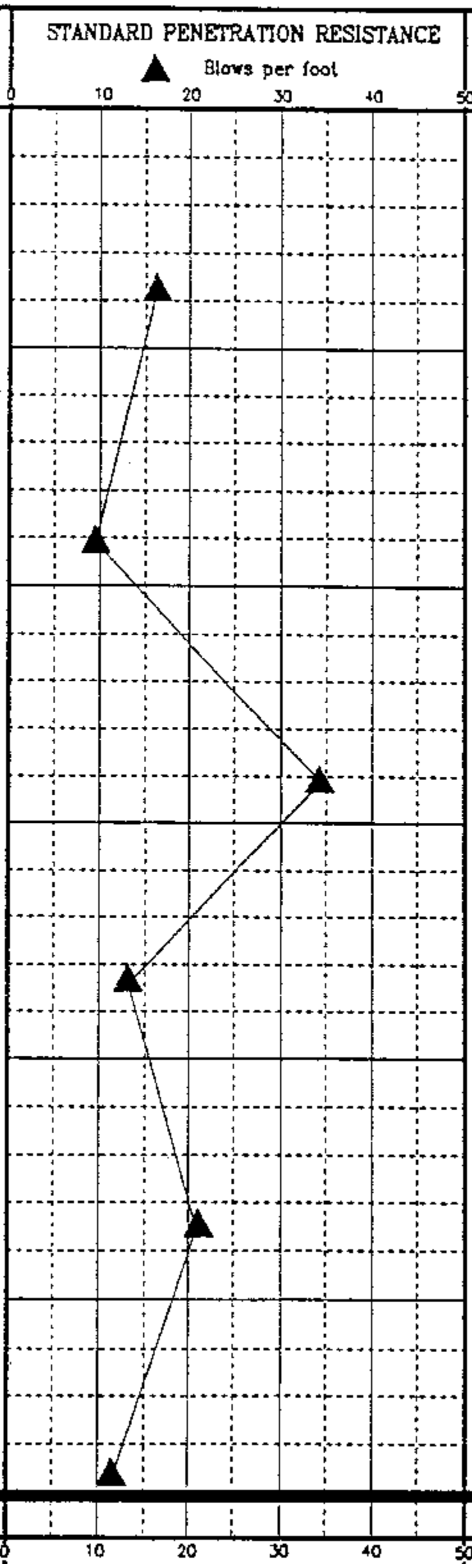
RZA

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Drilling started: *06 November 1991* Drilling completed: *06 November 1991* Logged by: *JK*

PROJECT *Mobil Bulk Plant* W.O. *W-4558-3* BORING NO. *B-8A*

DEPTH (feet)	SOIL DESCRIPTION Approximate ground surface elevation:	SAMPLE NUMBER	OVM READING	GROUND WATER	TESTING
0	*Loose to medium dense, moist, dark grey, SILT with sand and some gravel. Strong odor noted.*				
		S-1	*187*		
5				ATD	
		S-2	*44*		WTPH-G BTEX WTPH-D
10					
	Inferred (insufficient recovery), medium dense, wet, grey, SILT with sand and some gravel and organics.	*S-3*	*–*		
15					
	Medium dense, moist, brown ORGANICS (wood and peat) with trace sand	*S-4*	*23*		WTPH-G BTEX WTPH-D
20					
	Medium dense, moist, coarse SAND with organics and some silt	*S-5*	*0*		WTPH-G BTEX WTPH-D
25					
		S-6	*0*		
30	*Boring terminated at approximately 29 feet*				



MOISTURE CONTENT

Plastic limit Natural Liquid limit

LEGEND

Ⅰ 2-inch OD split-spoon sample

ATD Groundwater level at time of drilling

WTPH-G BTEX WTPH-D Soil analyses method

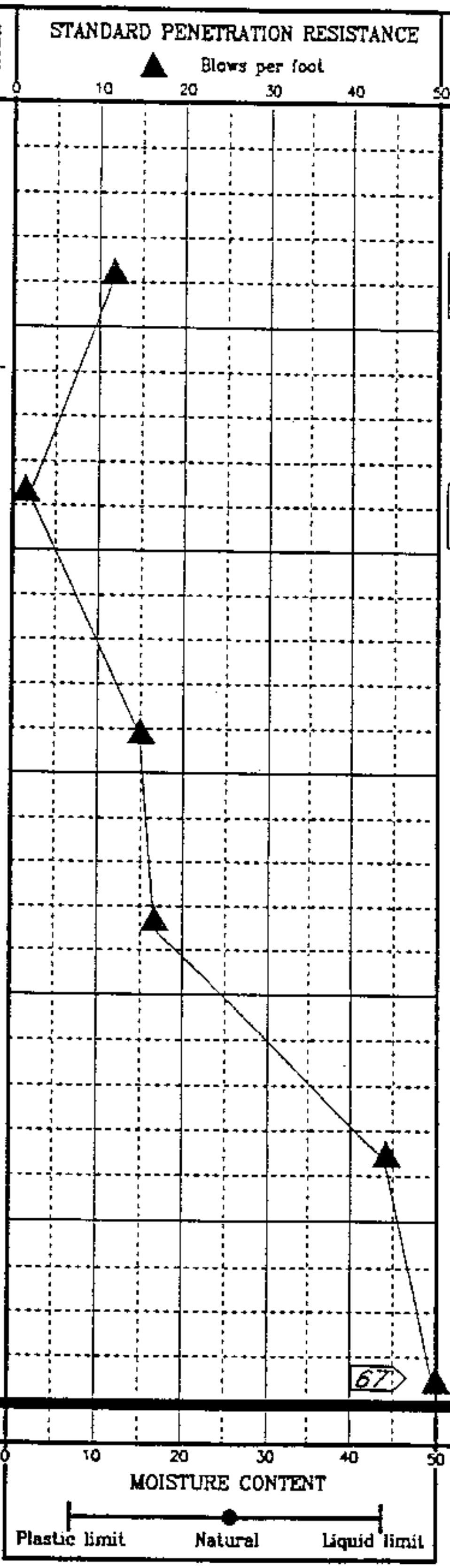
RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Drilling started: *06 November 1991* Drilling completed: *06 November 1991* Logged by: *JK*

PROJECT *Mobil Bulk Plant* W.O. *W-4558-3* BORING NO. *B-15A*

SOIL DESCRIPTION Approximate ground surface elevation:	SAMPLE TYPE	SAMPLE NUMBER	OVM READING	GROUND WATER	TESTING
Loose to medium dense moist, dark grey, SILT with sand and some gravel. Strong odor noted	I	*S-1*	*49*	ATD	*WTPH-G BTEX WTPH-D*
Loose, wet grey SILT with sand and trace gravel	I	*S-2*	*1*		*WTPH-G BTEX WTPH-D*
Medium dense, wet, grey, medium SAND with gravel and some silt	I	*S-3*	*8*		
Medium dense, moist, brown ORGANICS (wood and peat) with some fine sand	I	*S-4*	*10*		
Dense, moist, brown, medium SAND with silt	I	*S-5*	*0*		
	I	*S-6*	*0*		

DEPTH (feet): 0, 5, 10, 15, 20, 25, 30



Boring terminated at approximately 29 feet

LEGEND

I 2-inch OD split-spoon sample

ATD Groundwater level at time of drilling

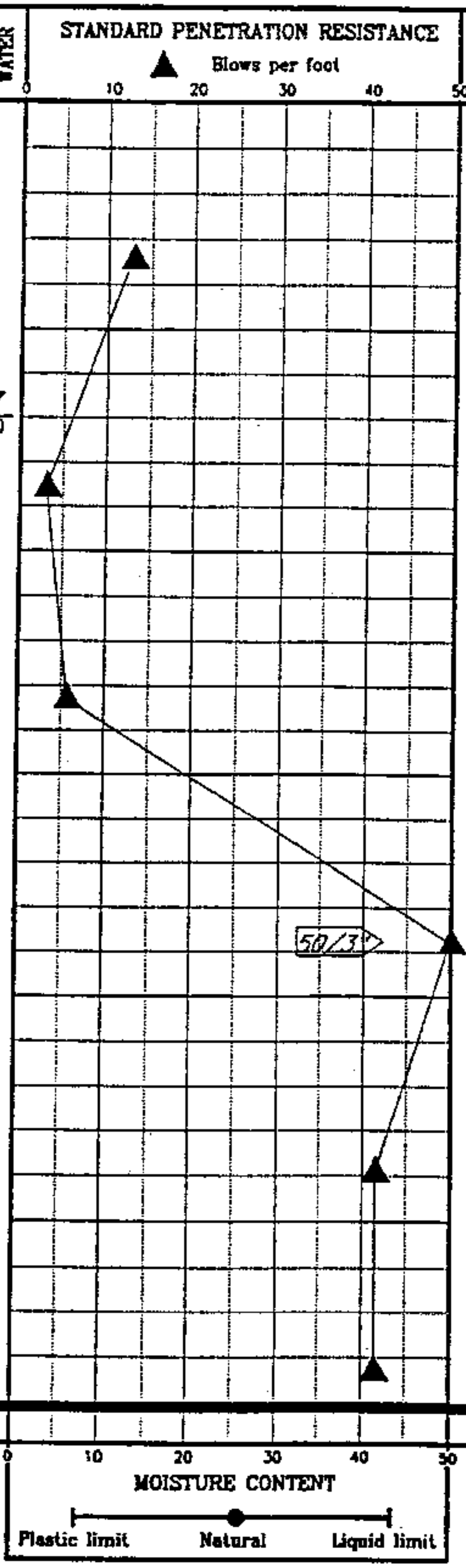
WTPH-G BTEX WTPH-D Soil analyses method

RZA
RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Drilling started: *06 November 1991* Drilling completed: *06 November 1991* Logged by: *JK*

PROJECT *Mobil Bulk Plant* W.O. *W-4558-3* BORING NO. *B-21-91*

DEPTH (feet)	SOIL DESCRIPTION Approximate ground surface elevation:	SAMPLE TYPE	SAMPLE NUMBER	GROUND WATER	TESTING
0	*1 inch vegetation*				
	Moist, gray, sand – gravel				
	Medium dense, moist, gray, sandy SILT	I	*S-1*		
5					
				▼ ATD	
	Loose, wet, black-gray, sandy SILT	I	*S-2*		
10					
	Loose, moist, brown – black (top 3 inches oily), PEAT, underlain by gray, coarse SAND (bottom 2 inches)	I	*S-3*		
15					
	Dense, wet, brown oily WOOD and PEAT	I	*S-4*		
20					
		I	*S-5*		8015 418.1 BTEX 6010
25					
	Dense, moist, (overlying peat/wood – 2 inches), brown, coarse SAND, with some gravel	I	*S-6*		8015 418.1 BTEX 6010
30	*Boring terminated at approximately 29.0 feet.*				



LEGEND

I 2-inch OD split-spoon sample

▼ ATD Groundwater level at time of drilling

8015 418.1 BTEX 6010 Soil Analysis (EPA Method shown)

RZA

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Drilling started: *20 June 1991* Drilling completed: *20 June 1991* Logged by: *JK*

PROJECT: *Everett Mobil Bulk Plant* W.O. *11-04558-04* WELL NO. *B-34*

Elevation reference: *N/A*
Ground surface elevation: *N/A*
Well completed: *N/A*
Casing elevation: *N/A*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0						
	Loose, moist, brown, silty, fine to medium SAND interbedded with gray, sandy SILT with trace gravel		*S-1*	*5*	*17*	
5			*S-2*		*69*	
			S-3			▼ ATD
	Medium dense to dense, saturated, gray, silty, fine to medium SAND with some wood debris		*S-4*	*41*	*80*	
10						
	Grades to grayish-black, silty, medium to coarse SAND					
			S-5	*12*		
15	*Bottom of boring at 14 feet.* *Petroleum-like staining and odor observed in all samples.* *Field FT-IR analysis of sample S-5 indicated >10,000 ppm TPH.*					
20						
25						
30						

AS-BUILT DESIGN: *Boring abandoned by backfilling with bentonite.*

TESTING

LEGEND

- 2-inch O.D. split-spoon sample
- 3-inch OD Shelby sampler
- ▼ Observed groundwater level ATD = at time of drilling

RZA AGRA, Inc.
Geotechnical & Environmental Group

11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *06 December 1993* Drilling completed: *06 December 1993* Logged by: *GKS*

Bobcat Boring Logs

BB-1

Gray, moist to wet, silty, gravelly SAND with some cobbles. Slow seepage at approximately 1.0 foot; no other seepage encountered; soil exhibits a petroleum hydrocarbon-like odor. No LPH observed. Met with refusal at approximately 3.0 feet.

BB-2

Gray, moist to wet, gravelly SAND. Slow seepage at approximately 1.5 feet; no other seepage encountered; soil exhibits a petroleum hydrocarbon-like odor. Seepage from 1.5 foot depth pooled at bottom of boring and exhibits an irridescent sheen. No LPH observed. Boring terminated at a depth of approximately 4.0 feet.

BB-3

Gray, moist to wet, gravelly SAND with some gravel. Slow seepage below approximately 2.5 feet; soil exhibits a petroleum hydrocarbon-like odor. Discontinuous blebs of LPH observed on water pooled at the bottom of the boring. Boring terminated at a depth of approximately 4.0 feet. Boring allowed to remain open approximately two hours; discontinuous blebs of LPH still present on the water pooled in the bottom of the boring.

BB-4

Gray, moist to wet, silty, gravelly SAND with some wood debris. Slow seepage at approximately 1.0 foot; soil exhibits a petroleum hydrocarbon-like odor. Moderate seepage observed below approximately 3.5 feet. Approximately 0.01 to 0.02 feet of LPH accumulated on groundwater in the boring. Boring terminated at a depth of approximately 4.0 feet.

BB-5

Dark gray, wet, SAND with some silt, gravel, and wood debris. Moderate seepage observed below approximately 3.0 feet; soil exhibits a petroleum hydrocarbon-like odor. Boring terminated at a depth of approximately 4.0 feet; caved to approximately 3.5 feet. Gauged fluid at bottom of boring using Colorcut paste; it appeared to be 100% LPH. Collected two bottles of LPH for potential future laboratory analysis; collected one bag sample of soil for possible sieve analysis.

BB-6

Gray, moist to wet, gravelly, SAND with some silt. LPH seepage observed at approximately 3.8 feet; soil exhibits a petroleum hydrocarbon-like odor. Boring terminated at a depth of approximately 4.0 feet. Gauged fluid at bottom of boring using Colorcut paste; it appeared to be 100% LPH.

BB-7

Gray, moist to wet, gravelly, SAND with some silt and wood debris. Slow water and LPH seepage observed at approximately 1.0 feet; rapid LPH seepage observed below approximately 3.5 feet; soil exhibits a petroleum hydrocarbon-like odor. Boring terminated at a depth of approximately 4.0 feet. Gauged fluid at bottom of boring using Colorcut paste; it appeared to be 100% LPH.

Logged By TJP
5/22/96

BB-8

Gray, moist to wet, gravelly SAND with some silt; scattered glass shards. LPH observed on tip of auger at approximately 2.5 feet. Slow seepage observed below approximately 3.8 feet; soil exhibits a petroleum hydrocarbon-like odor. Boring terminated at a depth of approximately 4.0 feet. Gauged fluid at bottom of boring using Colorcut paste approximately one hour after drilling boring; LPH thickness approximately 0.05 feet.

BB-9

Gray, moist to wet, gravelly SAND with some silt. Slow seepage observed at approximately 1.5 feet. Slow seepage observed again below approximately 3.8 feet; soil exhibits a petroleum hydrocarbon-like odor. Boring terminated at a depth of approximately 4.0 feet. Gauged fluid at bottom of boring using Colorcut paste; fluid appears to be a mixture of LPH and water (stains tape black like LPH but changes Colorcut from yellow to red like water).

BB-10

Gray, moist to wet, gravelly SAND with some silt and cobbles. No seepage observed; soil exhibits a petroleum hydrocarbon-like odor. Boring terminated at a depth of approximately 4.0 feet.

BB-11

Gray, moist to wet, gravelly SAND with some silt. No seepage observed in boring but soil and auger tip appears to be saturated with water; no LPH observed. Soil exhibits a petroleum hydrocarbon-like odor. Boring terminated at a depth of approximately 4.0 feet. Boring left open overnight. Fluid level in boring in 5/23/96 was at approximately 3.0 feet. Gauged fluid with Colorcut paste; LPH thickness measured in boring using this method was approximately four inches. Collected two bottles of LPH for potential future laboratory analysis; collected one bag sample of soil for possible sieve analysis.

BB-12

Gray, wet, gravelly SAND with some silt. Rapid seepage observed below approximately 3.0 feet; soil exhibits a petroleum hydrocarbon-like odor. Boring terminated at a depth of approximately 4.0 feet. Seepage accumulated in the boring to a depth of approximately 2.0 feet. Gauged fluid at bottom of boring using Colorcut paste; LPH thickness approximately 0.01 feet. Collected two bottles of LPH for potential future laboratory analysis.

BB-13

Gray, moist, gravelly SAND overlying saturated ¾-inch minus round rock at approximately 2.0 feet. LPH on tip of auger when removed from the boring. However, boring caved as fast as the auger was removed; consequently, LPH thickness was indeterminate; soil exhibits a petroleum hydrocarbon-like odor. Boring terminated at a depth of approximately 4.0 feet.

BB-14

Gray, moist, gravelly SAND with some silt and scattered metal debris. No seepage observed; soil exhibits a petroleum hydrocarbon-like odor. Boring terminated at a depth of approximately 4.0 feet.

Logged By TJP
5/22/96

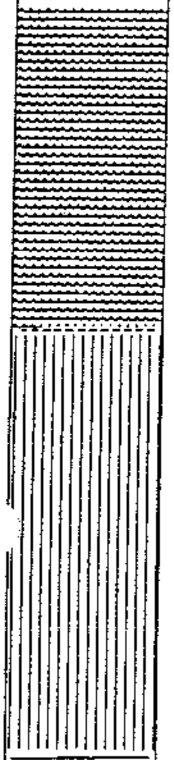
LOG OF
EXPLORATORY BORING

ocation of boring:

Project No: 05-487-002
Client: American Distributing Co
Location: Bulk Terminal-Everett,
Logged by: G. Stuesse
Installation Data: (See Below)

Boring No: W-1
Date: 2-23-90
Driller: Geotech
Drilling Method: CMEC-55
Hollow Stem Auger
Hole Diameter: 7"
Page No: 1 of 1

Water Level	Time:	Date:	Comments:



pth ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0 -					----------	0-3.0" Asphalt
2 -				Ring @ 3.0'	Pt	3.0' Organic debris, silty, brown, loose, moist, primarily wood shavings, slight organic odo
4 -		4.00				
6 -						
8 -						
0 -					----------	10.0' Silt, brown, soft, wet, wood shavings, slight odor.
					ML	
2 -						
4 -						15.0' Silt, brown, soft, wet, wood shavings, slight petroleum sheen on cuttings.
6					ML	
3 -						
ɔ -						
: -						
: -	TD=23.0'					

Installation Data:

Screen:	23.0' - 3.0'
Blank:	3.0' - 0
Sand:	23.0' - 2.0'
Bentonite:	2.0' - 1.0'
Concrete:	1.0' - 0

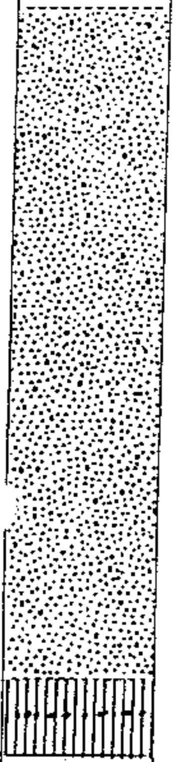
LOG OF
EXPLORATORY BORING

ocation of boring:

Project No: 05-487-002
Client: American Distributing Co
Location: Bulk Terminal-Everett,
Logged by: G. Stuesse
Installation Data: (See Below)

Boring No: W-2
Date: 2-22-90
Driller: Geotech
Drilling Method: CMEC-55
Hollow Stem Auger
Hole Diameter: 7"
Page No: 1 of 1

Water Level	Time:	Date:	Comments:



epth (ft)	Graphic Log	Blow/ft	Vapor Concen-tration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0			TIP II			0-3" Gravel; degraded asphalt.
						3-5" Sand, fine-coarse, grey, loose, very moist, occasional fine gravel, slight-moderate oily odor, dark brown, oily film on outside of sampler.
2					SW	
		11	60	Ring @ 3.0'		
4						
						5.0' Sand, fine-coarse, grey, loose, wet, occasional fine gravel, slight, moderate oily, odor, dark brown oily film on outside of sampler.
6					SW	
8						
0						
2						
4						
						15.0' Sand, fine-coarse, grey, loose, wet, occasional coarse gravel, slight-medium oily odor, dark brown oily film on outside of sampler.
6					SW	
8						
0					SW	20.0' Sand, fine coarse, grey, loose, wet, occasional coarse gravel, slight-medium oily odor, dark brown oily film on outside of sampler.
2					OL	
						23.0' Clay, brown, soft, wet, possible organic, very slight organic odor.
4	TD=23.0'					

NOTE: The lower 3.0' of well could not be sand packed due to heaving sands.

Installation Data:

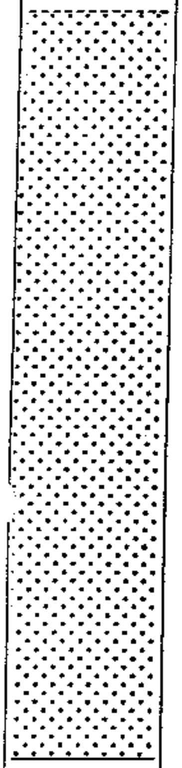
Screen:	23.0'	-	3.0'
Blank:	3.0'	-	0'
Sand:	23.0'	-	2.0'
Bentonite:	2.0'	-	1.0'
Concrete:	1.0'	-	0'

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-002
Client: American Distributing Co
Location: Bulk Terminal-Everett,
Logged by: G. Stuesse
Installation Data: (See Below)

Boring No: W-3
Date: 2-22-90
Driller: Geotech
Drilling Method: CMEC-55
Hollow Stem Auger
Hole Diameter: 7"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time:	Date:	Comments:
0 -					----------	0-3" Asphalt			
-									
2 -									
-		11		Ring @ 3.0'		3.0' Sand, slight silty, fine-medium, grey, loose, moist, occasional gravel, no odor.			
4 -					SP				
-									
6 -									
-						7.0' Sand, slight silty, fine-medium, grey, loose, wet, occasional gravel, no odor.			
8 -					SP				
-									
10 -									
-									
.2 -									
-									
4 -									
						15.0' Sand, slight silty, fine-medium, grey, loose, wet, occasional gravel, no odor.			
.ι					SP				
-									
8 -									
-									
:0 -						20.0' Sand, slight silty, fine-medium, grey, loose, wet, occasional gravel, no odor.			
-					SP				
2 -									
-									
4 -	TD=23.0'					NOTE: Vapors from well have H2S odor.			

Installation Data:

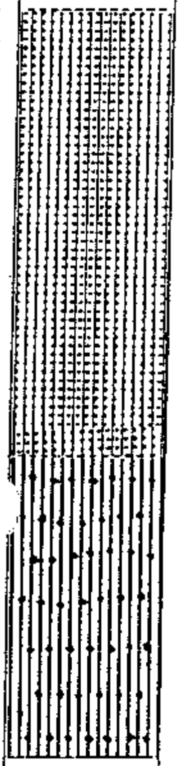
Screen:	23.0' - 3.0'
Blank:	3.0' - 0'
Sand:	23.0' - 2.0'
Bentonite:	2.0' - 1.0'
Concrete:	1.0' - 0'

LOG OF
EXPLORATORY BORING

ocation of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-4
Date: 2/22/90
Driller:
Drilling Method:
Hole Diameter: 7"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0									0 -3" Concrete.
2									
4		16	0	Ring @ 4'	SM				@ 4' Sand, silty, fine to medium grained, gray/brown, loose, wet, moderate odor, film of brown oil on sampler.
6									
8									
0									@ 10' Sand, silty, fine to medium grained, gray/brown, loose, wet, moderate odor, pieces of glass, metal and wood.
2									
4									
6									@ 15' Clay, organic, brown, soft, wet, pieces of wood, very slight odor.
8					OL				
0									@ 20' Clay, organic, brown, soft, wet, pieces of wood, very slight odor.
2									
4	TD=23'								

Installation Data:

Screen	23'	-	3'
Blank	3'	-	0
Sand	23'	-	2'
Bentonite	2'	-	1'
Concrete	1'	-	0

LOG OF
EXPLORATORY BORING

Location of boring:

Project No: 05-487-003

Client: American Distributing Co.

Location: Bulk Terminal
Everett, WA

Logged By:

Installation Data: See Below

Boring No: W-5

Date: 2/22/90

Driller:

Drilling Method:

Hole Diameter: 7"

Page No: 1 of 1

Water Level	Time	Date	Comments:

epth ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0 -					----------	0 - 6" Gravel.
2 -						
-		28	50	Ring @ 3'	SP	@ 3' Sand, fine to medium grained, slightly silty, gray, loose, moist, slight odor, pieces of wood and metal.
4 -						
6 -						@ 6' Sand, fine to medium grained, slightly silty, gray, loose, wet, slight odor, film of brown oil on cuttings.
8 -						
0 -						
2 -						
-						
					SP	@ 15' Sand, fine to medium grained, slightly silty, gray, loose, wet, slight odor, film of brown oil on cuttings.
8 -						
) -						@ 20' Sand, fine to medium grained, slightly silty, gray, loose, wet, slight odor, Cuttings coated with brown oil film..
-	TD=23'					

Installation Data:

Screen	23' -	3'
Blank	3' -	0
Sand	23' -	2'
Bentonite	2' -	1'
Concrete	1' -	0

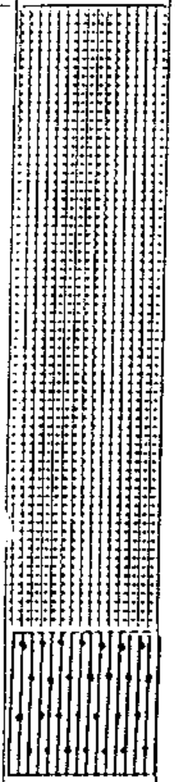
LOG OF
EXPLORATORY BORING

ocation of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-6
Date: 2/23/90
Driller:
Drilling Method:
Hole Diameter: 7"
Page No: 1 of 1

Water Level	Time	Date	Comments:



epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0						@ 0 - 5' Sand, slightly silty, fine to medium grained, gray, loose moist, slight odor, some gravel.
2						
		19	30	Ring @ 3'	SM	
4						
6						@ 6' Sand, slightly silty, fine to medium grained, gray, loose, wet, slight odor, some gravel, pieces of wood, brown oily film on water and cuttings.
8						
.0						@ 10' Sand, very silty, fine to medium grained, gray, loose, wet, slight odor, some gravel, pieces of wood, brown oily film on water and cuttings.
.2						
4						
8						
0					OL	@ 20' Clay, organic, dark brown, soft, wet, hydrogen sulfide odor.
2						
4	TD=23'					

Installation Data:

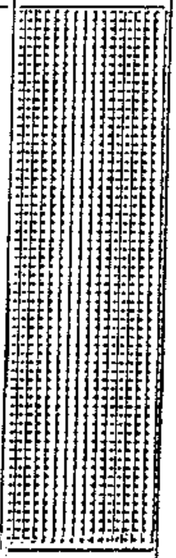
Screen	23'	-	3'
Blank	3'	-	0
Sand	23'	-	2'
Bentonite	2'	-	1'
Concrete	1'	-	0

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By: G. Stuesse
Installation Data: Backfill with
Enviroplug

Boring No: W-7
Date: 2/21/90
Driller: Geotech
Drilling Method: CMEC-55
Hollow-Stem Auger
Hole Diameter: 7"
Page No: 1 of 1

Depth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0			TIP						
2					SM				
		5	400	Ring @ 3'					@ 3' Sand, silty, fine to coarse grained, gray to dark gray, loose wet, gravel, slight oily odor.
4									
6									
8									
10									
12									
14									
1	TD=16'								

LOG OF
EXPLORATORY BORING

'ocation of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By: G. Stuesse
Installation Data: See Below

Boring No: W-8
Date: 6/28/90
Driller: ESE
Drilling Method: Hand Auger
Hole Diameter: 4"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:

0 -
-
2 -
-
4 -
-
6 -
-
8 -
-
0 -

TD=10'

SM — 0 - 3' Sand, silty, brown, loose, moist to wet, no odor.

ML — @ 3' - 10' Silt, gray, soft, wet, slight odor.

Installation Data:	Screen	10' - 2'
	Blank	2' - 0
	Sand	10' - 1'
	Bentonite	1' - .5'
	Concrete	.5' - 0

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-9
Date: 6/28/90
Driller:
Drilling Method: Hand Auger
Hole Diameter: 7"
Page No: 1 of 1

Depth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0 -	▥								
-	▥				ML	0 - 3' Silt, sandy, brown, moist, no odor.			
2 -	▥								
-	▥					@ 3' - 7.5' Silt, gray, wet, moderate odor.			
4 -	▥								
-	▥								
6 -	▥								
-	▥								
8 -	TD=7.5'								

Installation Data:

Screen	7.5' - 1.5'
Blank	1.5' - 0
Sand	7.5' - 1.0'
Bentonite	1.0' - 0.5'
Concrete	0.5' - 0

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-10
Date: 6/28/90
Driller:
Drilling Method: Hand Auger
Hole Diameter: 7"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0					ML				
2					Pt				
4									
6	TD=6'								

0 - 2' Silt, brown, moist, pieces of wood and metal, no odor.
@ 2' - 6' Peat, brown, wet, no odor.

Installation Data:

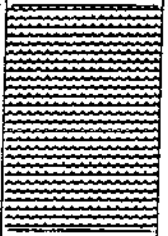
Screen	6.0' - 2.0'
Blank	2.0' - 0
Sand	6.0' - 1.5'
Bentonite	1.5' - 0.5'

LOG OF
EXPLORATORY BORING

ocation of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-11
Date: 6/28/90
Driller:
Drilling Method: Hand Auger
Hole Diameter: 7"
Page No: 1 of 1

epth 'ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0 -									
-						0 - 2' Peat, silty, brown, moist, no odor.			
2 -					Pt	@ 2' - 6.5' Peat, brown, wet, brown, oil sheen.			
-									
4 -									
-									
6 -									
-	TD=6.5'								

Installation Data:

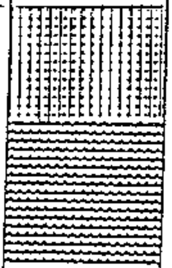
Screen	6.5' - 1.5'
Blank	1.5' - 0
Sand	6.5' - 1.0'
Bentonite	1.0' - 0.5'
Concrete	0.5' - 0

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-12
Date: 6/28/90
Driller:
Drilling Method: Hand Auger
Hole Diameter: 7"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0									
2					SM				0 - 3' Sand, silty, brown, moist, no odor.
4					Pt				@ 3' - 7.5' Peat, silty, brown, wet, slight odor.
6									
8	TD=7.5'								

Installation Data:

Screen	7.5'	1.5'
Blank	1.5'	0
Sand	7.5'	1.0'
Bentonite	1.0'	0.5'
Concrete	0.5'	0

LOG OF
EXPLORATORY BORING

ield location of boring:

Project No: 05-487-003

Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-13
Date: 6/28/90
Driller:
Drilling Method: Hand Auger
Hole Diameter: 7"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0									
2					ML	0 - 4' Silt, some sand and gravel, brown, moist, occasional cobbles, no odor.			
4						4' - 7' Silt, some sand and gravel, brown, moist, occasional cobbles, no odor.			
6									
8	TD=7'					Installation Data:			

Installation Data:

Screen	7'	-	2'
Blank	2'	-	0
Sand	7'	-	1'
Bentonite	1'	-	.5'
Concrete	.5'	-	0

LOG OF
EXPLORATORY BORING

ocation of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-14
Date: 6/28/90
Driller:
Drilling Method: Hand Auger
Hole Diameter: 7"
Page No: 1 of 1

pth ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0									
					ML	0 - 6.5' Silt, sandy, moist to wet, very slight odor.			
2									
4									
	TD=6.5'								

Installation Data:

Screen	6.5' - 2.0'
Blank	2.0' - 0
Sand	6.5' - 1.0'
Bentonite	1.0' - 0.5'
Concrete	0.5' - 0

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-003

Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-15
Date: 6/28/90
Driller:
Drilling Method: Hand Auger
Hole Diameter: 7"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0									
2					ML	0 - 7' Silt, some sand and cobbles, moist to wet, slight odor.			
4									
6									
8	TD=7'								

Installation Data:

Screen	6.0' - 1.5'
Blank	1.5' - 0
Sand	6.0' - 1.0'
Bentonite	1.0' - 0.5'
Concrete	0.5' - 0

LOG OF
EXPLORATORY BORING

ocation of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-16
Date: 6/28/90
Driller:
Drilling Method: Hand Auger
Hole Diameter: 7"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0 2 4 6 8	 TD=6'				ML	0 - 6' Silt, some sand and gravel, moist to wet, occasional cobbles, oil on ground water surface.			

Installation Data:
Screen 6' - 2'
Blank 2' - 0
Sand 6' - 1'
Bentonite 1' - .5'
Concrete .5' - 0

LOG OF
EXPLORATORY BORING

Location of boring:

Project No: 05-487-003
Client: American Distributing Co.
Location: Bulk Terminal
Everett, WA
Logged By:
Installation Data: See Below

Boring No: W-17
Date: 6/28/90
Driller:
Drilling Method: Hand Auger
Hole Diameter: 7"
Page No: 1 of 1

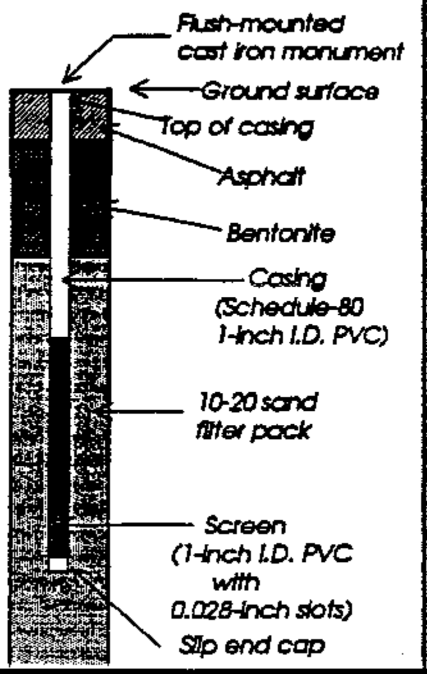
Depth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0					ML	0 - 6' Silt, some sand and gravel, moist to wet, occasional cobbles, oil on ground water surface.			
2									
4									
6									
	TD=6'					Installation Data:			
8									

Installation Data:
Screen 6' - 2'
Blank 2' - 0
Sand 6' - 1'
Bentonite 1' - .5'
Concrete .5' - 0

PROJECT: *Mobil Oil/ADC Bulk Plant Properties* W.O. *11-04558-09* WELL NO. *GP-1*

Elevation reference: *Unknown*	Well completed: *19 March 1996*	AS-BUILT DESIGN	Page 1 of 1
Ground surface elevation: *Unknown*	Casing elevation: *Unknown*		

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Gravel Surfacing over moist, brown, silty, gravelly SAND, non-odorous*						
	Weathered, red clay brick						
	Moist, brown, silty, fine SAND with some gravel and minor brick fragments		*GP-1/ 3.0'*		*0.0*		
5							
	Moist to wet, gray, fine to medium SAND, petroleum odor at 7.0 feet					*3/22/96* ▼	
			GP-1/ 8.0'		*27.0*	▼ ATD	
	Grades to wet, gray, fine to coarse SAND (3-inch fine sandy silt layer at 10.0 feet)						
10			*GP-1/ 10.0'*		*7.0*		WTPH-D
	Bottom of boring at 12 feet.						
15							
20							
25							
30							



LEGEND

I	2-inch O.D. Geoprobe sample
▼ ATD	Observed groundwater level ATD = at time of drilling
▼ 0/00/00	Observed groundwater level 0/00/00 = date observed
WTPH-G/ BTEX WTPH-D WTPH-D Ext.	Analytical testing

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Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *19 March 1996* Drilling completed: *19 March 1996* Logged by: *CCC*

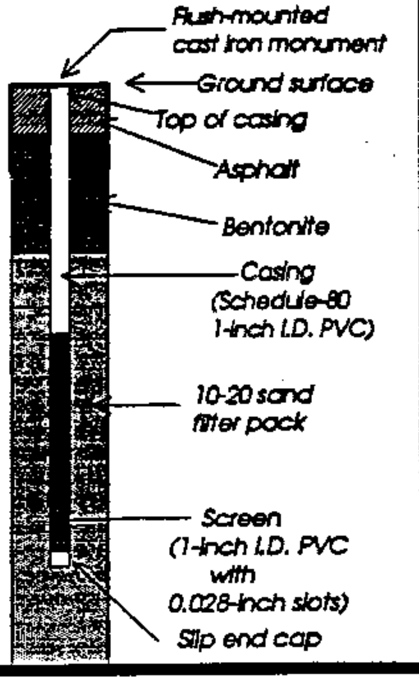
PROJECT: Mobil Oil/ADC Bulk Plant Properties W.O. 11-04558-09 WELL NO. GP-2

Elevation reference: Unknown
Ground surface elevation: Unknown
Well completed: 19 March 1996
Casing elevation: Unknown

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	Asphalt and base course over moist, gray/brown, silty, gravelly SAND						
	Moist, gray, fine to coarse SAND with some silt, non-odorous	I	GP-2/ 3.5'		0.0		
	Grades to gray/brown, silty, fine to medium SAND, non-odorous						
5						3/22/96 ▼	
	2-inch fine sandy SILT layer at 7.3 feet	I	GP-2/ 8.0'		11.0	▼ ATD	
	Grades to saturated, stained black, fine to medium SAND, strong petroleum odor and LPH globules						
10							
	Fine SAND interbedded with fine wood fragments	I	GP-2/ 11.0'		11.0		WTPH-D
	Bottom of boring at 12 feet.						
15							
20							
25							
30							



LEGEND

I	2-inch O.D. Geoprobe sample
▼ ATD	Observed groundwater level ATD = at time of drilling
▼ 0/00/00	Observed groundwater level 0/00/00 = date observed
WTPH-G/ BTEX WTPH-D WTPH-D Ext.	Analytical testing

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Drilling started: 19 March 1996
Drilling completed: 19 March 1996
Logged by: CCC

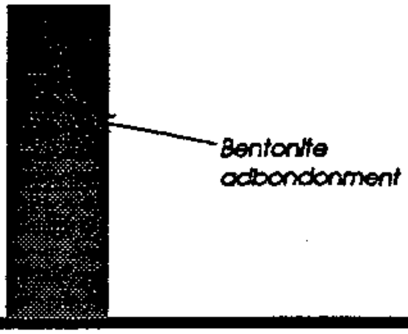
PROJECT: *Mobil Oil/ADC Bulk Plant Properties* W.O. *11-04558-09* WELL NO. *GP-3*

Elevation reference: *Unknown*
Ground surface elevation: *Unknown*
Well completed: *Not Applicable*
Casing elevation: *Unknown*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Asphalt and base course over moist, gray/brown fine SAND, non-odorous*						
	Grades to moist to wet, gray, fine SAND, strong pertoleum odor and LPH		*GP-3/ 3.0*		*11.0*	ATD	
5			*GP-3/ 6.5*		*17.0*		WTPH-D
	Bottom of boring at 6.5 feet, due to refusal.						
10							
15							
20							
25							
30							



LEGEND

2-inch O.D. Geoprobe sample

Observed groundwater level ATD = at time of drilling

Observed groundwater level 0/00/00 = date observed

WTPH-G/ BTEX WTPH-D WTPH-D Ext. Analytical testing

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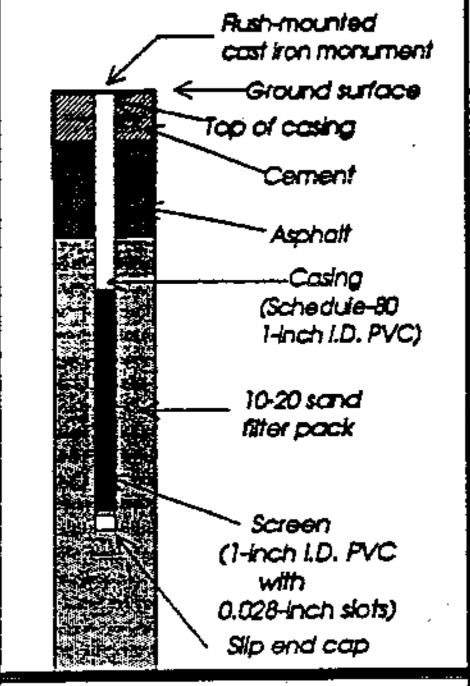
Drilling started: *19 March 1996* Drilling completed: *19 March 1996* Logged by: *CCC*

PROJECT: Mobil Oil/ADC Bulk Plant Properties W.O. 11-04558-09 WELL NO. GP-4

Elevation reference: Unknown	Well completed: 19 March 1996	Page 1 of 1
Ground surface elevation: Unknown	Casing elevation: Unknown	

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	Asphalt over base course over gray/brown, gravelly, silty SAND, non-odorous						
	Moist, brown/black/gray, silty, fine to medium SAND with some gravel, wood and brick fragments, non-odorous		GP-4/ 4.0'		0.0	3/22/96 ▼	
5	Moist to wet, gray/brown, fine SAND, moderate petroleum odor		GP-4/ 6.0'		7.0	▼ ATD	WTPH-D
	Wood debris and LPH		GP-4/ 8.0'		11.0		
10	Fine grained wood fragments, slight petroleum staining and odor						
	Bottom of boring at 12 feet.						
15							
20							
25							
30							

AS-BUILT DESIGN



LEGEND

- I 2-inch O.D. Geoprobe sample
- ▼ ATD Observed groundwater level ATD = at time of drilling
- ▼ 0/00/00 Observed groundwater level 0/00/00 = date observed
- ☐ Analytical testing

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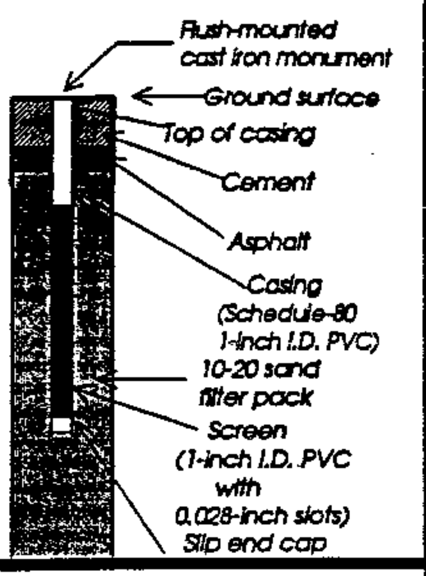
Drilling started: 19 March 1996 Drilling completed: 19 March 1996 Logged by: CCC

PROJECT: *Mobil Oil/ADC Bulk Plant Properties* W.O. *11-04558-09* WELL NO. *GP-5*

Elevation reference: *Unknown*	Well completed: *19 March 1996*	AS-BUILT DESIGN	Page 1 of 1
Ground surface elevation: *Unknown*	Casing elevation: *Unknown*		

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Asphalt and base course over moist, gray/black, fine SAND and broken gravel*						
	Moist to wet, brown, fine SAND with some silt, trace petroleum odor					ATD ▼	
	Moist to wet, gray, fine SAND, strong petroleum odor, LPH below 3.7 feet	I	GP-5/ 3.0' GP-5/ 4.0'			▼ 3/22/96	WTPH-D
5			GP-5/ 6.5'				
	Grades to moist, fine sandy SILT						
	Fine grained wood debris with LPH						
	Saturated, gray, fine SAND with LPH	I	GP-5/ 8.0				WTPH-D
10	*Bottom of boring at 9.5 feet, due to refusal.*						
15							
20							
25							
30							



LEGEND

I	2-inch O.D. Geoprobe sample
▼ ATD	Observed groundwater level ATD = at time of drilling
▼ 0/00/00	Observed groundwater level 0/00/00 = date observed
WTPH-G/ BTEX WTPH-D WTPH-D Ext.	Analytical testing

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Drilling started: *19 March 1996* Drilling completed: *19 March 1996* Logged by: *CCC*

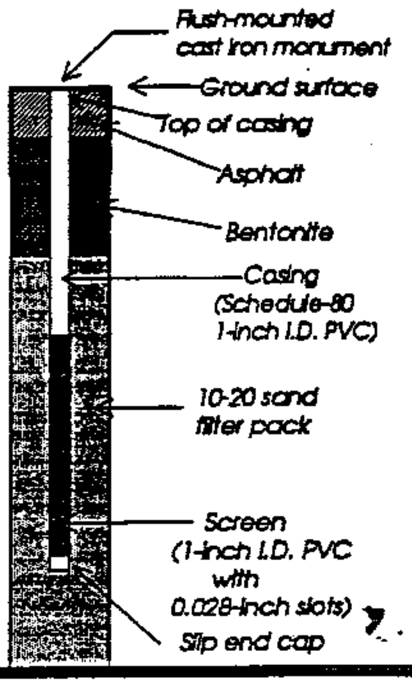
PROJECT: Mobil Oil/ADC Bulk Plant Properties W.O. 11-04558-09 WELL NO. GP-6

Elevation reference: Unknown
Ground surface elevation: Unknown
Well completed: 19 March 1996
Casing elevation: Unknown

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Asphalt and base course over moist, gray, fine SAND with silt rich zones (2 to 3 feet - silty, gravelly SAND with wood debris, non-odorous)*						
	Black, fine to medium sandy SILT and wood fragments, saturated with very viscous LPH	I	GP-6/ 3.5'		15	▼ AID ▼ 3/22/96	
5			GP-6/ 6.0'				
	Fine to medium grained wood debris, petroleum odor, no LPH						
	Wood fragments saturated with very viscous LPH						
10							
	Bottom of boring at 12 feet.						
15							
20							
25							
30							



LEGEND

I 2-inch O.D. Geoprobe sample

▼ AID Observed groundwater level AID = at time of drilling

▼ 0/00/00 Observed groundwater level 0/00/00 = date observed

☐ Analytical testing

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Drilling started: 19 March 1996 Drilling completed: 19 March 1996 Logged by: CCC

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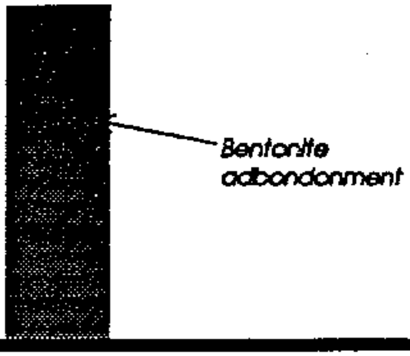
onmental, Inc.

PROJECT: *Mobil Oil/ADC Bulk Plant Properties* W.O. *11-04558-09* WELL NO. *GP-7*

Elevation reference: *Unknown*	Well completed: *Not Applicable*	AS-BUILT DESIGN	Page 1 of 1
Ground surface elevation: *Unknown*	Casing elevation: *Unknown*		



DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Asphalt and base course over moist, brown, fine SAND with some silt (5-inch sandy SILT layer at 3.0 feet), non-odorous*						
	Moist, brown, silty, gravelly SAND with wood debris and very viscous LPH grading to fine grained wood debris		*GP-7/ 4.0'*			ATD	
5			*GP-7/ 5.5*				*WTPH-G/ BTEX WTPH-D Ext.*
	Bottom of boring at 7.0 feet, due to refusal.						
10							
15							
20							
25							
30							

LEGEND

I 2-inch O.D. Geoprobe sample

▼ Observed groundwater level ATD = at time of drilling

▼ 0/00/00 Observed groundwater level 0/00/00 = date observed

WTPH-G/ BTEX WTPH-D WTPH-D Ext. Analytical testing

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Drilling started: *20 March 1996* Drilling completed: *20 March 1996* Logged by: *CCC*

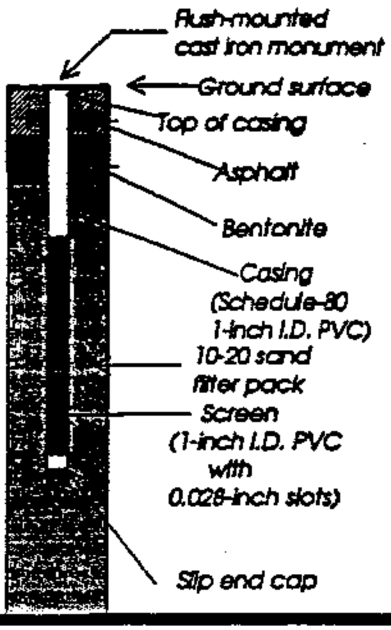
PROJECT: Mobil Oil/ADC Bulk Plant Properties W.O. 11-04558-09 WELL NO. GP-8

Elevation reference: Unknown
Ground surface elevation: Unknown
Well completed: 20 March 1996
Casing elevation: Unknown

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	Asphalt and base course						
			GP-8/ 3.0'				
	Minor recovery, moist, dark gray SAND, slight petroleum odor					▼ 3/22/96	
5	Moist, black to gray/green, fine sandy SILT with wood debris, 1" thick zone of LPH						
	Fine grained wood debris saturated with LPH over gray/green SILT		GP-8/ 9.0'		11		WTPH-G/ BTEX WTPH-D Ext.
	Mionr recovery - silty, fine SAND over fine grained wood debris, petroleum odor						
10							
	Bottom of boring at 11 feet.						
15							
20							
25							
30							



LEGEND

I	1-inch O.D. Geoprobe sample
▼ 0/00/00	Observed groundwater level 0/00/00 = date observed
▼ ATD	Observed groundwater level ATD = at time of drilling
WTPH-G/ BTEX WTPH-D WTPH-D Ext.	Analytical testing

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Drilling started: 20 March 1996
Drilling completed: 20 March 1996
Logged by: CCC

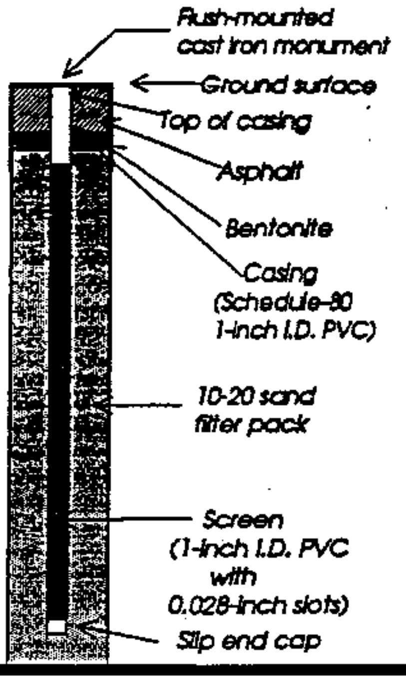
PROJECT: *Mobil Oil/ADC Bulk Plant Properties* W.O. *11-04558-09* WELL NO. *GP-9*

Elevation reference: *Unknown* **Well completed:** *20 March 1996*
Ground surface elevation: *Unknown* **Casing elevation:** *Unknown*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Asphalt and base course*						
	Trace recovery; minor gravel and wood fragments						
5						▼ 3/22/96	
	Minor recovery; moist, gray, fine SAND over minor wood debris and sandy SILT with gravel, strong petroleum odor						
			GP-9/ 8.0'		*3.0*		WTPH-G/ BTEX WTPH-D Ext. WTPH-D
10							
	No recovery						
	Bottom of boring at 12 feet.						
15							
20							
25							
30							



LEGEND

Ⅰ 2-inch O.D. Geoprobe sample

▼ ATD Observed groundwater level ATD = at time of drilling

▼ 0/00/00 Observed groundwater level 0/00/00 = date observed

WTPH-G/ BTEX WTPH-D WTPH-D Ext. Analytical testing

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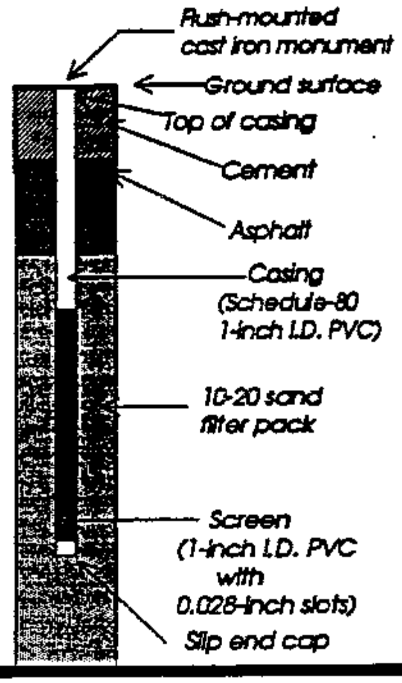
Drilling started: *20 March 1996* Drilling completed: *20 March 1996* Logged by: *CCC*

PROJECT: *Mobil Oil/ADC Bulk Plant Properties* W.O. *11-04558-09* WELL NO. *GP-10*

Elevation reference: *Unknown*	Well completed: *20 March 1996*	AS-BUILT DESIGN	Page 1 of 1
Ground surface elevation: *Unknown*	Casing elevation: *Unknown*		

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Asphalt and base course over moist, brown/gray, silty, fine SAND, non-odorous*		*GP-10/ 3.0'*		*1.0*		
	Moist, gray, fine sandy SILT with some gravel, slight petroleum odor						
	Woody debris saturated with LPH						
5	*Moist to wet, gray/orange/brown, gravelly, medium to coarse SAND, petroleum odor*		*GP-10/ 7.0'*			▼ 3/22/96	
	Wet, brown stained gray, fine sandy SILT, strong petroleum odor, minor LPH						WTPH-D
	Wet, brown, fine grained wood debris with LPH, minor saturated sand						
10	*Saturated, gray, fine SAND with wood debris, strong sulfur odor, slight petroleum odor*		*GP-10/ 11.0'*		*0.0*		
	Wood fragments						
	Bottom of boring at 12 feet.						
15							
20							
25							
30							



LEGEND

I	2-inch O.D. Geoprobe sample
▼ ATD	Observed groundwater level ATD = at time of drilling
▼ 0/00/00	Observed groundwater level 0/00/00 = date observed
WTPH-G/ BTEX WTPH-D WTPH-D Ext.	Analytical testing

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Kirkland, Washington 98034-6918

Drilling started: *20 March 1996* Drilling completed: *20 March 1996* Logged by: *CCC*

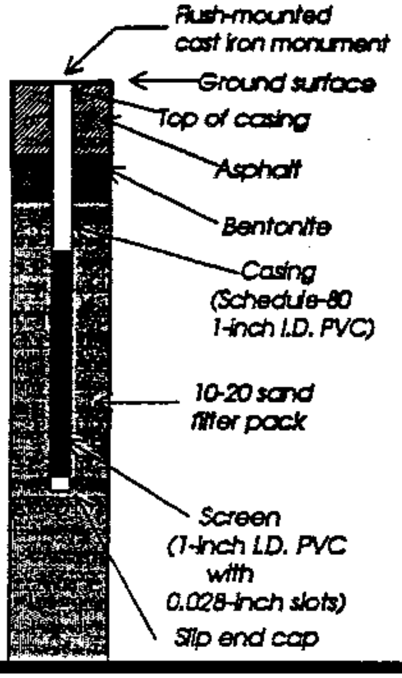
PROJECT: *Mobil Oil/ADC Bulk Plant Properties* W.O. *11-04558-09* WELL NO. *GP-11*

Elevation reference: *Unknown*
Ground surface elevation: *Unknown*
Well completed: *20 March 1996*
Casing elevation: *Unknown*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Asphalt and base course over moist, brown, silty, fine SAND, non-odorous*		*GP-11/ 3.0'*		*4.0*		
	Moist, gray, silty, fine SAND with mottling and some shells and wood debris						
5	*Moist, tan grading to gray, fine sandy SILT with interbedded wood debris, slight petroleum odor at 4.0 feet*					▼ 3/22/96	
	Wet to saturated, brown, silty, gravelly SAND, strong petroleum odor, minor LPH		*GP-11/ 6.5'*				*WTPH-D*
	Saturated, black, fine SAND, trace petroleum odor		*GP-11/ 8.0'*		*0.0*		*WTPH-G/ BTEX WTPH-D WTPH-D Ext.*
10			*GP-11/ 12.0'*				
	Bottom of boring at 12 feet.						
15							
20							
25							
30							



LEGEND

I 2-inch O.D. Geoprobe sample

▼ ATD Observed groundwater level ATD = at time of drilling

▼ 0/00/00 Observed groundwater level 0/00/00 = date observed

WTPH-G/ BTEX WTPH-D WTPH-D Ext. Analytical testing

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Kirkland, Washington 98034-6918

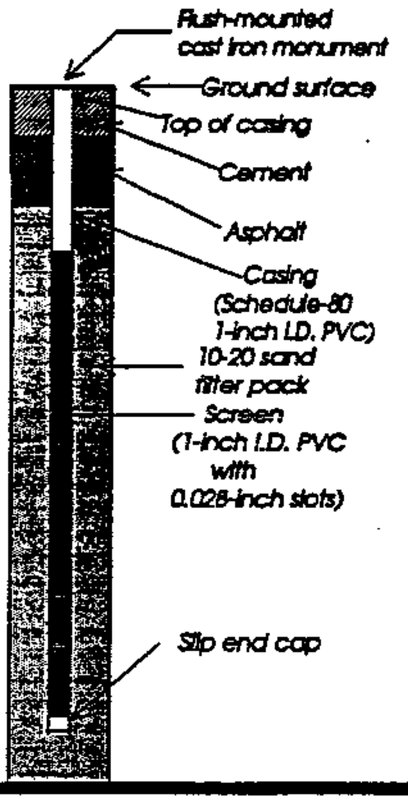
Drilling started: *20 March 1996* Drilling completed: *20 March 1996* Logged by: *CCC*

PROJECT: *Mobil Oil/ADC Bulk Plant Properties* **W.O.** *11-04558-09* **WELL NO.** *GP-12*

Elevation reference: *Unknown* **Well completed:** *20 March 1996*
Ground surface elevation: *Unknown* **Casing elevation:** *Unknown*

AS-BUILT DESIGN **Page 1 of 1**

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Asphalt and base course over moist, black, gravelly SAND, slight petroleum odor*						
	Moist, gray/brown, fine to coarse SAND grading to brown, fine SAND with some gravel, non-odorous						
5		I	*GP-12/ 8.0'*				
						3/22/96 ▼	
		I	*GP-12/ 10.0'*			▼ ATD	
10	*Wet, gray stained globules black, fine SAND with gravel, strong petroleum odor and minor LPH globules*	I	*GP-12/ 11.0'*				*WTPH-D*
	Saturated, gray, fine SAND with some gravel, strong petroleum odor, minor globules of LPH		*GP-12/ 12.5'*		*3.2*		*WTPH-D*
15	*Bottom of boring at 14 feet.*						
20							
25							
30							



LEGEND

- I 2-inch O.D. Geoprobe sample
- ▼ 0/00/00 Observed groundwater level 0/00/00 = date observed
- ▼ ATD Observed groundwater level ATD = at time of drilling
- WTPH-G/ BTEX WTPH-D WTPH-D Ext. Analytical testing

AGRA
Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

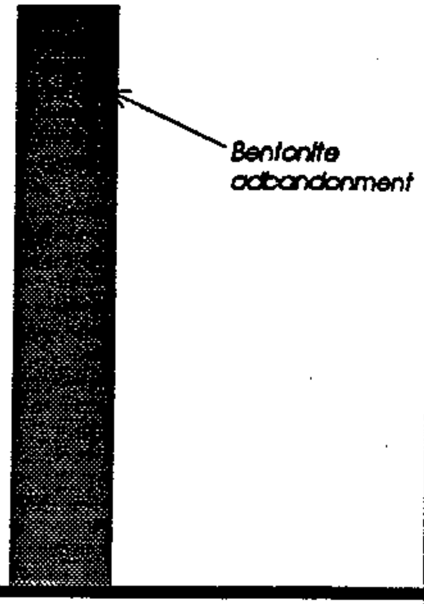
Drilling started: *19 March 1996* **Drilling completed:** *19 March 1996* **Logged by:** *CCC*

AGRA Earth En
onmental, Inc.

PROJECT: *Mobil Oil/ADC Bulk Plant Properties* W.O. *11-04558-09* WELL NO. *GP-13*

Elevation reference: *Unknown*	Well completed: *20 March 1996*	AS-BUILT DESIGN	Page 1 of 1
Ground surface elevation: *Unknown*	Casing elevation: *Unknown*		

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Asphalt over dense, moist, gray, gravelly, fine to coarse SAND, non-odorous*		*GP-13/ 3.5'*				
5	*Grades to moist, gray/black, gravelly, fine to medium SAND, non-odorous*		*GP-13/ 7.0'*				WTPH-D
10	*Wet/saturated, gray/black, silty, fine SAND with some gravel and some wood debris, organic odor*		*GP-13/ 10.0'*			▼ ATD	WTPH-G/ BTEX WTPH-D Ext. WTPH-D
	Bottom of boring at 12 feet.						
15							
20							
25							
30							



LEGEND

2-inch O.D. Geoprobe sample	Observed groundwater level 0/00/00 = date observed
Observed groundwater level ATD = at time of drilling	WTPH-G/ BTEX WTPH-D WTPH-D Ext. Analytical testing

AGRA
Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *20 March 1996* Drilling completed: *20 March 1996* Logged by: *CCC*

AGRA Earth
ironmental, Inc.

BORING NUMBER MW-7

W.O. W-4558-1

PROJECT NAME Mobil Oil - Everett Bulk Plant

SOIL DESCRIPTION

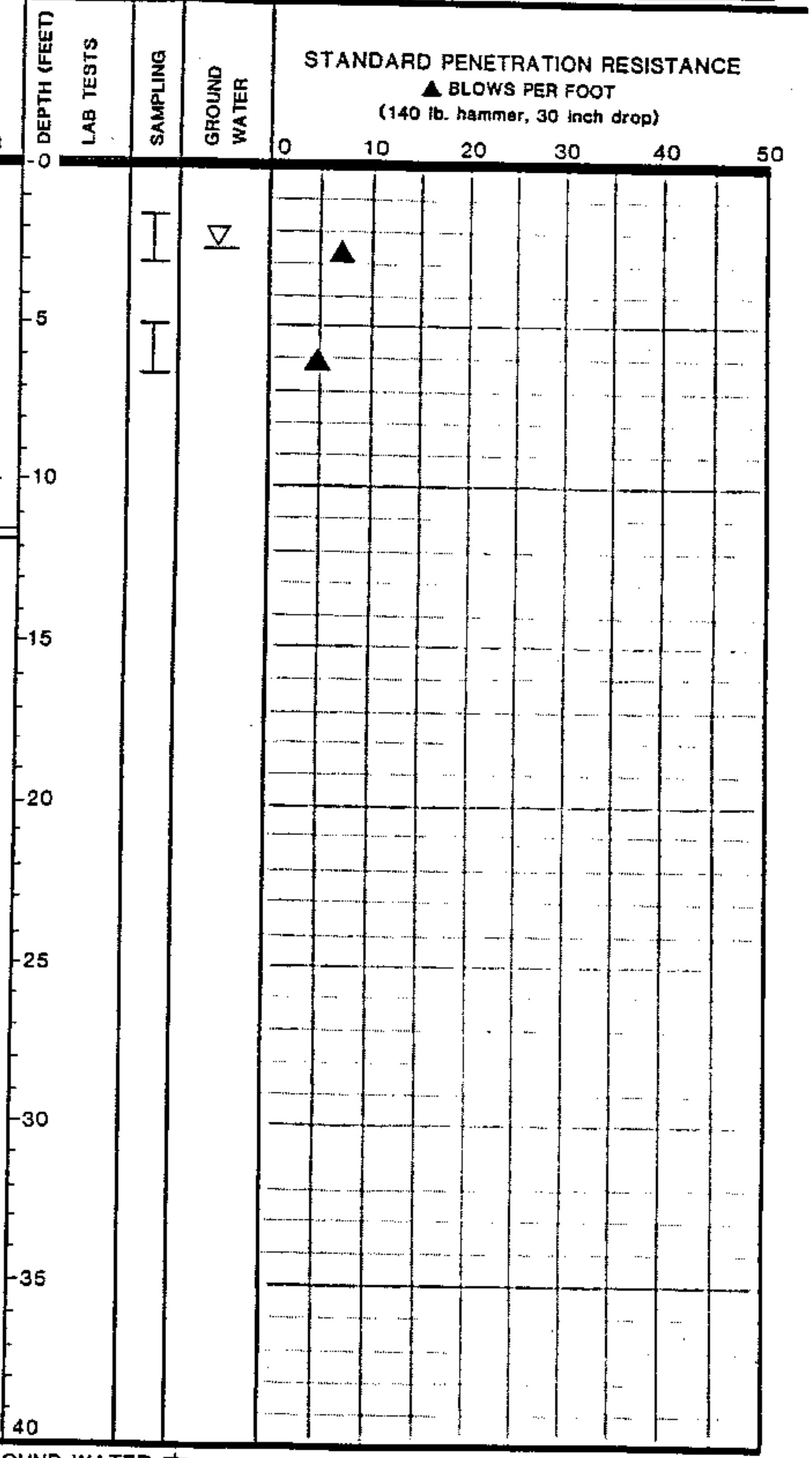
Ground Surface Elevation Approximately Feet

Loose, wet to saturated, brown-gray, silty fine SAND and fine sandy SILT with a trace of gravel (Fill)

Very loose to loose, saturated, gray, silty fine to medium SAND with a trace of gravel (Fill)

Soft, saturated, brown, silty PEAT

Total depth 11½ feet
Boring completed 9 March 1988



SAMPLING
I 2" OD SPLIT SPOON SAMPLE
II 3" OD SHELBY SAMPLE
?.5" ID RING SAMPLE
ULK SAMPLE
* SAMPLE NOT RECOVERED

GROUND WATER
▨ SEAL
DATE
WATER LEVEL AT TIME OF DRILLING ▽ ATD
OBSERVATION WELL TIP

LABORATORY TESTS
● % WATER CONTENT
NP NON PLASTIC
LIQUID LIMIT
NATURAL WATER CONTENT
PLASTIC LIMIT

RZA

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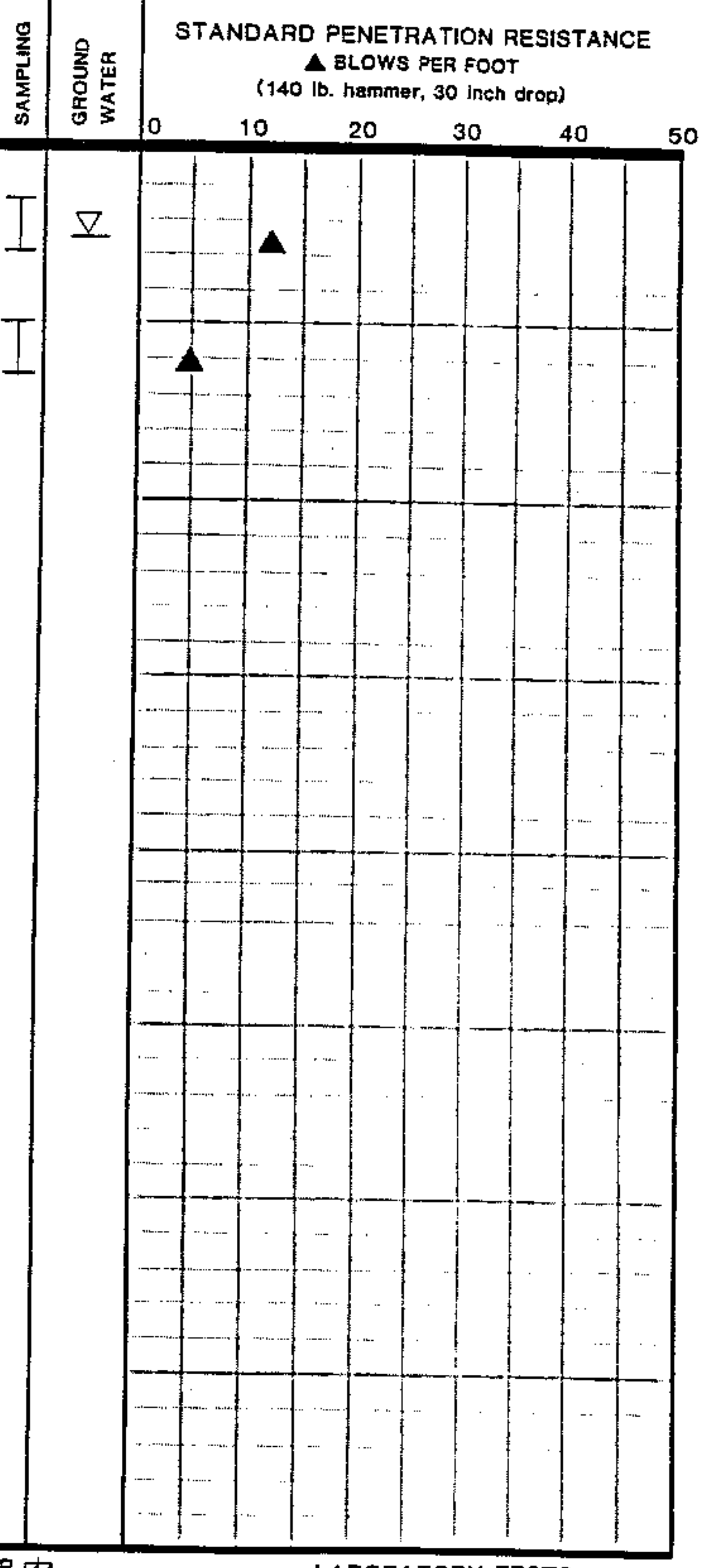
BORING NUMBER MW-8 W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

SOIL DESCRIPTION Ground Surface Elevation Approximately Feet	DEPTH (FEET)
Loose to medium dense, wet to saturated, gray and brown-gray, silty fine SAND and fine sandy SILT with a trace of gravel (Fill)	0
Very loose to loose, saturated, gray, silty fine SAND with a trace of gravel (Fill)	5
Soft, saturated, brown, silty PEAT	10
Total depth 11½ feet Boring completed 9 March 1988	
	15
	20
	25
	30
	35
	40

LAB TESTS | SAMPLING | GROUND WATER



SAMPLING
- I 2" OD SPLIT SPOON SAMPLE
- II 3" OD SHELBY SAMPLE
- 2.5" ID RING SAMPLE
- BULK SAMPLE
- ★ SAMPLE NOT RECOVERED

GROUND WATER
- ▨ SEAL
- DATE
- WATER LEVEL AT TIME OF DRILLING ▽ ATD
- OBSERVATION WELL TIP

LABORATORY TESTS
- ● % WATER CONTENT
- NP NON PLASTIC
- LIQUID LIMIT
- NATURAL WATER CONTENT
- PLASTIC LIMIT

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BORING NUMBER MW-9
W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

SOIL DESCRIPTION

Ground Surface Elevation Approximately ____ Feet

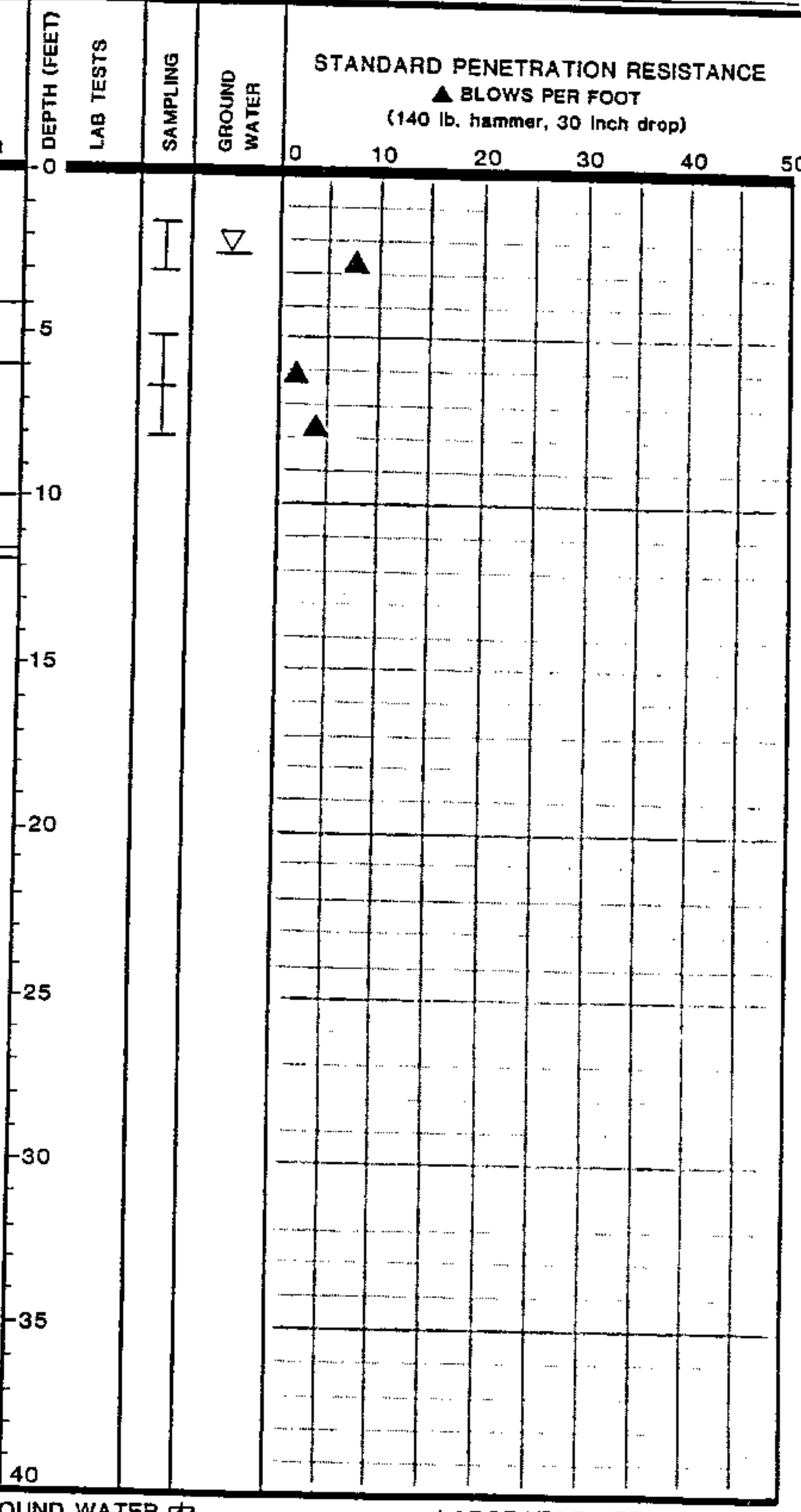
Loose, wet to saturated, dark brown, gravelly, silty, fine SAND with a trace to some wood debris (Fill)

Very loose, saturated, wood debris

Very loose to loose, saturated, dark brown-gray and gray, silty, fine SAND (Fill)

Soft, saturated, brown, silty PEAT

Total depth 11½ feet
Boring completed 9 March 1988



SAMPLING
- Ⅰ 2" OD SPLIT SPOON SAMPLE
- Ⅱ 3" OD SHELBY SAMPLE
- 2.5" ID RING SAMPLE
- BULK SAMPLE
- ★ SAMPLE NOT RECOVERED

GROUND WATER
- ▨ SEAL
- DATE
- WATER LEVEL AT TIME OF DRILLING ▽ ATD
- OBSERVATION WELL TIP

LABORATORY TESTS
- ● % WATER CONTENT
- NP NON PLASTIC
- LIQUID LIMIT
- NATURAL WATER CONTENT
- PLASTIC LIMIT

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Geotechnical / Hydrogeological Consultants

BORING NUMBER MW-10 W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

SOIL DESCRIPTION

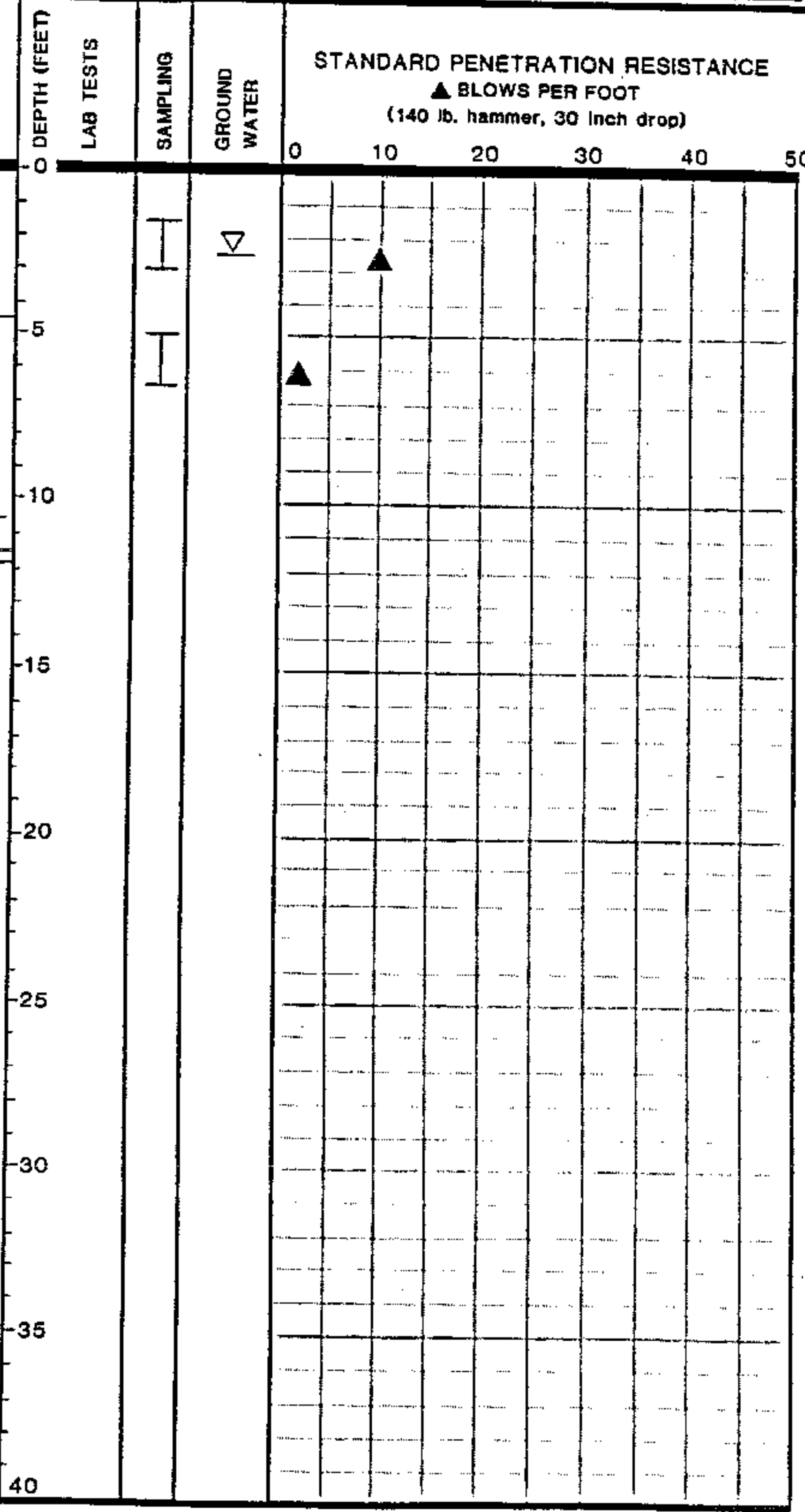
Ground Surface Elevation Approximately Feet

Loose to medium dense, wet to saturated, dark brown, gravelly, silty, fine to coarse SAND with a trace to some wood debris (Fill)

Very loose, saturated, dark brown and gray, silty fine SAND (Fill)

Soft, saturated, brown, silty PEAT

Total depth 11½ feet
Boring completed 9 March 1988



SAMPLING
- I 2" OD SPLIT SPOON SAMPLE
- II 3" OD SHELBY SAMPLE
- 2.5" ID RING SAMPLE
- BULK SAMPLE
- * SAMPLE NOT RECOVERED

GROUND WATER
- ▨ SEAL
- DATE
- WATER LEVEL AT TIME OF DRILLING ▽ ATD
- OBSERVATION WELL TIP

LABORATORY TESTS
- ● % WATER CONTENT
- NP NON PLASTIC
- LIQUID LIMIT
- NATURAL WATER CONTENT
- PLASTIC LIMIT

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BORING NUMBER MW-11

W.O. W-4558-1

PROJECT NAME Mobil Oil - Everett Bulk Plant

SOIL DESCRIPTION

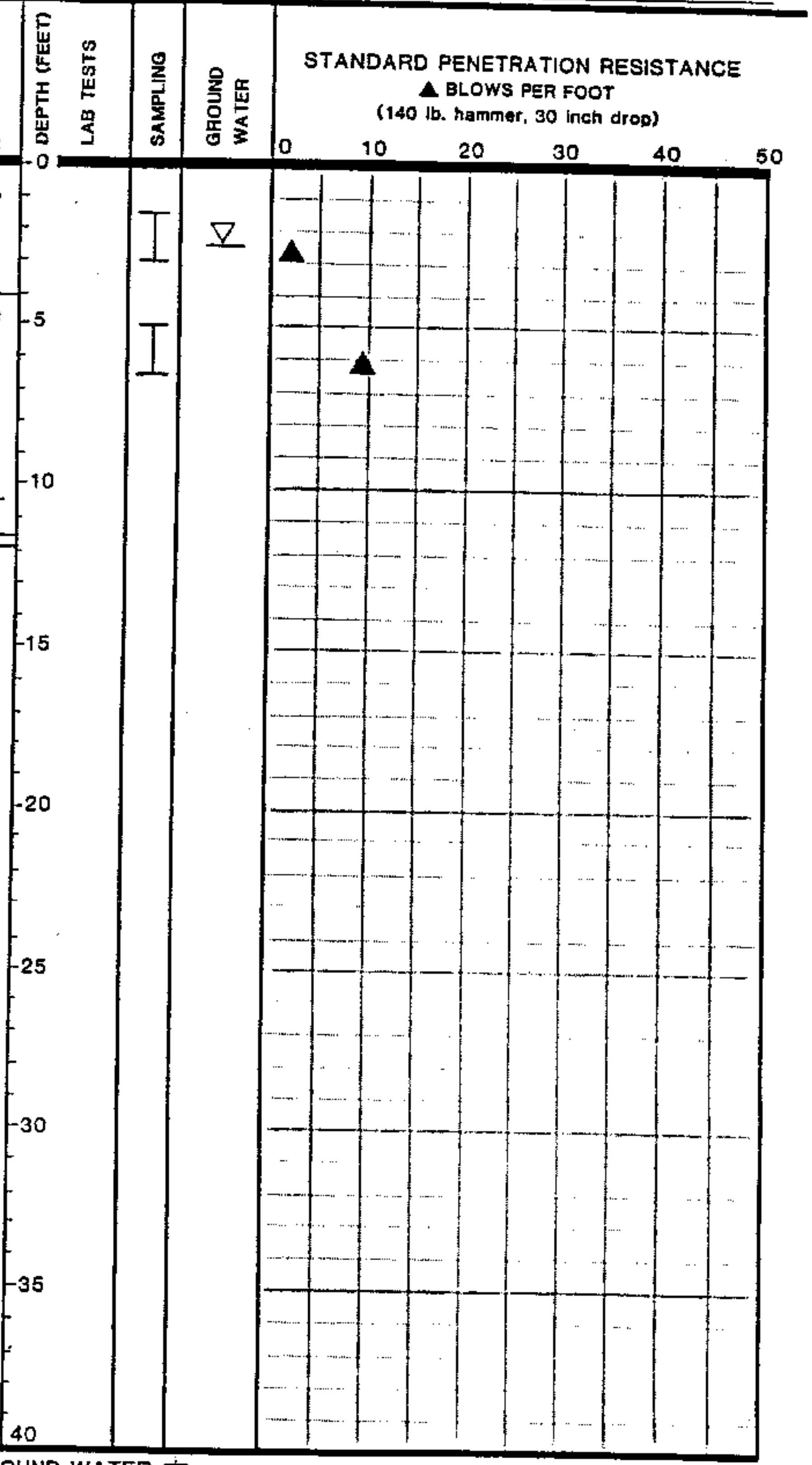
Ground Surface Elevation Approximately Feet

Very loose, wet to saturated, gray and brown-gray, silty, fine SAND with a trace of gravel and wood debris (Fill)

Loose to medium dense, saturated, gray, silty fine SAND with some fine sandy SILT and a trace of gravel (Fill)

Soft, saturated, brown, silty PEAT

Total depth 11½ feet
Boring completed 9 March 1988



SAMPLING
I 2" OD SPLIT SPOON SAMPLE
II 3" OD SHELBY SAMPLE
5" ID RING SAMPLE
LK SAMPLE
★ SAMPLE NOT RECOVERED

GROUND WATER
▨ SEAL
DATE
▽ ATD WATER LEVEL AT TIME OF DRILLING
OBSERVATION WELL TIP

LABORATORY TESTS
● % WATER CONTENT
NP NON PLASTIC
LIQUID LIMIT
NATURAL WATER CONTENT
PLASTIC LIMIT

RZA

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Geotechnical / Hydrogeological Consultants

BORING NUMBER MW-12
W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

SOIL DESCRIPTION

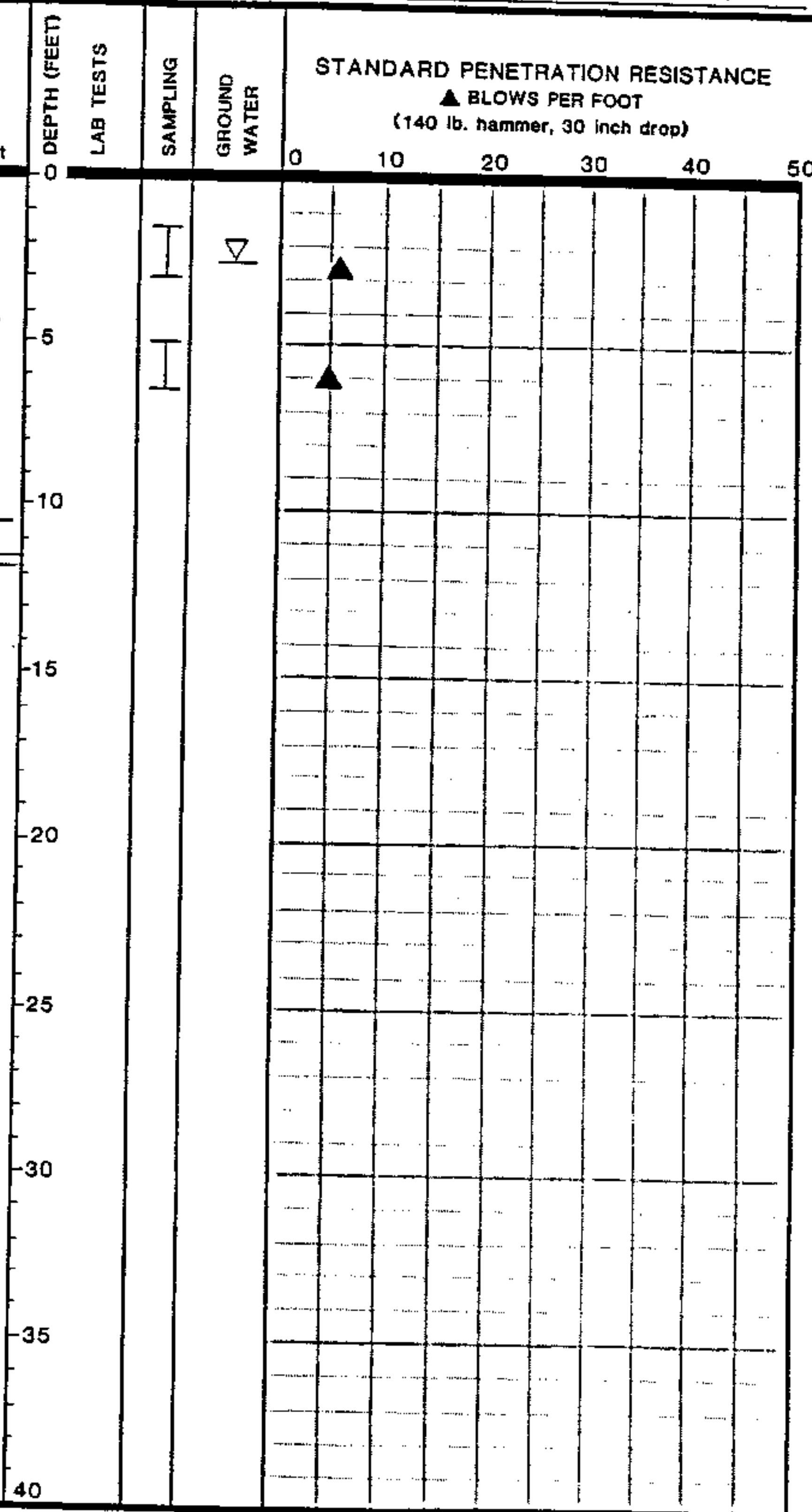
Ground Surface Elevation Approximately Feet

Loose, wet to saturated, gray and brown-gray, silty, fine SAND with a trace of gravel and wood debris (Fill)

Very loose to loose, saturated, gray, silty, fine to medium SAND with a trace of gravel (Fill)

Soft, saturated, brown, silty PEAT

Total depth 11½ feet
Boring completed 9 March 1988



SAMPLING
- I 2" OD SPLIT SPOON SAMPLE
- II 3" OD SHELBY SAMPLE
- 2.5" ID RING SAMPLE
- BULK SAMPLE
- * SAMPLE NOT RECOVERED

GROUND WATER
- ▨ SEAL
- DATE
- ▽ ATD WATER LEVEL AT TIME OF DRILLING
- OBSERVATION WELL TIP

LABORATORY TESTS
- ● % WATER CONTENT
- NP NON PLASTIC
- LIQUID LIMIT
- NATURAL WATER CONTENT
- PLASTIC LIMIT

BORING NUMBER MW-13
W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

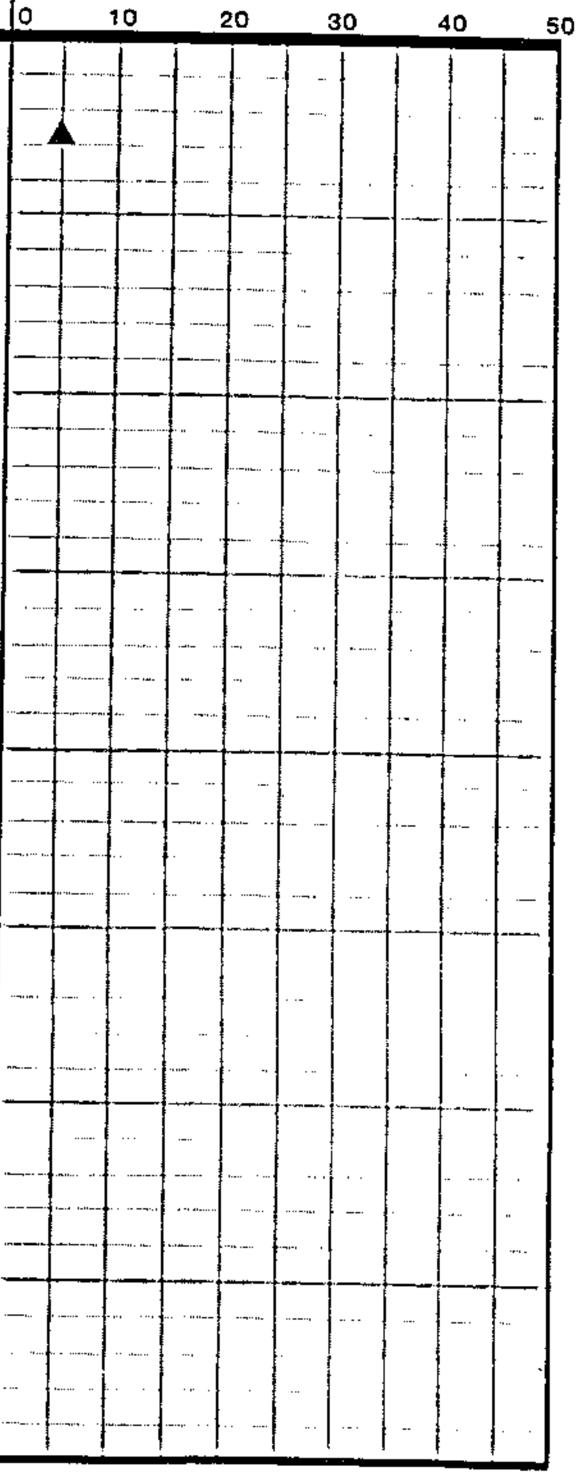
SOIL DESCRIPTION

Ground Surface Elevation Approximately ____ Feet

Depth (feet)	Soil description	Lab tests	Sampling	Ground water
0	Loose, wet to saturated, brown-gray, silty fine SAND with a trace to some gravel and wood debris (Fill)		I *	∇
5	Loose, saturated, gray, silty SAND with some gravel (Fill)		B	
10	Soft, saturated, brown, silty PEAT			
	Total depth 11½ feet Boring completed 9 March 1988			

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40

STANDARD PENETRATION RESISTANCE
▲ BLOWS PER FOOT
(140 lb. hammer, 30 inch drop)



SAMPLING
I 2" OD SPLIT SPOON SAMPLE
II 3" OD SHELBY SAMPLE
‾ 2.5" ID RING SAMPLE
BULK SAMPLE
* SAMPLE NOT RECOVERED

GROUND WATER
▨ SEAL
DATE
WATER LEVEL AT TIME OF DRILLING ∇ ATD
OBSERVATION WELL TIP

LABORATORY TESTS
● % WATER CONTENT
NP NON PLASTIC
PLASTIC LIMIT
NATURAL WATER CONTENT
LIQUID LIMIT

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BORING NUMBER MW-14 W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

SOIL DESCRIPTION

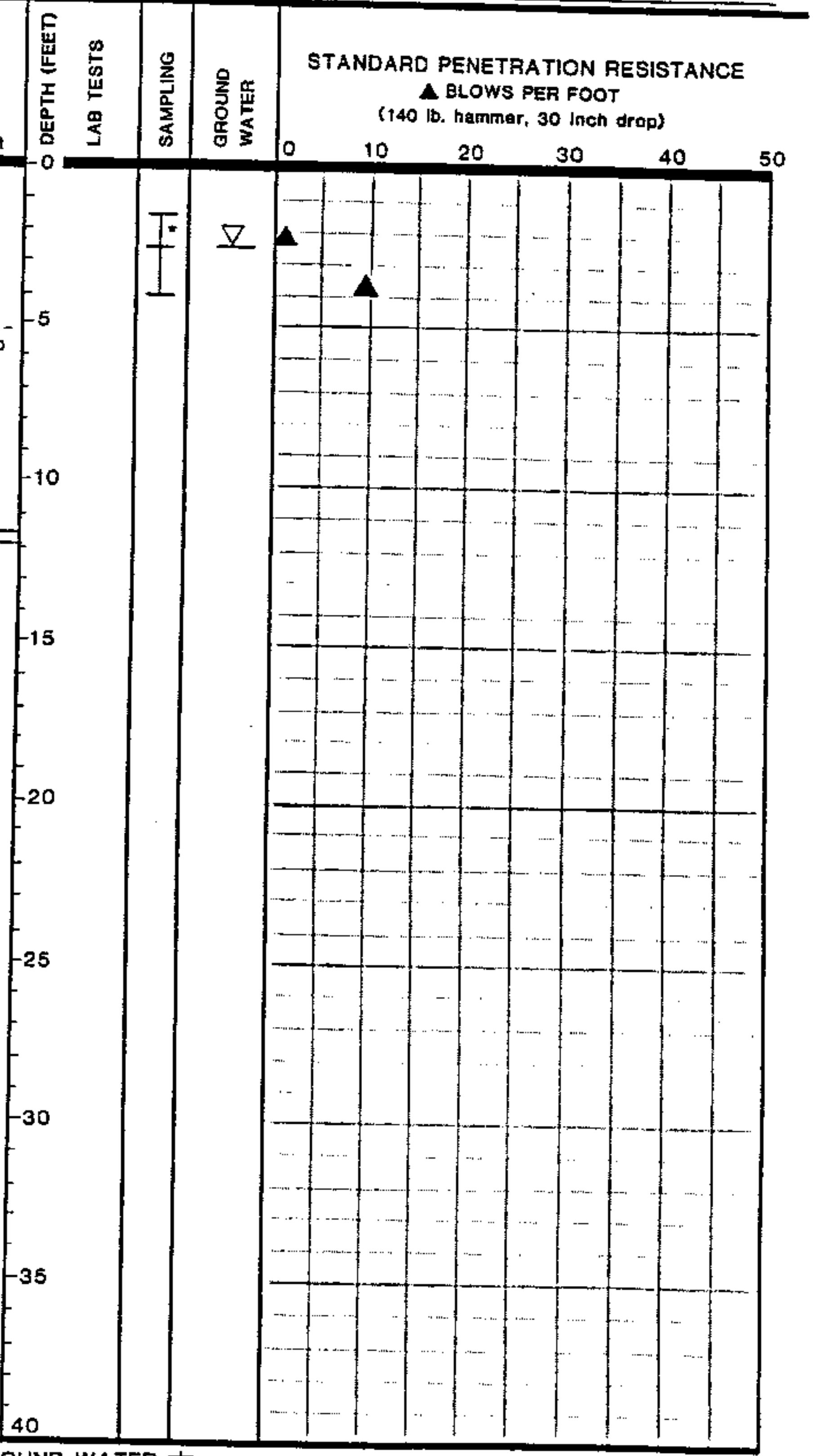
Ground Surface Elevation Approximately Feet

Very loose to medium dense (variable), wet to saturated, dark brown to black, silty fine SAND with some zones of wood, brick, etc. (Fill)

Loose, saturated, gray, silty SAND with a trace to some gravel (Fill)

Soft, saturated, brown, silty PEAT

Total depth 11½ feet
Boring completed 9 March 1988



SAMPLING
- Ι 2" OD SPLIT SPOON SAMPLE
- Ⅱ 3" OD SHELBY SAMPLE
- ⌉ 2.5" ID RING SAMPLE
- BULK SAMPLE
- ★ SAMPLE NOT RECOVERED

GROUND WATER
- ▨ SEAL
- DATE
- ∇ ATD WATER LEVEL AT TIME OF DRILLING
- ▯ OBSERVATION WELL TIP

LABORATORY TESTS
- ● % WATER CONTENT
- NP NON PLASTIC
- PLASTIC LIMIT ├──●──┤ LIQUID LIMIT, NATURAL WATER CONTENT

RZA *RITTENHOUSE-ZEMAN & ASSOC., INC.*
Geotechnical / Hydrogeological Consultants

BORING NUMBER MW-15
W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

SOIL DESCRIPTION

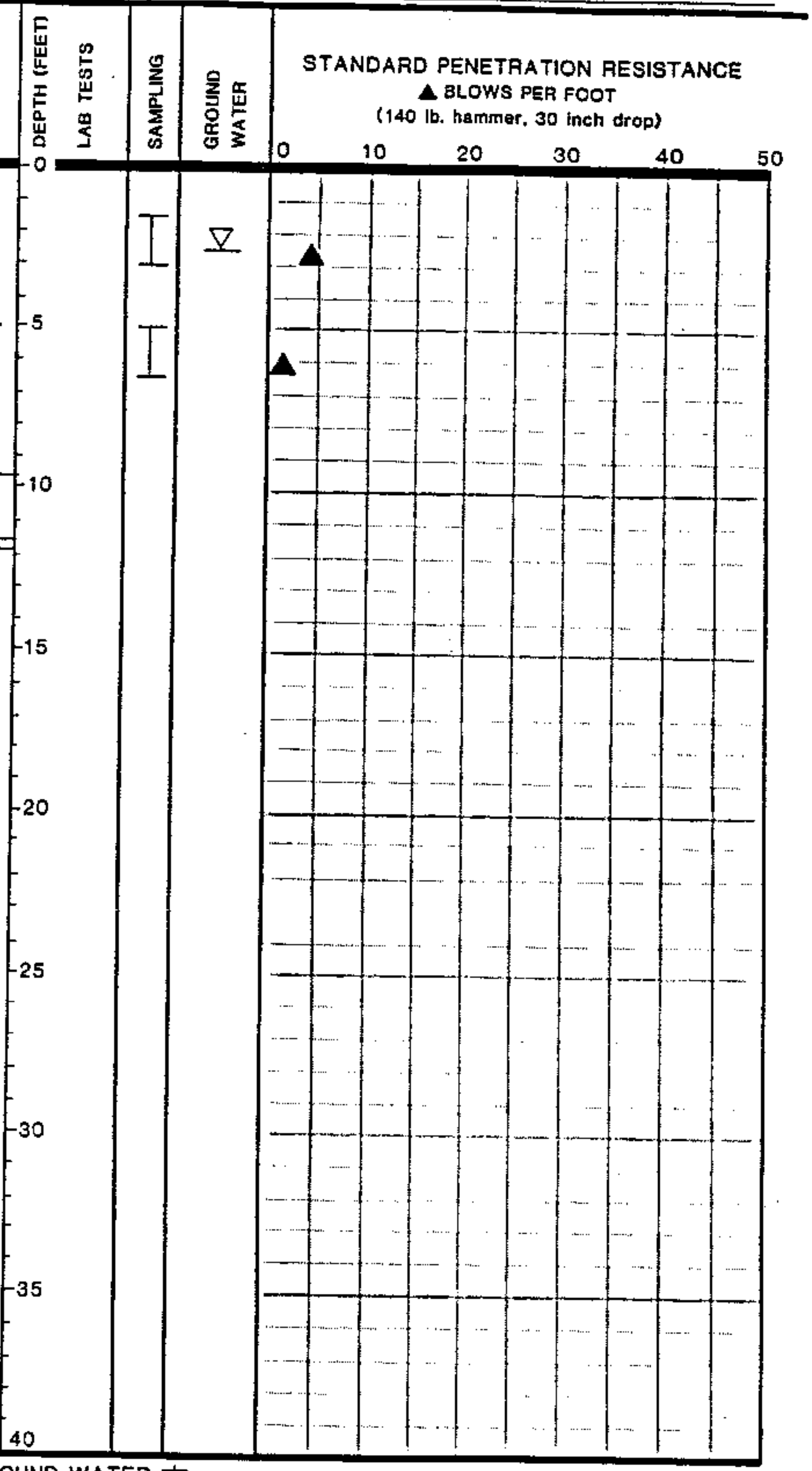
Ground Surface Elevation Approximately ____ Feet

Very loose to loose, wet to saturated, dark brown and gray, silty fine SAND with a trace of gravel and wood debris (Fill)

Very loose, saturated, gray, silty, fine SAND with a trace of gravel (Fill)

Soft, saturated, brown, silty PEAT

Total depth 11½ feet
Boring completed 9 March 1988



SAMPLING
- I 2" OD SPLIT SPOON SAMPLE
- II 3" OD SHELBY SAMPLE
- 2.5" ID RING SAMPLE
- BULK SAMPLE
- ★ SAMPLE NOT RECOVERED

GROUND WATER
- ▨ SEAL
- DATE
- ∇ ATD WATER LEVEL AT TIME OF DRILLING
- OBSERVATION WELL TIP

LABORATORY TESTS
- ● % WATER CONTENT
- NP NON PLASTIC
- LIQUID LIMIT
- NATURAL WATER CONTENT
- PLASTIC LIMIT

RZA **RITTENHOUSE-ZEMAN & ASSOC., INC.**
Geotechnical / Hydrogeological Consultants

BORING NUMBER MW-16
W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

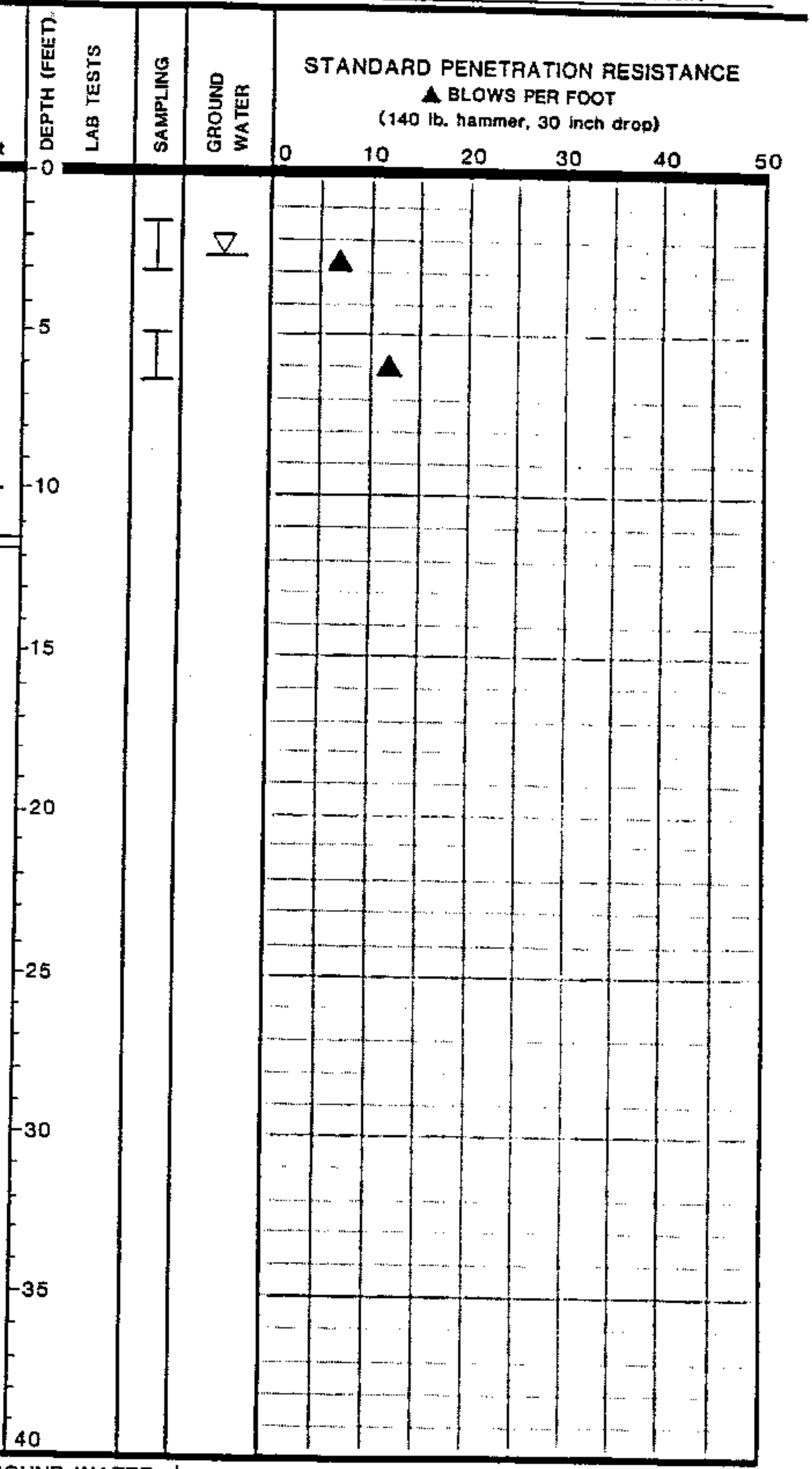
SOIL DESCRIPTION

Ground Surface Elevation Approximately Feet

Loose to medium dense, wet to saturated, brown-gray, gravelly, silty SAND with a trace to some wood debris (Fill)

Soft, saturated, brown, silty PEAT

Total depth 11½ feet
Boring completed 9 March 1988



SAMPLING
- Ⅰ 2" OD SPLIT SPOON SAMPLE
- Ⅱ 3" OD SHELBY SAMPLE
- ⌉ 2.5" ID RING SAMPLE
- BULK SAMPLE
- * SAMPLE NOT RECOVERED

GROUND WATER
- ▨ SEAL
- DATE
- ▽ WATER LEVEL AT TIME OF DRILLING (ATD)
- OBSERVATION WELL TIP

LABORATORY TESTS
- ● % WATER CONTENT
- NP NON PLASTIC
- LIQUID LIMIT
- NATURAL WATER CONTENT
- PLASTIC LIMIT

RITTENHOUSE-ZEMAN & ASSOC., INC.
Geotechnical / Hydrogeological Consultants

BORING NUMBER MW-17
W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

SOIL DESCRIPTION

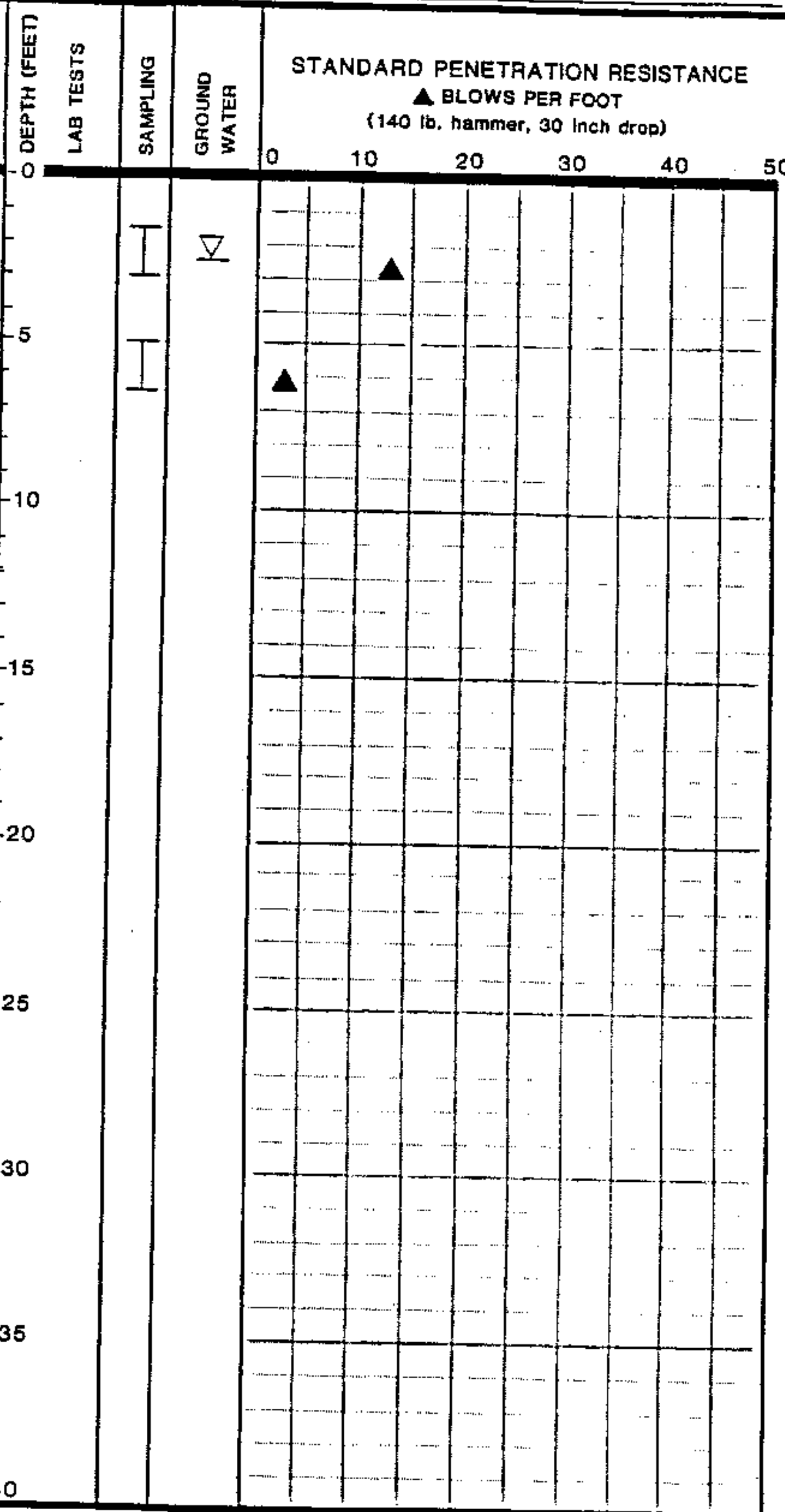
Ground Surface Elevation Approximately Feet

Loose to medium dense, wet to saturated, brown-gray to gray, silty, fine to medium SAND with a trace of gravel (Fill)

Very loose, saturated, gray, silty, fine to medium SAND with trace of gravel, wood debris and black organics (Fill)

Soft, saturated, brown, silty PEAT

Total depth 11½ feet
Boring completed 10 March 1988



SAMPLING
I 2" OD SPLIT SPOON SAMPLE
II 3" OD SHELBY SAMPLE
2.5" ID RING SAMPLE
ULK SAMPLE
× SAMPLE NOT RECOVERED

GROUND WATER
▨ SEAL
DATE
WATER LEVEL AT TIME OF DRILLING ▽ ATD
OBSERVATION WELL TIP

LABORATORY TESTS
● % WATER CONTENT
NP NON PLASTIC
LIQUID LIMIT
NATURAL WATER CONTENT
PLASTIC LIMIT

RZA RITTENHOUSE-ZEMAN & ASSOC., INC.
Geotechnical / Hydrogeological Consultants

BORING NUMBER MW-18
W.O. W-4558-1
PROJECT NAME Mobil Oil - Everett Bulk Plant

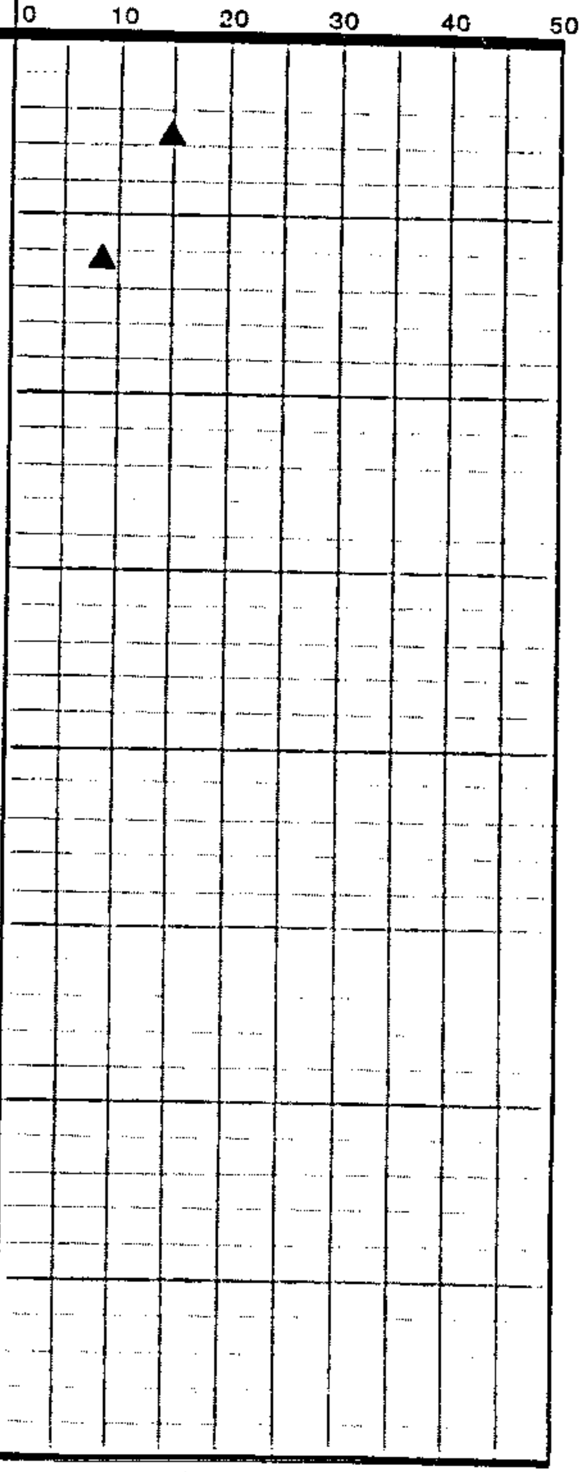
SOIL DESCRIPTION

Ground Surface Elevation Approximately ____ Feet

DEPTH (FEET)	SOIL DESCRIPTION	LAB TESTS	SAMPLING	GROUND WATER
0	Loose to medium dense, wet to saturated, dark brown to black, gravelly, silty, fine SAND (Fill)		I	∇
5	Loose, saturated, gray, silty, fine to medium SAND with a trace to some gravel and wood debris (Fill)		I	
10	Soft, saturated, brown, silty PEAT			
	Total depth 11½ feet Boring completed 10 March 1988			
15				
20				
25				
30				
35				
40				

STANDARD PENETRATION RESISTANCE

▲ BLOWS PER FOOT
(140 lb. hammer, 30 inch drop)

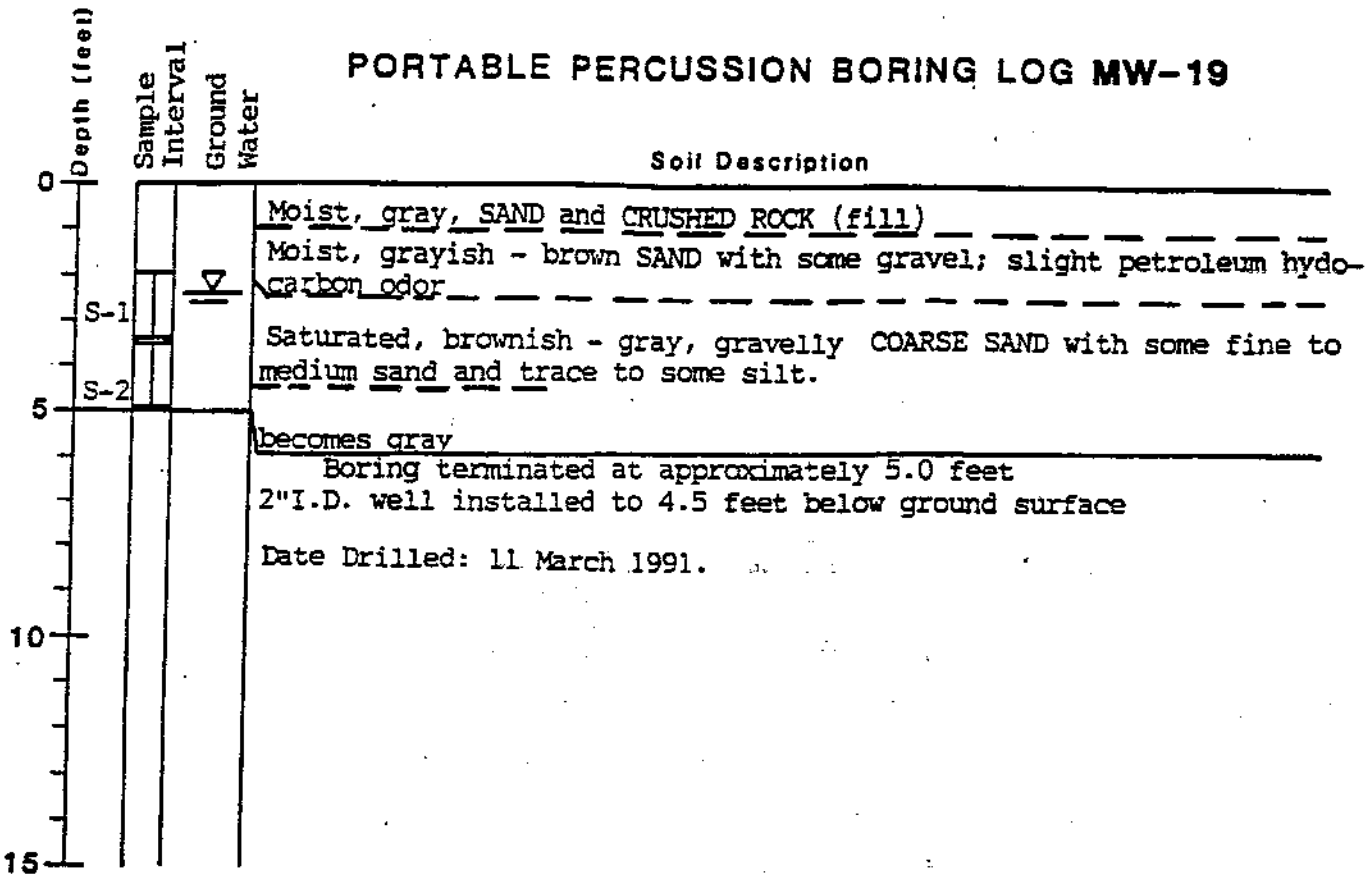


SAMPLING
- I 2" OD SPLIT SPOON SAMPLE
- II 3" OD SHELBY SAMPLE
- 2.5" ID RING SAMPLE
- ULK SAMPLE
- * SAMPLE NOT RECOVERED

GROUND WATER
- ▨ SEAL
- DATE
- ∇ ATD WATER LEVEL AT TIME OF DRILLING
- OBSERVATION WELL TIP

LABORATORY TESTS
- ● % WATER CONTENT
- NP NON PLASTIC
- PLASTIC LIMIT
- NATURAL WATER CONTENT
- LIQUID LIMIT

PORTABLE PERCUSSION BORING LOG **MW-19**



Moist, gray, SAND and CRUSHED ROCK (fill)

Moist, grayish - brown SAND with some gravel; slight petroleum hydocarbon odor

Saturated, brownish - gray, gravelly COARSE SAND with some fine to medium sand and trace to some silt.

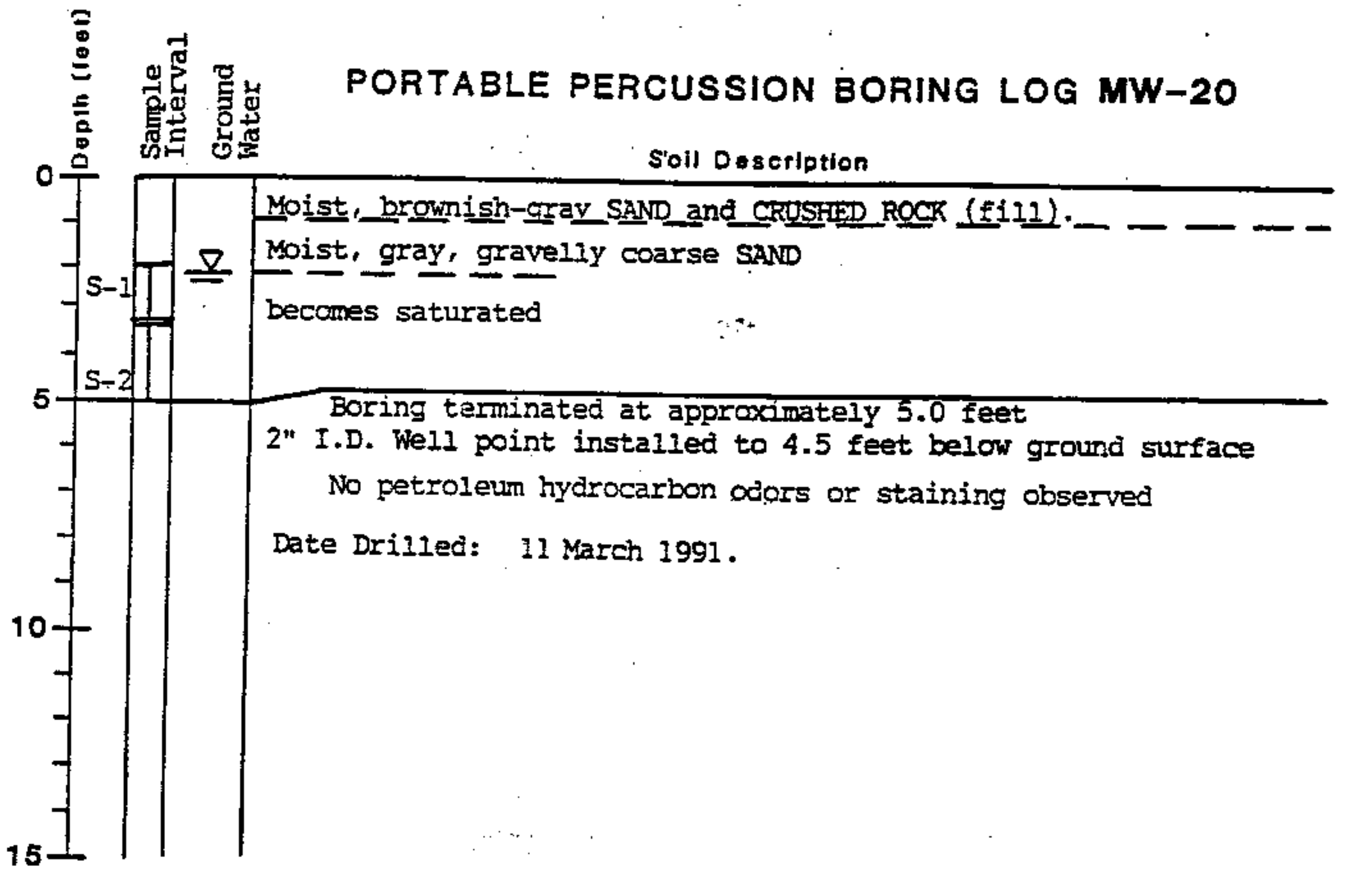
becomes gray

Boring terminated at approximately 5.0 feet

2"I.D. well installed to 4.5 feet below ground surface

Date Drilled: 11 March 1991.

PORTABLE PERCUSSION BORING LOG **MW-20**



Moist, brownish-gray SAND and CRUSHED ROCK (fill).

Moist, gray, gravelly coarse SAND

becomes saturated

Boring terminated at approximately 5.0 feet

2" I.D. Well point installed to 4.5 feet below ground surface

No petroleum hydrocarbon odors or staining observed

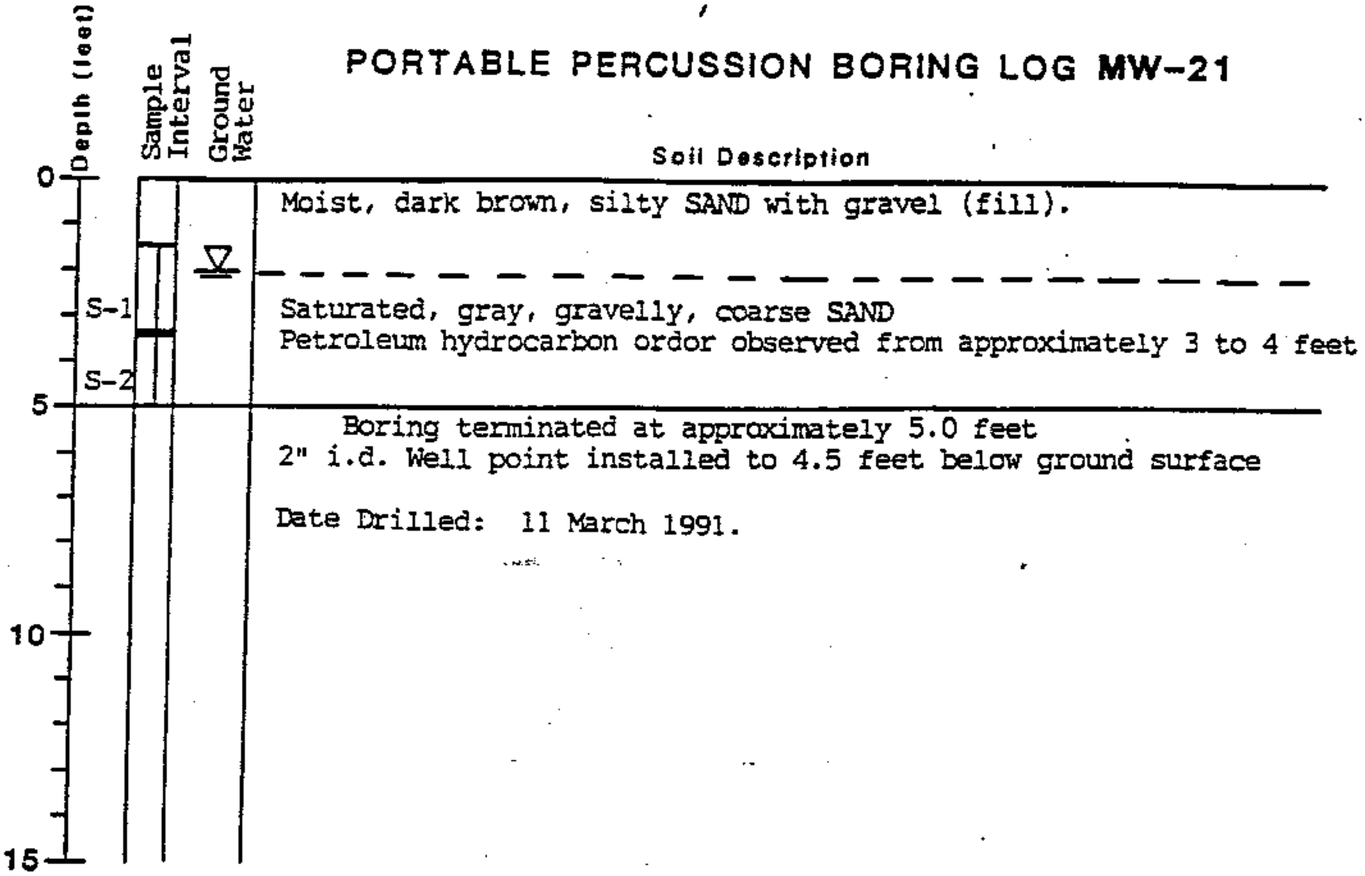
Date Drilled: 11 March 1991.

▽ ATD groundwater level at time of drilling

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical Consultants
1400 140th N.E.
Bellevue, Washington 98007
(206) 746-8020

RZA

PORTABLE PERCUSSION BORING LOG MW-21



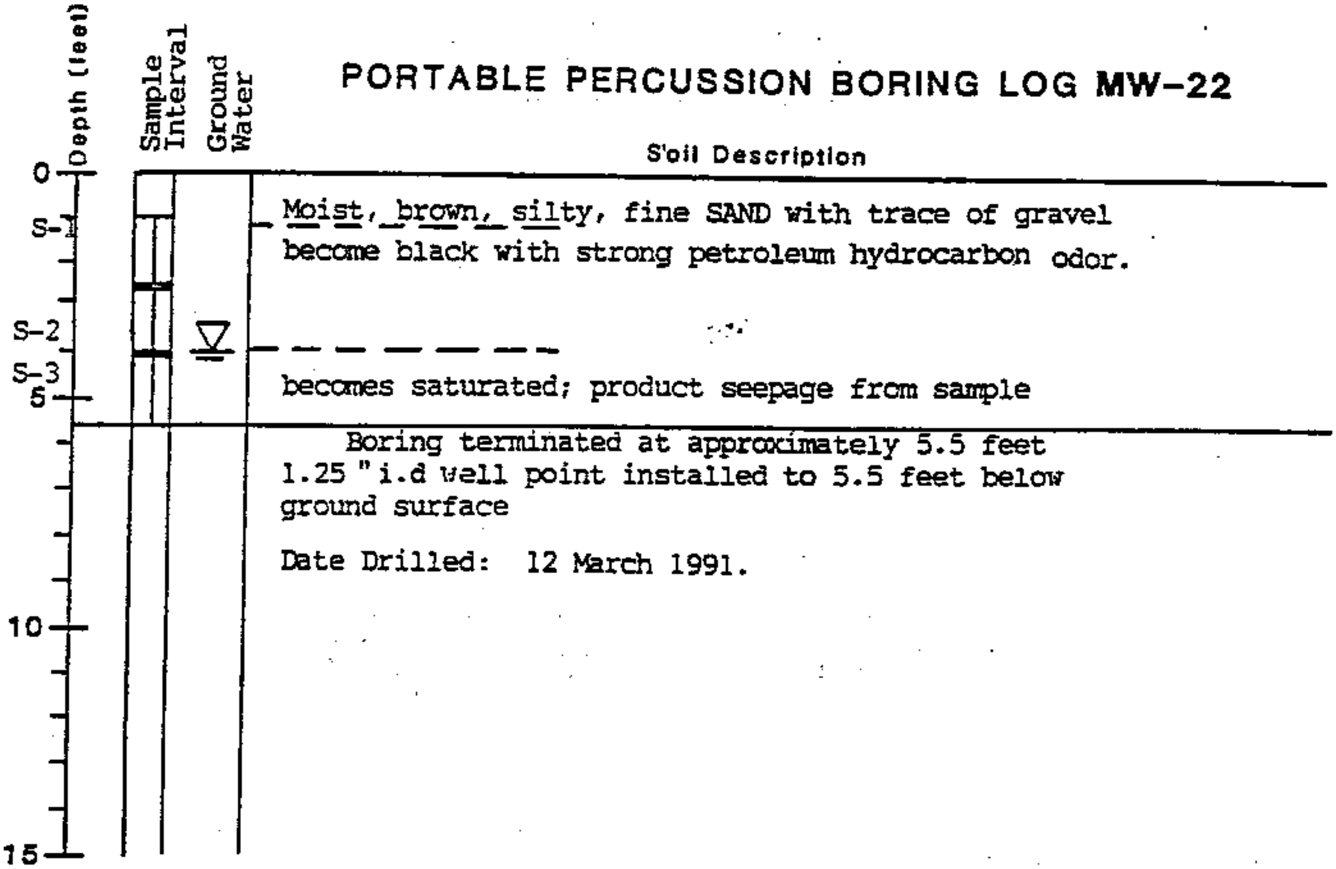
Moist, dark brown, silty SAND with gravel (fill).

Saturated, gray, gravelly, coarse SAND
Petroleum hydrocarbon ordor observed from approximately 3 to 4 feet

Boring terminated at approximately 5.0 feet
2" i.d. Well point installed to 4.5 feet below ground surface

Date Drilled: 11 March 1991.

PORTABLE PERCUSSION BORING LOG MW-22



Moist, brown, silty, fine SAND with trace of gravel
become black with strong petroleum hydrocarbon odor.

becomes saturated; product seepage from sample

Boring terminated at approximately 5.5 feet
1.25 "i.d well point installed to 5.5 feet below
ground surface

Date Drilled: 12 March 1991.

▽ ATD groundwater at time of drilling

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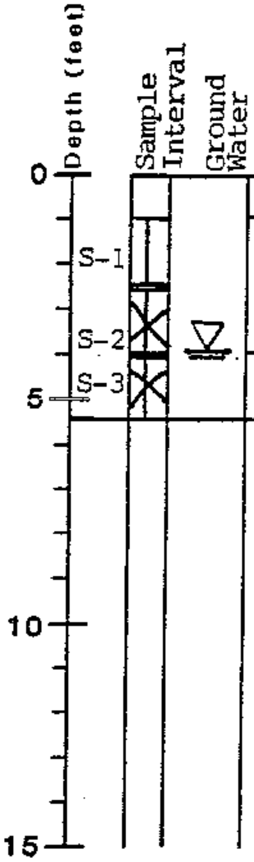
Geotechnical Consultants
1400 140th N.E.
Bellevue, Washington 98007
(206) 746-8020
RZA

PORTABLE PERCUSSION BORING LOG **MW-23**



Soil Description

Moist, brown, silty, fine to medium SAND with gravel

Moist, brown, fine to medium SAND with some silt and some gravel

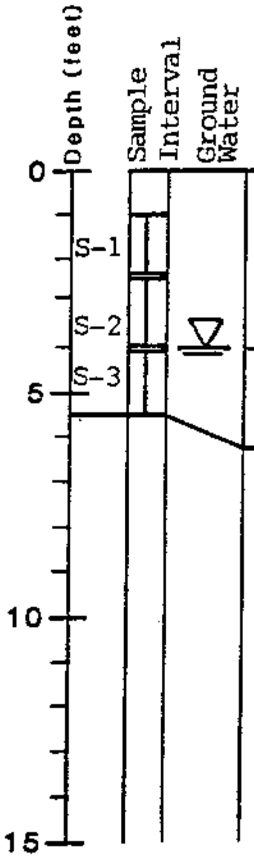
No samples recovered below 2.5 feet

becomes saturated

Boring terminated at approximately 5.5 feet
1.25" i.d Well point installed to 5.5 feet below ground surface

No petroleum hydrocarbon odors or staining observed

PORTABLE PERCUSSION BORING LOG **MW-24**



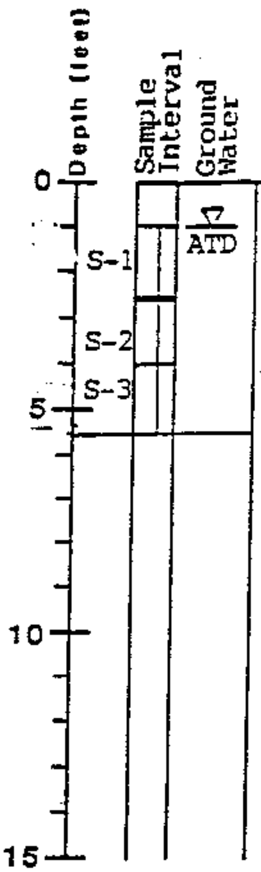
Soil Description

Moist, brown, fine to medium SAND with some gravel and some silt

becomes saturated
slight petroleum hydrocarbon odor and staining observed

Boring terminated at approximately 5.5 feet
1.25" i.d. Well point installed to 5.5 feet below ground surface

PORTABLE PERCUSSION BORING LOG MW-25



Soil Description

Asphalt pavement

Moist to wet, gray, medium SAND (fill)

Moist, gray with rust mottling, silty SAND with gravel and some wood debris (fill)

becomes gray saturated

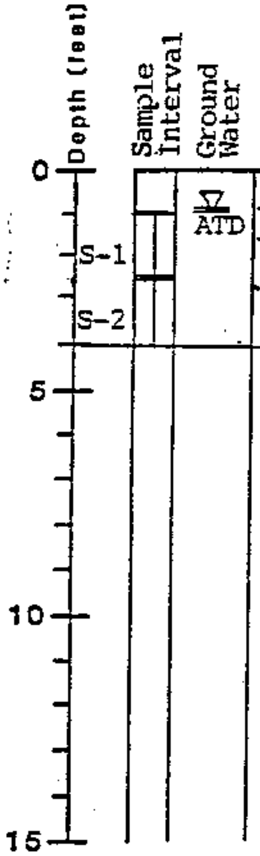
Saturated, dark brown, silty, fine to medium SAND with some gravel, wood debris 7 brick fragments (fill)

Saturated, gray, fine to medium SAND (fill)

boring terminated at approximately 5.5 feet
2" I.D. well point installed to 5.0 feet below ground surface
no petroleum hydrocarbon odor or unusual staining observed
OVM headspace readings all nondetectable

Date Drilled: 14 June 1991.

PORTABLE PERCUSSION BORING LOG MW-26



S'oil Description

Asphalt pavement

Wet, dark brown, silty SAND with gravel (fill)

Moist, gray with grayish-brown laminae, fine to medium SAnd with some gravel (fill)

Wet, brownish-gray, silty fine to medium SAND with some gravel & some wood debris

boring terminated at approximately 4.0 feet
2" I.D. well point installed to 5.0 feet below ground surface
no petroleum hydrocarbon odor or unusual staining observed
OVM readings all nondetectable

Date Drilled: 14 June 1991.

$\frac{\nabla}{\text{ATD}}$ groundwater level at time of drilling

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Geotechnical Consultants
1400 140th N.E.
Bellevue, Washington 98007
(206) 746-8020

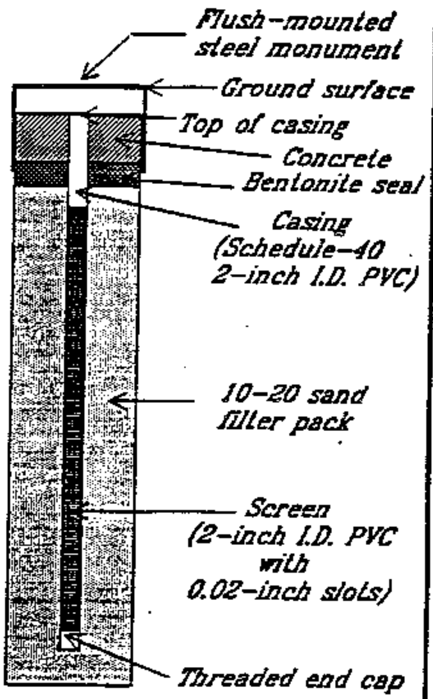
RZA

PROJECT *Mobil Bulk Plant* W.O. *W-4558-3* WELL NO. *MW-27*

Elevation reference:
Ground surface elevation:
Well completed: *20 June 1991*
Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*2" Asphalt.*						
	Medium dense, moist, gray, silty fine SAND with hydrocarbon odor	I	*S-1*	*15*		▼ ATD	
5							
	Loose, wet, brown, PEAT with oily sheen and hydrocarbon odor	I	*S-2*	*2*			*8015* *418.1* *BTEX* *6010*
10							
	Loose, moist, gray, medium SAND hydrocarbon odor and sheen	I	*S-3*	*4*			*8015* *418.1* *BTEX* *6010*
	Boring terminated at 13.5 feet.						
15							
20							
25							
30							

AS-BUILT DESIGN



LEGEND

I 2-inch O.D. split-spoon sample

▼ ATD Observed groundwater level (ATD = at time of drilling)

8015 418.1 BTEX 6010 Soil Analysis (EPA Method shown)

RZA *RITTENHOUSE-ZEMAN & ASSOCIATES, INC.*
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

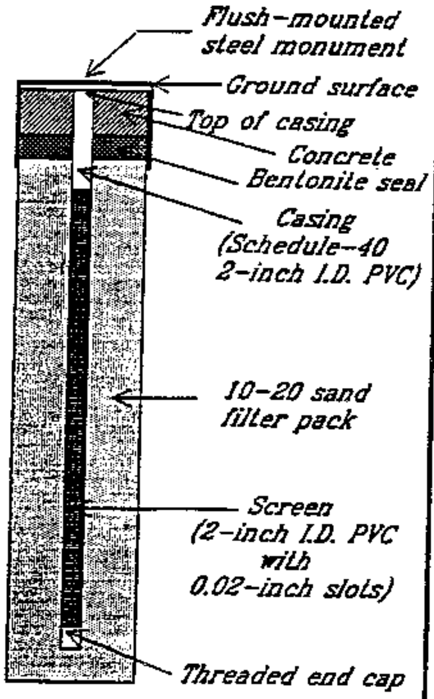
Drilling started: *20 June 1991* Drilling completed: *20 June 1991* Logged by: *JK*

PROJECT *Mobil Bulk Plant* W.O. *W-4558-3* WELL NO. *MW-28*

Elevation reference:
Ground surface elevation:
Well completed: *20 June 1991*
Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*2" Asphalt.*						
	3 inches brown/gray sandy GRAVEL						
	Loose, moist, gray silty fine SAND	I	*S-1*	*2*		▼ ATD	
5							
	Loose, moist, brown, PEAT layer, strong hydrocarbon odor	I	*S-2*	*2*			8015 418.1 BTEX 6010
10							
	Loose, moist to wet, brown, silty medium SAND with organics (peat); moderate hydrocarbon odor	I	*S-3*	*2*			8015 418.1 BTEX 6010
	Boring terminated at 13.5 feet.						
15							
20							
25							
30							

AS-BUILT DESIGN



LEGEND

I 2-inch O.D. split-spoon sample

▼ ATD Observed groundwater level (ATD = at time of drilling)

8015 418.1 BTEX 6010 Soil Analysis (EPA Method shown)

RZA *RITTENHOUSE-ZEMAN & ASSOCIATES, INC.*
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

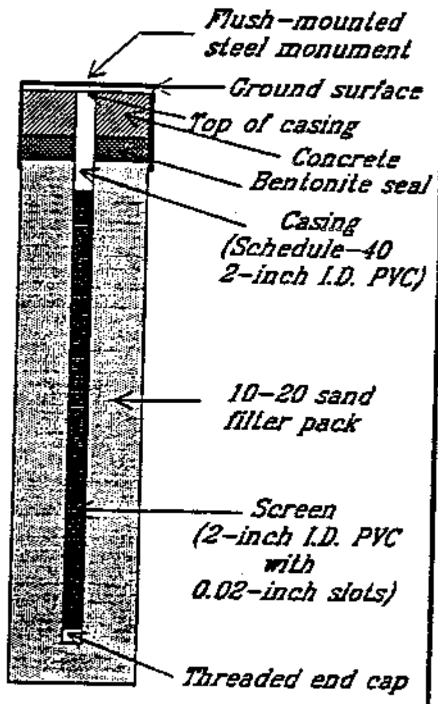
Drilling started: *20 June 1991* Drilling completed: *20 June 1991* Logged by: *JK*

PROJECT *Mobil Bulk Plant* W.O. *W-4558-3* WELL NO. *MW-29*

Elevation reference:
Ground surface elevation:
Well completed: *20 June 1991*
Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*2" to 3" Asphalt.*						
	Loose, moist, gray, sandy, gravel						
5	*Loose, moist, gray fine sandy SILT grading into silty fine sand*	I	*S-1*	*3*		ATD	8015 418.1 BTEX 6010
10	*Loose, wet, black oil-saturated PEAT with wood*	I	*S-2*	*5*			8015 418.1 BTEX 6010
		I	*S-3*	*50/3"*			
	Boring terminated at 13.5 feet.						
20							
25							
30							

AS-BUILT DESIGN



LEGEND

I 2-inch O.D. split-spoon sample

8015 418.1 BTEX 6010 Soil Analysis (EPA Method shown)

▼ ATD Observed groundwater level (ATD = at time of drilling)

X Sample not recovered

RZA
RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

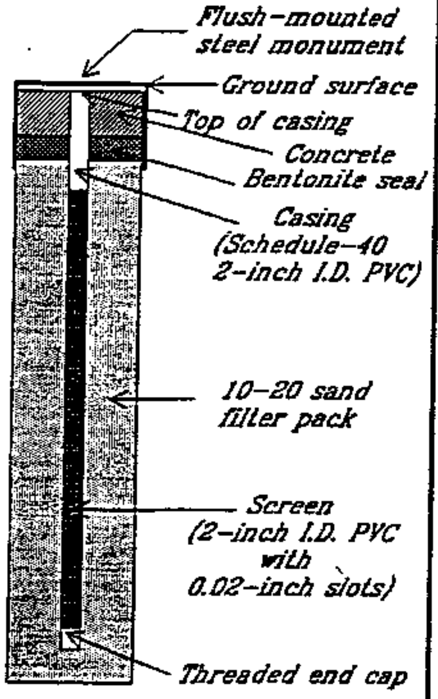
Drilling started: *20 June 1991* Drilling completed: *20 June 1991* Logged by: *JK*

PROJECT *Mobil Bulk Plant* W.O. *W-4558-3* WELL NO. *MW-30*

Elevation reference:
Ground surface elevation:
Well completed: *20 June 1991*
Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*2" Asphalt.*						
	Loose, moist, gray, silty SAND						
	Loose, moist, gray, silty fine SAND	☒	*S-1*	*5*		▼ ATD	
5	*Loose, black, oily wood and PEAT*						
	Very loose, wet, oily, gray medium SAND with organics (wood and peat)	I	*S-2*	*2*			*8015* *418.1* *BTEX* *6010*
10							
	Loose, wet (oily), black/brown PEAT and wood	I	*S-3*	*8*			*8015* *418.1* *BTEX* *6010*
	Boring terminated at 13.5 feet.						
15							
20							
25							
30							

AS-BUILT DESIGN



LEGEND

I 2-inch O.D. split-spoon sample

▼ ATD Observed groundwater level (ATD = at time of drilling)

8015 418.1 BTEX 6010 Soil Analysis (EPA Method shown)

X Sample not recovered

RZA *RITTENHOUSE-ZEMAN & ASSOCIATES, INC.*
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

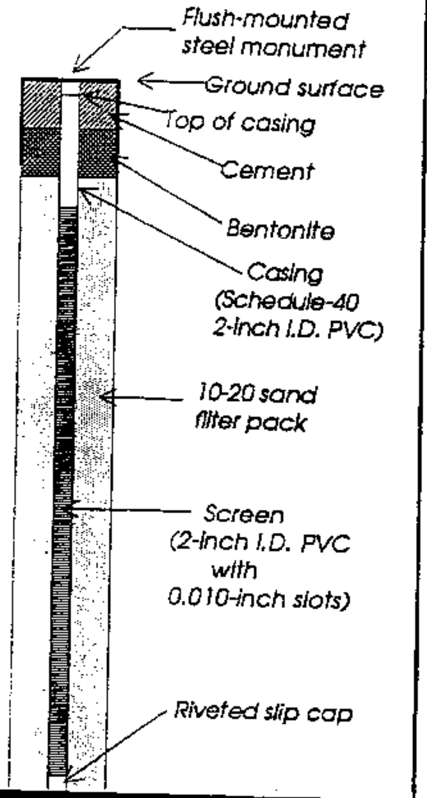
Drilling started: *20 June 1991* Drilling completed: *20 June 1991* Logged by: *JK*

PROJECT: *Everett Mobil Bulk Plant* W.O. *11-04558-04* WELL NO. *MW-3*

Elevation reference: *100.00 feet*
Ground surface elevation: *Unknown*
Well completed: *07 December 1993*
Casing elevation: *98.58 feet*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	*Asphaltic Concrete*					
	Medium dense, wet, brownish-gray, fine SAND with gravel (Fill). Slight pertoleum-like odor observed	I	*S-1*	*25*	*5*	
5	*Loose, wet to saturated, dark greenish-gray, SAND with some gravel and wood debris (Fill)*	I	*S-2*	*6*	*5*	▼ 12/8/93
10	*Medium dense, saturated, dark gray, medium SAND with wood debris*	I	*S-3*	*22*	*5*	
15	*Bottom of boring at 15 feet.*					
20						
25						
30						

AS-BUILT DESIGN



Page 1 of 1

TESTIN

LEGEND

I 2-inch O.D. split-spoon sample

▼ 0/00/00 Observed groundwater level 0/00/00 = date observed

RZA AGRA, Inc.
Geotechnical & Environmental Group

11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *07 December 1993* Drilling completed: *07 December 1993* Logged by: *TJP*

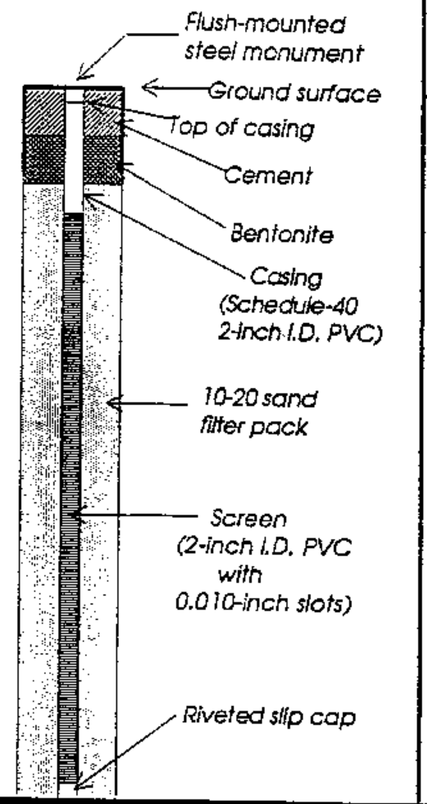
PROJECT: *Everett Mobil Bulk Plant* W.O. *11-04558-04* WELL NO. *MW-32*

Elevation reference: *100.00 feet*
Ground surface elevation: *Unknown*
Well completed: *07 December 1993*
Casing elevation: *99.17 feet*

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	*Gravel surface*					
	Mediun dense, wet to saturated, greenish-gray, gravelly, medium SAND (Fill)	I	*S-1*	*13*	*5*	▼ 12/8/93
5						
	Medium dense, saturated, grayish-dark brown, medium SAND with gravel, some silt and wood fragments	I	*S-2*	*17*	*5*	
10						
	Medium dense, saturated, grayish-dark brown, silty, fine to medium SAND with some gravel and wood fragments	I	*S-3*	*17*	*5*	
15	*Bottom of boring at 15 feet. No unusual staining or petroleum-like odors observed.*					
20						
25						
30						

AS-BUILT DESIGN



TESTING

LEGEND

I 2-inch O.D. split-spoon sample

▼ 0/00/00 Observed groundwater level 0/00/00 = date observed

RZA AGRA, Inc.
Geotechnical & Environmental Group

11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *07 December 1993* Drilling completed: *07 December 1993* Logged by: *TJP*

PROJECT: *Everett Mobil Bulk Plant* W.O. *11-04558-04* WELL NO. *MW-3*

Elevation reference: *100.00 feet*
Ground surface elevation: *Unknown*

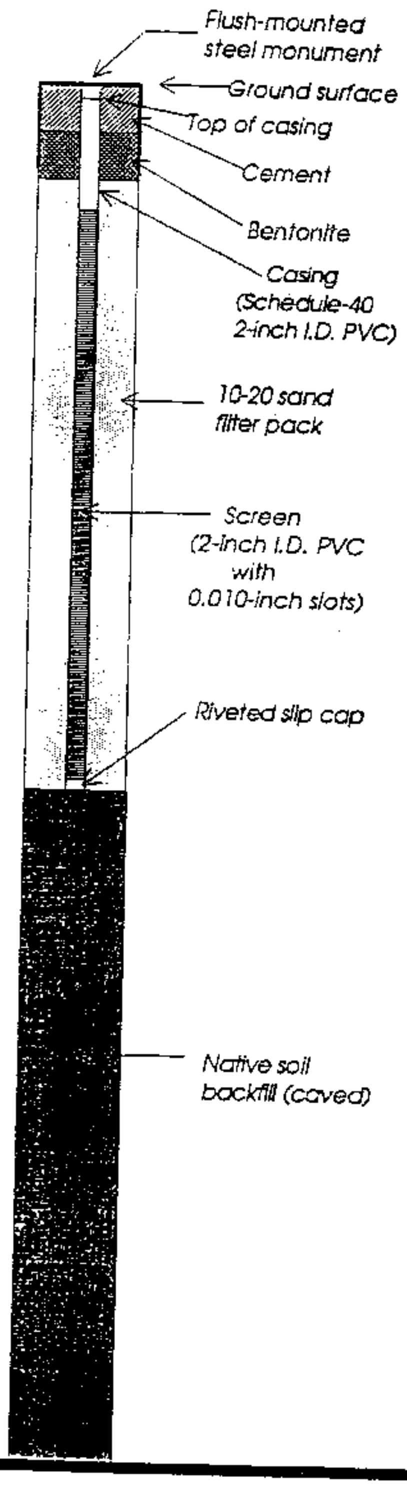
Well completed: *07 December 1993*
Casing elevation: *97.64 feet*

AS-BUILT DESIGN

Page 1 of 1

TESTING

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	*Asphaltic Concrete*					
	Medium dense, wet to saturated, gray, medium to coarse SAND with some gravel (Fill)		*S-1*	*21*	*5*	▼ 12/8/93
5	*Medium dense, saturated, greenish-gray, silty, fine to medium SAND (Fill)*		*S-2*	*11*	*5*	
	Loose, saturated, brown, silty PEAT		*S-3*	*5*	*5*	
10	*Loose to medium dense, saturated, gray to brownish-gray, SAND with trace to some silt, gravel and wood fragments*		*S-4*	*8*	*5*	
	(Chunk of wood stuck in sample tube; S-5 blow count probably not representative)		*S-5*	*50/5"*	*5*	
15			*S-6*	*11*	*5*	
			S-7	*6*	*5*	
20			*S-8*	*10*	*5*	
			S-9	*17*	*5*	
25	*Very stiff, saturated, brown, clayey SILT with organics (PEAT-Like)*		*S-10*	*14*	*5*	
			S-11	*17*	*5*	
30	*Bottom of boring at 29 feet.*					



No unusual staining or petroleum-like odors observed.

LEGEND

2-inch O.D. split-spoon sample	▼ 0/00/00 Observed groundwater level 0/00/00 = date observed

RZA AGRA, Inc.
Geotechnical & Environmental Group

11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *07 December 1993* Drilling completed: *07 December 1993* Logged by: *TJP*

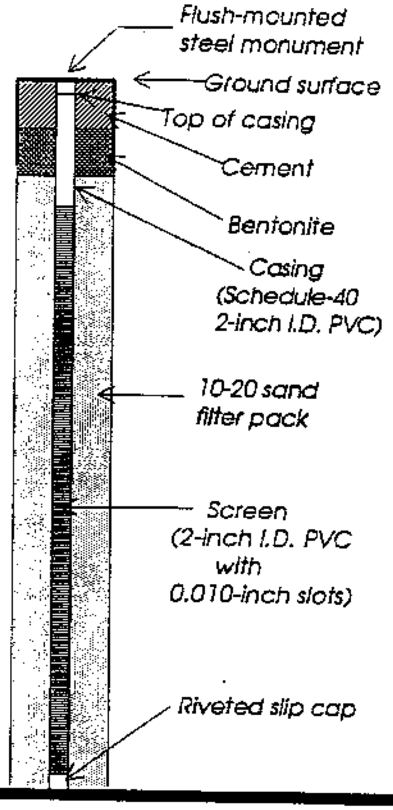
PROJECT: *Everett Mobil Bulk Plant* W.O. *11-04558-04* WELL NO. *MW-35*

Elevation reference: *100.00 feet*
Ground surface elevation: *Unknown*
Well completed: *06 December 1993*
Casing elevation: *103.96 feet*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0							
	Dense, moist, gray, silty, fine to medium SAND with some gravel	I	*S-1*	*38*	*0*		
5						▼ 12/8/93	
	Loose, moist to saturated, gray, fine sandy SILT with some gravel	I	*S-2*	*6*	*0*		
10							
		I	*S-3*	*4*	*0*		
15	*Bottom of boring at 15 feet. Field FT-IR analysis of samples S-1 and S-2 indicated TPH concentrations of <50 ppm.*						
20							
25							
30							



LEGEND

I 2-inch O.D. split-spoon sample

▼ 0/00/00 Observed groundwater level
0/00/00 = date observed

RZA AGRA, Inc.
Geotechnical & Environmental Group

11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *06 December 1993* Drilling completed: *06 December 1993* Logged by: *GKS*

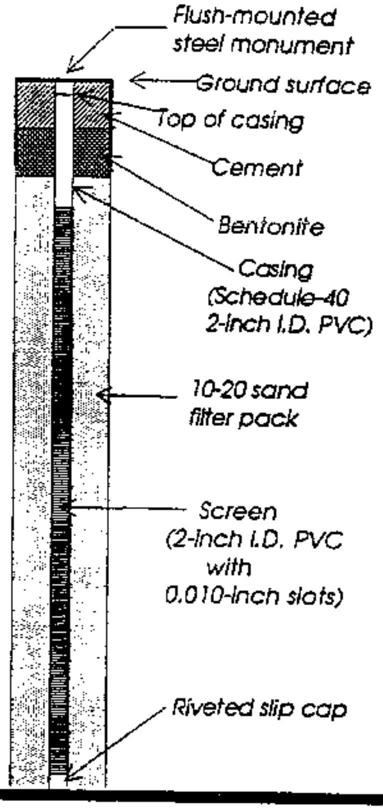
PROJECT: *Everett Mobil Bulk Plant* W.O. *11-04558-04* WELL NO. *MW-36*

Elevation reference: *100.00 feet*
Ground surface elevation: *Unknown*
Well completed: *06 December 1993*
Casing elevation: *99.91 feet*

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0							
						▼ 12/8/93	
	Medium dense, moist, blackish-gray, silty, fine to medium SAND with some gravel	I	*S-1*	*19*	*0*		
5	*Becomes very loose, with increasing silt content*						
		I	*S-2*	*2*	*0*		
10							
	Wood debris	I	*S-3*	*4*	*0*		
15	*Bottom of boring at 15 feet.*						
20							
25							
30							

AS-BUILT DESIGN



LEGEND

I 2-inch O.D. split-spoon sample

▼ 0/00/00 Observed groundwater level 0/00/00 = date observed

RZA AGRA, Inc.
Geotechnical & Environmental Group

11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *06 December 1993* Drilling completed: *06 December 1993* Logged by: *GKS*

PROJECT: *Everett Mobil Bulk Plant* W.O. *11-04558-04* WELL NO. *MW-3*

Elevation reference: *100.00 feet*
Ground surface elevation: *Unknown*
Well completed: *06 December 1993*
Casing elevation: *103.87 feet*

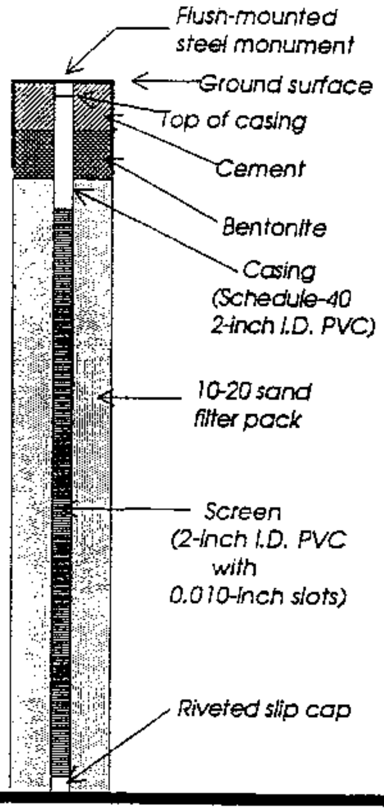
Page 1 of 1

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
Medium dense, moist, gray, silty, fine to medium SAND with trace gravel	I	*S-1*	*17*	*51*	
Becomes very loose, saturated; strong petroleum-like odor	I	*S-2*	*3*	*57*	▼ 12/8/93
Very loose, saturated, reddish-brown, medium to coarse SAND with some silt, trace gravel and organics; petroleum seepage observed	I	*S-3*	*3*	*34*	

DEPTH (feet): 0, 5, 10, 15, 20, 25, 30

Bottom of boring at 15 feet.

AS-BUILT DESIGN



TESTING

LEGEND

I 2-inch O.D. split-spoon sample

▼ 0/00/00 Observed groundwater level 0/00/00 = date observed

RZA AGRA, Inc.
Geotechnical & Environmental Group

11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *06 December 1993* Drilling completed: *06 December 1993* Logged by: *GKS*

CT: *Mobil/ADC* W.O. *11-04558-09* WELL NO. *MW-38*

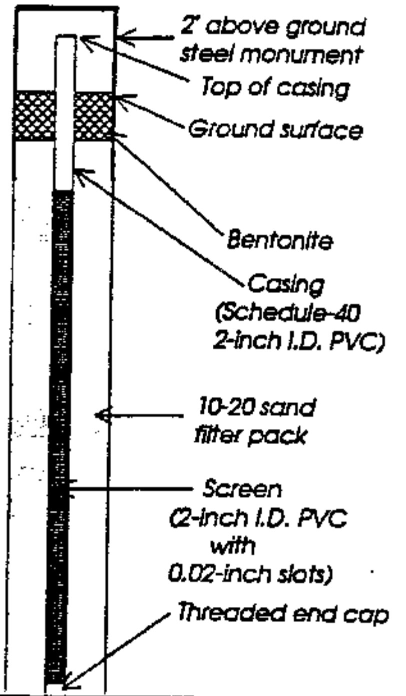
on reference: *Unknown* Well completed: *05 June 1996*

und surface elevation: *Unknown* Casing elevation: *Unknown*

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	*Grass and Roots*					
	Loose, moist, dark brown, silty SAND with gravel (strong petroleum hydrocarbon-like odor)					
		●	MW-38/ 2.5			
5		I	MW-38/ 5.0	10	0.0	▼ ATD
		I	MW-38/ 7.5	50/ 1"	0.0	
10	*Medium dense, saturated, brown WOOD CHIPS with trace silt (Fill) (strong petroleum hydrocarbon-like odor)*	I	MW-38/ 10.0	11	0.0	
	Bottom of boring at 12.5 feet.					
15						
20						
25						
30						

AS-BUILT DESIGN



TESTING

LEGEND

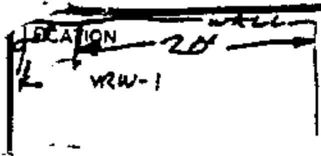
I 2-inch O.D. split-spoon sample

● Grab sample

▼ ATD Observed groundwater level ATD = at time of drilling

AGRA
Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *05 June 1996* Drilling completed: *05 June 1996* Logged by: *RAL*



AGRA Earth & Environmental

TEST BORING LOG

HOLE NO. VRW-1
SHEET 1 OF 1
TOTAL DEPTH 15.0
DATE BEGUN 6/5/96
DATE COMPLETED 6/5/96

WEATHER partly cloudy, 50's

SAMPLING

GROUNDWATER TABLE
DEPTH IN FEET 6.7
TIME 0430
DATE 6/5/96

PROJECT NAME MOBIL/ADC
PROJECT NUMBER 11-04558-09 T17
PROJECT ENGINEER RAC
DRILLING CONTRACTOR/CREW CASCADE
METHOD USED HSA
SAMPLING METHOD: SPT STANDARD PENETRATION TEST T-TUBE R=RING DEM

SOIL DESCRIPTION

GRASS AND ROOTS OVER
BACKFILL BENTONITE TO APPROX. 5.0 feet

VRW-1 5.0 — 15 7 6 — SM m dense, saturated, dark brown silty SAND with GRAVEL (SM) - wood debris, free product (oil), strong oil. NO SAMPLE FOR HEADSPACE

VRW-1 7.5 — 8 6 6 — Pt stiff, ~~moist~~ saturated, brown PEAT - trace silt, strong odor. HNU=14 ppm

VRW-1 10.0 — 12 11 8 — SP m. dense, saturated, grey brown SAND with silt (SP) - trace peat, wood debris from 10-10.5 feet, strong odor. HNU = 40 ppm

VRW-1 12.5 — 6 6 5 — Pt stiff, saturated, brown PEAT - trace silt, strong odor HNU = 5 ppm

DRILL OUT TO 15' HEAVING SAND
0.5 THREADED CAP

140 lb — 30" Drop

BORING LOG SUMMARY

AGRA
arth & Environmental

MONITORING WELL AS-BUILT REPORT

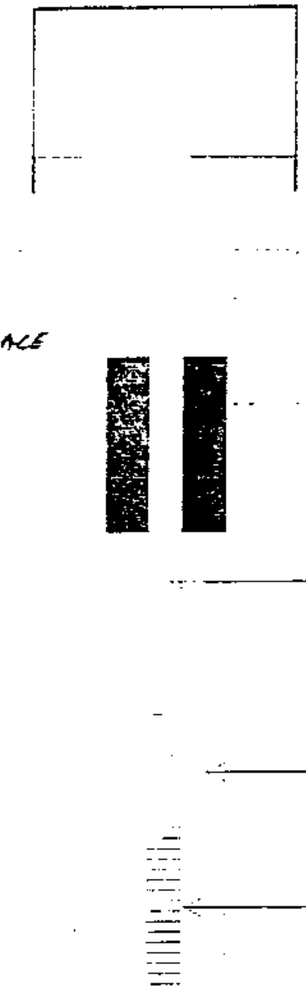
PROJECT No. 11-04558-09
PROJECT NAME MOBIL / ADC
BORING/WELL I.D. VAW-1
DATE 6/5/95

L ATION
OBSERVED BY RTL
DRILLER/INSTALLER CASCADE

SOIL TYPE DEPTH

ABOVE GROUND RISER HEIGHT (IF APPLICABLE) 2
~~MONUMENT TYPE~~ (IF APPLICABLE)
WELL CAP TYPE locking

+2.0



~~GROUT TYPE~~/#SACKS

0 SURFACE

BENTONITE SEAL /#SACKS

1

WELL CASING I.D. 4"
TYPE OF CASING Schedule 40 PVC
TYPE OF CONNECTION Threaded

2

FILTER PACK/SIZE/#SACKS 6X12

WELL SCREEN I.D. 4"
TYPE OF SCREEN "V" screen
SLOT SIZE 0.030

DIAMETER OF BOREHOLE 12"

14.0
14.5
ENDCAP TYPE threaded (0.5' pointed)

14.5

REMARKS

LOCATION: WALL ← 20' → VRW-1

WEATHER: partly cloudy, 50's

AGRA
Earth & Environmental

TEST BORING LOG

HOLE NO. VRW-1
SHEET 1 OF 1
TOTAL DEPTH 15.0
DATE BEGUN 6/5/96
DATE COMPLETED 6/5/96

SAMPLING

GROUNDWATER TABLE
ATD=AT TIME OF DRILLING AB=AFTER BORING
DEPTH IN FEET 6.7
TIME 0430
DATE 6/5/96

PROJECT NAME MOBIL/ADC
PROJECT NUMBER 11-04558-09 T17
GEOLOGIST ENGINEER RAC
DRILLING CONTRACTOR CREW CASCADE
METHOD USED HSA
SAMPLING METHOD SPT=STANDARD PENETRATION TEST T=TUBE BARING D&M

SOIL DESCRIPTION

GRASS AND ROOTS OVER
BACKFILL BENTONITE to APPROX. 5.0 feet

DEM VRW-1 5.0	15 7 6	SM	m. dense, saturated, dark brown silty SAND with GRAVEL (SM) - wood debris, free product (oil), strong oil. NO SAMPLE FOR HEADSPACE
VRW-1 7.5	8 6 6	Pt	stiff, ~~moist~~ saturated, brown PEAT - trace silt, strong odor HNU=14ppm
VRW-1 10.0	12 11 8	SP	m. dense, saturated, grey brown SAND with silt (SP) - trace peat, wood debris from 10-10.5 feet, strong odor. HNU = 40ppm
VRW-1 12.5	6 6 5	Pt	stiff, saturated, brown PEAT - trace silt, strong odor HNU = 5 ppm

DRILL OUT TO 15'. HEAVING SAND
0.5 THREADED CAP.

140 lb - 30" Drop

BORING
LOG
SUMMARY

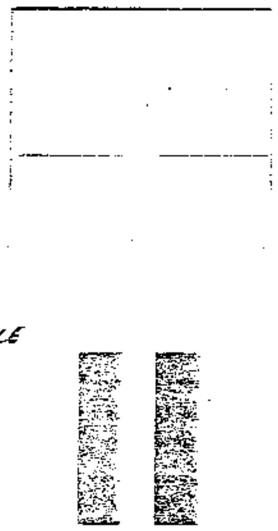
AGRA
Earth & Environmental

MONITORING WELL AS-BUILT REPORT

PROJECT No. 11-04558-09
LOCATION
PROJECT NAME MOBIL/ADL
OBSERVED BY BLL
BORING/WELL I.D. VRW-1
DRILLER/INSTALLER CASCADE
DATE 6/5/96

SOIL TYPE DEPTH

+2.0



ABOVE GROUND RISER HEIGHT (IF APPLICABLE) 2
~~MONUMENT TYPE~~ (IF APPLICABLE)
WELL CAP TYPE locking

~~GROUT TYPE~~/#SACKS

0 SURFACE

BENTONITE SEAL/#SACKS

1

WELL CASING I.D. 4"
TYPE OF CASING Schedule 40 PVC
TYPE OF CONNECTION Threaded

2

FILTER PACK/SIZE/#SACKS 6X12

WELL SCREEN I.D. 4"
TYPE OF SCREEN "V" screen
SLOT SIZE 0.030

DIAMETER OF BOREHOLE 12"

14.0
14.5
14.5

ENDCAP TYPE threaded (0.5' points)

REMARKS

OK

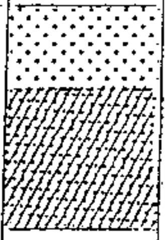
LOG OF
EXPLORATORY BORING

1 location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with enviroplug

Boring No: AD-01
Date: 1-15-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

Water Level	Time	Date	Comments:
3.0'			

epth (ft)	Graphic Log	Blow/ft	Vapor Concen-tration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0				Sample @ 0.5-1.0'	sp	Grass 0.5-1.0 Sand, coarse grained, occasional gravel, very slight clay loose, moist, no odor.
1						
2					sc	2.0' Sand, clayey, fine grained, grey brown, loose, very moist, moderate petroleum odor.
3				Sample @ 3.0'		2.5-3' Sand, clayey, occasional gravel, light grey brown, very moist, loose, strong petroleum odor.
	TD = 3.0'					3' Sand, coarse grained, slightly clayey, some gravel, light grey wet, moderate petroleum odor.
4						
5						

Groundwater at approximately 3'.

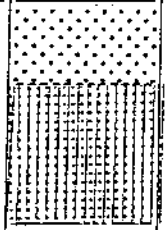
LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with enviroplug

Boring No: AD-02
Date: 1-15-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

Depth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
						approx. 2.0'			



Depth (ft)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0			Grass
	Sample @ 0.5-1.0'	sp	0.5-1.0' Sand, coarse grained with occasional gravel, saturated, slight petroleum odor.
1			
2			
	Sample @ 2.5-3.0'	sm	2.5-3.0' Sand, coarse grained with grey/green clayey silt, organic debris, strong petroleum odor, irridescent sheen on water.
3			
TD = 3.0'			
4			
5			

Groundwater at approximately 2'

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with enviroplug

Boring No: AD-03
Date: 1-15-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

Water Level	Time	Date	Comments:
Approx. 2.0'			

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0	▨					
1	▨			Sample @ 0.5-1.0'	sc	0.5-1.0 Sand, coarse grained, with clay and occasional pebbles/gravel, light brown, moist, no odor.
2	▨			Sample @ 1.5-2.0'	sc	1.5-2.0 Sand, coarse, grained, increased clay content with gravel, light grey-brown, wet, no odor.
	TD = 2.0'					
3						
4						Groundwater at approximately 2.0'
5						

LOG OF
EXPLORATORY BORING

ocation of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with enviroplug

Boring No.: AD-04
Date: 1-15-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

Water Level	Time	Date	Comments:
Approx. 9 inches			

epth (ft)	Graphic Log	Blow/ft	Vapor Concen-tration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)
0 -	▒				
-	▒			Sample @ 0.5-1.0	sp
1 -	▒				
-	TD = 1.0'				
2 -					
-					
3 -					
-					
4 -					
-					
5 -					

0.5-1.0 Sand, gravelly, coarse grained sand, light brown to grey, moist to wet, no odor.

Groundwater at approximately 9 inches.

LOG OF
EXPLORATORY BORING

ocation of boring:

Project No: 05-487-001	Boring No: **AD-05**
	Date: 1-15-90
Client: American Distributing Co.	Driller: D. Alford
Location: Bulk Terminal-Everett, WA	Drilling Method: Hand Auger
	Hole Diameter: 2"
Logged by: D. Alford	Page No: 1 of 1
Installation Data: Backfill with enviroplug	

pth (ft)	Graphic Log	Blow/ft	Vapor Concen-tration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
						Approx. 3.0'			

0 -	▨					
-	▨			Sample @	sc	0.5-1.0' Sand, clayey, coarse grained sand, light grey, loose,
1 -	▨			1.5-2.0		moist, some gravel, slight petroleum odor.
-	▨			Sample @	sc	1.5-2.0' Sand, clayey, coarse grained, light grey, loose,
2 -	▨			1.5-2.0'		moist, slight petroleum odor.
-	▨			Sample @	sc	2.5-3.0' Sand, clayey, coarse grained, light grey, loose,
3 -	▨			2.5-3.0		moist, some gravel, slight petroleum odor.
-	TD = 3.0'					
4 -						
-						Groundwater at approximately 3.0'
5 -						

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-001

Client: American Distributing Co.

Location: Bulk Terminal-Everett, WA

Logged by: D. Alford

Installation Data: Backfill with Enviroplug

Boring No: AD-06

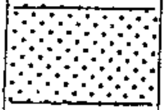
Date: 1-15-90

Driller: D. Alford

Drilling Method: Hand Auger

Hole Diameter: 2"

Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concen-tration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
						Approx. 1.5'			
0 -									
1 -				Sample @ 0.5-1.0	sp	0.5-1.0 Sand, coarse grained, gravelly, loose, moist, moderate odor.			
2 -	TD = 1.0'								
3 -						Groundwater at approximately 5.0'			
4 -									
5 -									

LOG OF
EXPLORATORY BORING

Location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with Enviroplug

Boring No: AD-07
Date: 1-15-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

Water Level	Time	Date	Comments:
Approx. 6"			

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0 -	░					
-	░			Sample @ 0.5-1.0"	sp	0.5-1.0 Sand, coarse grained, gravelly, loose, moist to wet, moderate odor, groundwater has irridescent film.
1 -	░					
-	TD = 1.0'					
2 -						
-						Groundwater at approximately 6 inches.
3 -						
-						
4 -						
-						
5 -						

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with enviroplug

Boring No: AD-08
Date: 1-16-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

Water Level	Time	Date	Comments:
Approx. 5.0'			

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0						Grass
				Sample @ 0.5-1.0'	sm	0.5-1.0' Sand, silty with occasional gravel, medium grained, light brown, dry, no odor.
1						
					sm	1.5-2.0' Sand. coarse grained, gravelly, some silt/clay, light to to dark brown, loose, moist, no odor.
2						
				Sample @ 2.5-3.0'	sc	2.5-3.0' Sand, clayey, with occasional gravel, light grey, moist strong petroleum odor.
3						
4						
				Sample @ 4.5-5.0'	sc	4.5-5.0' Sand, clayey, with occasional gravel, light grey, moist strong petroleum odor. Saturated at 5.0'
5						
	TD = 5.0'					

Groundwater at approximately 5.0'

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with Enviroplug

Boring No: AD-09
Date: 1-16-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
						Approx. 1.5'			
0									
1				Sample @ 0.5-1.0'	sp	0.5-1.0' Sand, coarse grained, with occasional gravel, loose, moist, no odor.			
2				Sample @ 1.5-2.0'	sp	1.5-2.0 Sand, with gravel, slightly loose, wet, petroleum odor.			
	TD = 2.0'								
3									
4						Groundwater at approximately 1.5'			
5									

LOG OF
EXPLORATORY BORING

i. ocation of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with Enviroplug

Boring No: AD-10
Date: 1-16-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
						Approx. 1.25'			
0	░								
1	░			Sample @ 0.5-1.0'	sp	0.5-1.0' Sand with gravel, loose, wet, visible oil stains, moderate petroleum odor.			
2	TD = 1.5'								
3						Groundwater at approximately 1.25'			
4									
5									

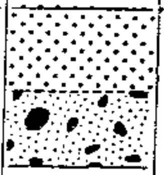
LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with Enviroplug

Boring No: AD-11
Date: 1-16-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concen-tration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
						Approx. 1.5'			



0 -						
1 -				Sample @ 0.5-1.0'	sp	0.5-1.0' Sand, gravelly, loose, moist, visible oil stains, moderate petroleum odor.
2 -				Sample @ 1.5-2.0'	gp	1.5-2.0' Sandy gravel, loose, wet, visible oil staining as above, moderate odor.
3 -	TD = 2.0'					
4 -						
5 -						

Groundwater at approximately 1.5'

LOG OF
EXPLORATORY BORING

.ocation of boring:

Project No: 05-487-001

Client: American Distributing Co.

Location: Bulk Terminal-Everett, WA

Logged by: D. Blaes

Installation Data: Backfill with Enviroplug

Boring No: AD-12

Date: 1-16-90

Driller: D. Alford

Drilling Method: Hand Auger

Hole Diameter: 2"

Page No: 1 of 1

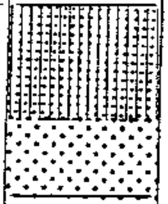
epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level Approx. 3.5'	Time	Date	Comments:
0 -									
1 -				Sample @ 0.5-1.0'	sp	0.5-1.0' Sand, with gravel, medium grained, brown, loose, moist, no petroleum odor.			
2 -									
3 -				Sample @ 2.5-3.0'	sp	2.5-3.0' Sand, medium grained, gravelly, grey brown, loose, visible oil staining, strong diesel odor.			
				Sample @ 3.0-3.5'		3.0-3.5' Sand, medium grained, gravelly, grey, wet, strong petroleum odor.			
4 -	TD = 3.5'								
5 -						Groundwater at approximately 3.5'			

LOG OF
EXPLORATORY BORING

ield location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with Enviroplug

Boring No: AD-13
Date: 1-16-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

pth ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
						Approx. 2.5'			
0									
1				Sample @ 0.5-1.0'	sm	0.5-1.0'			Sand, silty with occasional gravel, light brown-brown, moist, moderate petroleum odor.
2				Sample @ 2.0-2.5'	sp	2.0-2.5'			Sand, gravelly, dark brown, loose, very moist, visible petroleum staining, strong petroleum odor.
3	TD = 2.5'								
4									
5									

Groundwater approximately 2.5'

Note: Possible free product on ground water. Ground water has irridescent film and oil streaming from soil in capillary zone.

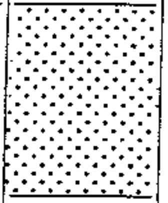
LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Alford
Installation Data: Backfill with Enviroplug

Boring No: AD-14
Date: 1-16-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

Water Level	Time	Date	Comments:
Approx. 2.5'			

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0						
1				Sample @ 0.5-1.0'	sp	0.5-1.0' Sand, gravelly, coarse grained, brown-dark brown, loose, moist, moderate petroleum odor.
2				Sample @ 2.0-2.5'	sp	2.0-2.5' Sand, gravelly, coarse grained, brown-dark brown, loose, very moist, strong petroleum odor, visible staining.
3	TD = 2.5'					
4						Groundwater approximately 2.5'
5						

LOG OF
EXPLORATORY BORING

Location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Blaes
Installation Data: Backfill with Enviroplug

Boring No: AD-15
Date: 1-17-90
Driller: D. Blaes
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

Water Level	Time	Date	Comments:
Approx. 3.0'			

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	
0	▨					
	▨			Sample @ 0.5-1.0'	sp	0.5-1.0' Sand, fine to medium grained, brown, dry, loose, no odor.
1	▨					
2	▨					
	▨			Sample @ 2.5-3.0'	sp	2.5-3.0' Sand, medium grained, grey to black, loose, moist to wet, very strong gasoline odor.
3	▨					
	TD = 3.0'					3.0'- Gravel-could not retain sample.
4						
						Groundwater approximately 3.0'
5						

LOG OF
EXPLORATORY BORING

le ocation of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Blaes
Installation Data: Backfill with Enviroplug

Boring No: AD-16
Date: 1-17-90
Driller: D. Blaes
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
						Approx. 1.5'			
0 -	▨					Grass			
-	▨			Sample @ 0.5-1.0'	sp	0.5-1.0 Sand, fine to medium grained, grey, loose, wet, visible petroleum staining, very strong gasoline odor.			
1 -	▨								
2 -	TD = 1.5'								
3 -						Groundwater at approximately 1.5'			
4 -									
5 -									

LOG OF
EXPLORATORY BORING

location of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Blaes
Installation Data: Backfill with Enviroplug

Boring No: AD-17
Date: 1-17-90
Driller: D. Blaes
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concen-tration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
						Approx. 1.0'			
0 -	▨					Grass			
-	▨			Sample @ 0.5-1.0'	sp	0.5-1.0' Sand, medium grained, gravel, dark grey loose, wet, moderate gasoline odor.			
1 -	▨								
-	TD = 1.0'								
2 -									
-						Groundwater at approximately 1.0'			
3 -									
-									
4 -									
-									
5 -									

LOG OF
EXPLORATORY BORING

Lt ocation of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Blaes
Installation Data: Backfill with Enviroplug

Boring No: AD-18
Date: 1-17-90
Driller: D. Alford
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

pth ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
						Approx. 4.5'			
0 -	▨								
-	▨			Sample @ 0.5-1.0'	sc				0.5-1.0' Sand, clayey, brown, slightly cohesive, moist, no odor
1 -	▨				sc				1.0-4.0' Sand, medium grained, clayey, brown to grey, organic debris, medium dense, moist, moderate diesel odor at 2.0-3.0'
-	▨								
2 -	▨								
-	▨								
3 -	▨								
-	▨								
4 -	▨			Sample @ 4.0-5.0'	sc				4.0-4.5' Sand, medium grained, clayey, grey to black, moderate to slight diesel odor.
-	▨								
5 -	TD = 4.5'								
-									
-									Groundwater at approximately 4.5'

LOG OF
EXPLORATORY BORING

.ocation of boring:

Project No: 05-487-001
Client: American Distributing Co.
Location: Bulk Terminal-Everett, WA
Logged by: D. Blaes
Installation Data: Backfill with Enviroplug

Boring No: AD-19
Date: 1-17-90
Driller: D. Blaes
Drilling Method: Hand Auger
Hole Diameter: 2"
Page No: 1 of 1

epth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level Approx. 1.5'	Time	Date	Comments:
0 -						Grass			
-				Sample @	sp	0.5-1.0' Sand, fine to medium grained, grey to black, loose,			
1 -				0.5-1.0'		moist, moderate diesel odor.			
-				Sample @		1.0-1.5' Sand, fine to medium grained, grey to black, loose,			
2 -	TD = 1.5'			1.0-1.5'		moist, soil saturated with diesel fuel oil.			
-						(probable free product on groundwater surface)			
3 -									
-									
4 -						Groundwater at approximately 1.5'			
-									
5 -									

TEST PIT LOGS

11-04558-04

Depth (feet)	Soil Classification
	Test Pit TP-1
0.0 - 0.5	Gravel surface
0.5 - 1.5	Loose, wet, dark grayish-brown, silty SAND with gravel (Fill)
1.5 - 3.5	Loose, wet to saturated, gray, coarse SAND with gravel
	Strong petroleum-like odor and black oily staining observed;
	Test pit terminated at approximately 3.5 feet
	Moderate groundwater and liquid petroleum hydrocarbon seepage below 3 feet
	Field FT-IR analysis indicated > 4,600 ppm TPH at 3 foot depth
	Test Pit TP-2
0.0 - 0.5	Gravel surface; old A/C at 0.5 feet
0.5 - 4.0	Loose, wet to saturated, gray, coarse SAND with gravel
	No unusual odors or staining observed;
	Test pit terminated at approximately 4.0 feet
	Moderate groundwater seepage observed below 3.5 feet
	A large block of concrete encountered at a depth of approximately 1 foot
	Field FT-IR analysis indicated 30 ppm TPH at 3.5 foot depth
	Test Pit TP-3
0.0 - 0.5	Gravel surface old A/C at 0.5 feet
0.5 - 4.0	Loose, wet to saturated, gray, coarse SAND with gravel
	Test pit terminated at approximately 4.0 feet
	Moderate groundwater seepage observed below 3.5 feet
	Slight surface sheen observed on groundwater emanating from the east side of the test pit
	Field FT-IR analysis indicated 80 ppm TPH at 3.5 foot depth

Depth (feet)	Soil Classification
	Test Pit TP-4
0.0 - 0.5	Gravel surface
0.5 - 4.0	Loose, wet to saturated, gray, coarse SAND with gravel Test pit terminated at approximately 4.0 feet Moderate groundwater seepage observed below 3.5 feet No unusual odors or staining observed Field FT-IR analysis indicated 30 ppm TPH at 3.5 feet
	Test Pit TP-5
0.0 - 0.5	Gravel surface
0.5 - 4.0	Loose, wet to saturated, gray, coarse SAND with gravel Test pit terminated at approximately 4.0 feet Moderate groundwater seepage observed below 3.5 feet No unusual odors or staining observed Field FT-IR analysis indicated 50 ppm TPH at 3.5 feet

Date excavated: 8 December 1993

Logged by: TJP

Backhoe Test Pit Logs

TP-1-96
Gray, moist to wet, silty SAND with gravel and some cobbles. Met with refusal at a depth of approximately 3.0 feet due to buried concrete. Slow seepage observed at approximately 1.5 feet. Soil exhibits a petroleum hydrocarbon-like odor. After approximately 1.5 hours, discontinuous blebs of LPH were observed on the water accumulated in the test pit.

TP-2-96
Brown, moist to wet, silty SAND with gravel and some wood and metal debris; becomes gray below approximately 1.0 feet. Slow seepage observed at approximately 1.0 feet and again below approximately 4.0 feet. Soil exhibits a petroleum hydrocarbon-like odor. After approximately 1.5 hours, discontinuous blebs of LPH were observed on the water accumulated in the test pit. Test pit terminated at approximately 4.5 feet.

TP-3-96
Gray, moist, gravelly SAND with some silt with scattered wood and brick debris. Underlain at approximately 4.0 feet by gray, wet to saturated, cohesive, silty, fine to medium SAND. Slow seepage observed at approximately 1.5 feet. Moderate seepage observed below a depth of approximately 6.0 feet. Soil exhibits a petroleum hydrocarbon-like odor. No LPH observed; sheen present of water accumulated in the test pit. Test pit terminated at approximately 6.5 feet.

Logged by TJP
5/23/96

Backhoe Test Pit Logs

TP-4-96

Brown, moist to wet, silty SAND with some gravel; becomes gray with a petroleum hydrocarbon-like odor below 2.5 feet. Slow seepage observed below approximately 5.0 feet. Discontinuous blebs of LPH observed on the groundwater accumulated in the bottom of the test pit. Test pit terminated at approximately 6.0 feet.

TP-5-96

Brown, moist to wet, silty SAND with some gravel with some brick and glass debris; becomes gray with a petroleum hydrocarbon-like odor below 2.5 feet. Slow seepage observed below approximately 5.0 feet. Encountered a 4-inch diameter clay pipe at approximately 4.5 feet. LPH and water drained from the pipe for approximately 10 to 15 minutes after digging through the pipe. Discontinuous blebs of LPH observed on the groundwater accumulated in the bottom of the test pit. The LPH appeared to originate from both seepage from the soil and infiltration from the broken clay pipe. Test pit terminated at approximately 6.0 feet.

TP-6-96

Brownish-gray, moist to wet, silty SAND with gravel and wood debris; becomes gray with a petroleum hydrocarbon-like odor below approximately 2.0 feet. Moderate to rapid LPH and groundwater seepage observed below approximately 4.0 feet. Approximately 0.02 feet of LPH accumulated as a continuous layer on top of groundwater pooled inside of the test pit. Test Pit terminated at approximately 6.0 feet.

TP-7-96

Moist to wet, dark brown to black, SAND with some silt and gravel; strong petroleum hydrocarbon-like odor observed. Moderate LPH and groundwater seepage observed below 3.0 feet. LPH accumulated as a continuous layer on top of the groundwater pooled in the test pit. LPH thickness was approximately 0.10 feet. Test pit terminated at approximately 4.0 feet.

Logged by TJP
06/06/96

APPENDIX D

SELECTED GEOTECHNICAL BORING LOGS

LOG OF BORING NO. DM-7-99

Sheet 1 of

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **December 8, 1999**
DATE COMPLETED: **December 8, 1999**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER: **Scott Kruger**
DRILLING METHOD: **Hollow Stem Auger to Mud Rotary**
SAMPLING METHOD: **D&M U, 300lb hammer, 30" drop**

WATER LEVEL: ▼ **7.00 ft**
ELEVATION: **18 ft**
TOTAL DEPTH : **45.00 ft**
WEATHER: **Light rain**
FIELD ENGINEER: **BBS**
CHECKED BY:

SAMPLE TYPE KEY:

■	Relatively undisturbed sample	B	Bag Sample
☒	Disturbed sample		
○	Sample attempt with no recovery		
◪	SPT split spoon sample		

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						18	0			brown woody debris mixed in with brown silty SAND (FILL)	
								SM		Dark to reddish brown medium to fine SAND with trace silt and fine gravel (loose to medium dense with depth)(wet) Petroleum Odor Detected in samples 1, 2, 3 (0 - 15 feet below ground surface) PID = 0	
18				7	☒	13	5				
							▼				
18	6.3	108	12.7	11	■	8	10				
18				6		3	15				
18	5.4	79.7	20.4	17	■	-2	20				
18				22	☒	-7	25				
								ML		Gray SILT with some medium sand and trace gravel (hard)(low plasticity)	
						-12	30				

NOTES: **PID is a Photo Ionization Detector that detects the presence of volatile hydrocarbons**

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**

FIELD ENGINEER: **BBS**
CHECKED BY:

Sheet 2 of 2

SAMPLE TYPE KEY:

- ■ Relatively undisturbed sample
- ☒ Disturbed sample
- ○ Sample attempt with no recovery
- ◩ SPT split spoon sample
- B Bag sample

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION(ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
18		119.2	25.8	81	■	-12	30				
								SM		Brown medium SAND with some silt and trace of fine gravel (very dense)(wet)	
12		107.2	15	50/6"	■	-17	35				
18		109.8	11.4	68	■	-22	40				
10				100/10"	☒	-27	45				
										End of Boring at 46 feet below ground surface Ground water encountered at 7 feet below ground surface	

NOTES: **PID is a Photo Ionization Detector that detects the presence of volatile hydrocarbons**

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

LOG OF BORING DM-7-99

FIGURE A-9.2

LOG OF BORING NO. DM-8-99

Sheet 1 of 2

PROJECT:	**California Street Overcrossing**
PROJECT NO:	**04333-041-189**
PROJECT LOCATION:	**Everett, WA**
CLIENT NAME:	**Port of Everett**
DATE STARTED:	**December 1, 1999**
DATE COMPLETED:	**December 1, 1999**
DRILLING CONTRACTOR:	**Cascade Drilling**
DRILLER:	**Scott Kruger**
DRILLING METHOD:	**Hollow Stem Auger to Mud Rotary**
SAMPLING METHOD:	**D&M U, 300lb hammer, 30" drop**
WATER LEVEL:	▼ **5.00 ft**
ELEVATION:	**18 ft**
TOTAL DEPTH :	**50.00 ft**
WEATHER:	**Overcast, light rain**
FIELD ENGINEER:	**BBS**
CHECKED BY:	

SAMPLE TYPE KEY:
- ■ Relatively undisturbed sample
- ☒ Disturbed sample
- ○ Sample attempt with no recovery
- ◪ SPT split spoon sample
- B Bag Sample

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	DESCRIPTION	REMARKS
						18	0		Asphalt	
								SM/ ML	Black SAND with some silt and trace fine gravel (fill)(very loose)(wet) Petroleum Odor Detected in samples 1, 2 (0 - 10 feet below ground surface) PID = 0	
18	19.6			2	☒	13	▼5			
								SM	Reddish brown medium SAND with some gravel and trace silt (very dense)(wet)	
18	5.1			5	☒	8	10			
18		78	13.9	52	■	3	15			
18		119.3	16.9	87	■	-2	20			
18		111.3	15.5	95	■	-7	25			
						-12	30			

NOTES: **PID is a Photo Ionization Detector that detects the presence of volatile hydrocarbons**

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**

FIELD ENGINEER: **BBS**
CHECKED BY:

Sheet 2 of 2

SAMPLE TYPE KEY:
- ■ Relatively undisturbed sample
- ☒ Disturbed sample
- ○ Sample attempt with no recovery
- ◪ SPT split spoon sample
- B Bag sample

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION(ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
9		113.1	14.3	50/3"	■	-12	30				
6				50/6"	☒	-17	35				
								ML		Gray SILT with trace fine to medium sand and fine gravel (very stiff)	
18				29	☒	-22	40				
18	90.2			36	☒	-27	45				
								SM		Gray fine to medium SAND with some silt (very dense)(wet)	
18				50/6"	■	-32	50				
										End of Boring at 51.5 feet below ground surface Ground water encountered at 5 feet below ground surface	

NOTES: **PID is a Photo Ionization Detector that detects the presence of volatile hydrocarbons**

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

LOG OF BORING DM-8-99

FIGURE A-10.2

MONITORING WELL NO. DM-6-99

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **December 6, 1999**
DATE COMPLETED: **December 6, 1999**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER: **Scott Kruger**
DRILLING METHOD: **Hollow Stem Auger to Mud Rotary**
SAMPLING METHOD: **D&M U, 300lb hammer, 30" drop**

WATER LEVEL: ▼0.00 ft
ELEVATION: **+20.00**
TOTAL DEPTH : **55.00 ft**
WEATHER **Overcast, light rain**
FIELD ENGINEER: **BBS**
CHECKED BY:

SAMPLE TYPE KEY:

- ■ Relatively undisturbed sample
- ☒ Disturbed sample
- ○ Sample attempt with no recovery
- ◪ SPT split spoon sample
- B Bag Sample

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	DESCRIPTION	WELL CONSTRUCTION DETAIL & REMARKS
						20.0	0	SM/ML	Blackish Brown fine sandy SILT with trace gravel (possible fill)(soft)(moist)	ELEVATION ▼ +20.00
						15.0	5	SM	Gray brown medium to fine SAND with trace to some silt and fine gravel (medium dense)(wet) Petroleum Odor Detected in samples 1, 2 (0 - 10 feet below ground surface) PID = 0	
18	15	99.6	25.3	1	■					
18		103.1	16.5	14	■	10.0	10			
18	3.1	126.6	13.6	56	■	5.0	15			
18				55	■	0.0	20			
18	14.3	90.6	14.3	14	■	-5.0	25			
								ML	Dark gray SILT with some fine sand (very stiff)(low plasticity)	
						-10.0	30			

NOTES: **PID is a Photo Ionization Detector that detects the presence of volatile hydrocarbons**

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

WELL SYMBOL KEY:

- Bentonite grout
- Bentonite plug
- Filter Pack
- Well screen
- Concrete plug

MONITORING WELL DM-6-99

FIGURE A-8.1

PROJECT:	**California Street Overcrossing**
PROJECT NO:	**04333-041-189**
PROJECT LOCATION:	**Everett, WA**

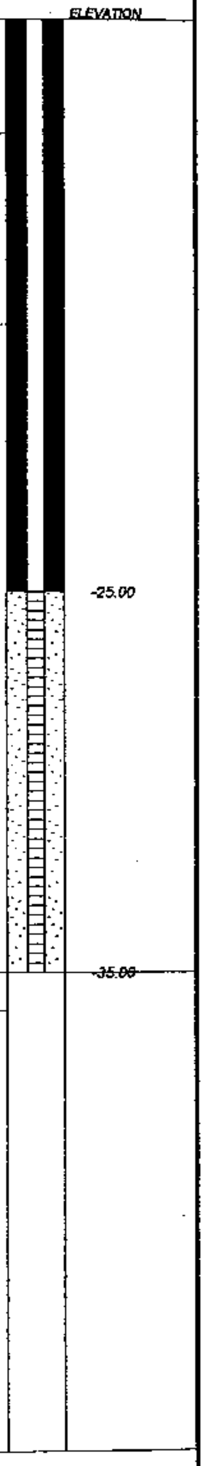
FIELD ENGINEER: **BBS**
CHECKED BY:

Sheet 2 of 2

SAMPLE TYPE KEY:
- ■ Relatively undisturbed sample
- ☒ Disturbed sample
- ○ Sample attempt with no recovery
- ◪ SPT split spoon sample
- B Bag sample

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION(ft.)	DEPTH (ft.)	USCS	DESCRIPTION
18		103.6	18.9	26	■	-10.0	30		
								SM	Brown medium SAND with some silt and trace gravel (very dense)(wet)
18		93.1	20.2	88 for 11	■	-15.0	35		
								SP	Gray brown medium SAND with trace silt and fine gravel (very dense)(wet)
18				88 for 11	■	-20.0	40		
18		109.4	20.1	96 for 11	■	-25.0	45		
12				50 for 5	■	-30.0	50		
12				50 for 5	■	-35.0	55		
									End of boring at 56 feet below ground surface Ground water encountered 6 feet below ground surface

WELL CONSTRUCTION DETAIL & REMARKS



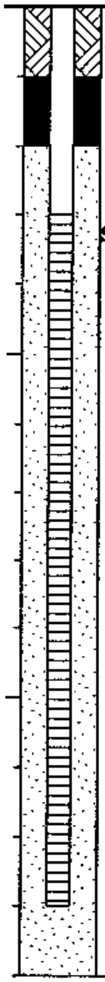
NOTES: **PID is a Photo Ionization Detector that detects the presence of volatile hydrocarbons**

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

WELL SYMBOL KEY:
- Bentonite grout
- Bentonite plug
- Filter Pack
- Well screen
- Concrete plug

MONITORING WELL DM-6-99

FIGURE A-8.2



Surface: Ashpalt Paving

DEPTH (feet)	WELL/PIEZO CONSTRUCTION	WATER LEVEL	MOISTURE CONTENT(%)	PLASTIC LIMIT(%)	LIQUID LIMIT(%)	% PASSING No. 200 SIEVE	OTHER TESTS	PID (ppm)	BLOWS/6 in** (uncorrected)	SAMPLER *	SAMPLE NUMBER	U.S.C.S. NAME	SOIL DESCRIPTION
0	CONCRETE MONUMENT												8" ASPHALTIC CONCRETE and ATB
												GW	6" CRUSHED ROCK BASE
	BENTONITE											SM	Dark gray fine to medium SAND with gravel and wood, (medium dense, moist), (FILL)
	10/20 COLORADO SILICA SAND PACK								3 7 3	☒	RW-10-1		- slight petroleum sheen on soil
		▼											
5	SLOTTED PIPE	▽											
												PT	Dark brown PEAT with silt and sand, (soft, wet)
									1 2 1	☒	RW-10-2		- heavy petroleum sheen on soil
10													
												SP-SM	Dark gray fine to medium SAND with silt, petroleum staining, (medium dense, wet)
									3 6 6	☒	RW-10-3		- slight petroleum sheen on soil
14													

Boring completed at 14' on 10/01/99. Groundwater encountered at 5' bgs during drilling and at 4.5' before developing well. Developed / purged 10 gallons until water turned clear.

DATE DRILLED: 10-1-99	SURFACE ELEVATION (feet):	DRILLING METHOD: Mobile B-59
LOGGED BY: S. Lewis	TOTAL DEPTH (feet): 14.0	DRILLER: Holt Drilling
REVIEWED BY: Jim Schmidt	DIAMETER OF BORING (in): 8 OD	CASING SIZE: 2" DIAMETER WELL

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NUMBER: 60-1914-01

Mobile
Everett, Washington

BORING LOG
RW-10

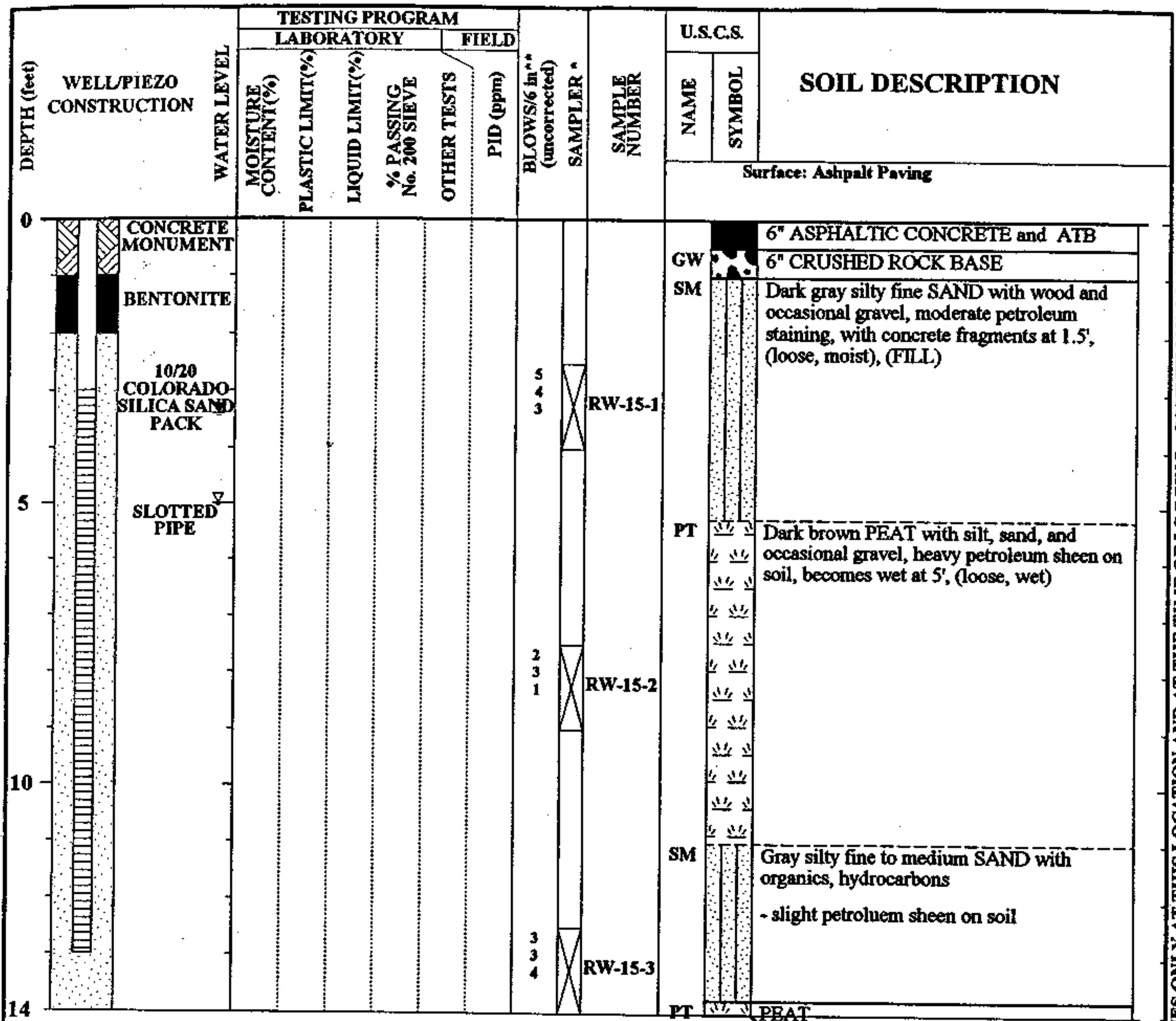
FIGURE

A - 2

PAGE 1 of 1

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

BY: ______ APPROV: ______



SOIL DESCRIPTION

Surface: Ashpalt Paving

6" ASPHALTIC CONCRETE and ATB

6" CRUSHED ROCK BASE

Dark gray silty fine SAND with wood and occasional gravel, moderate petroleum staining, with concrete fragments at 1.5', (loose, moist), (FILL)

Dark brown PEAT with silt, sand, and occasional gravel, heavy petroleum sheen on soil, becomes wet at 5', (loose, wet)

Gray silty fine to medium SAND with organics, hydrocarbons

- slight petroluem sheen on soil

PEAT

Boring completed at 14' on 10/01/99.
Groundwater encountered at 5' bgs during drilling and at 3.4' before developing well.
Developed / purged 10 gallons from well until water turned clear.

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 10-1-99
LOGGED BY: S. Lewis
REVIEWED BY: Jim Schmidt

SURFACE ELEVATION (feet):
TOTAL DEPTH (feet): 14.0
DIAMETER OF BORING (in): 8 OD

DRILLING METHOD: Mobile B-59
DRILLER: Holt Drilling
CASING SIZE: 2" DIAMETER WELL

APPROV: ____

BY: ____

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NUMBER: 60-1914-01

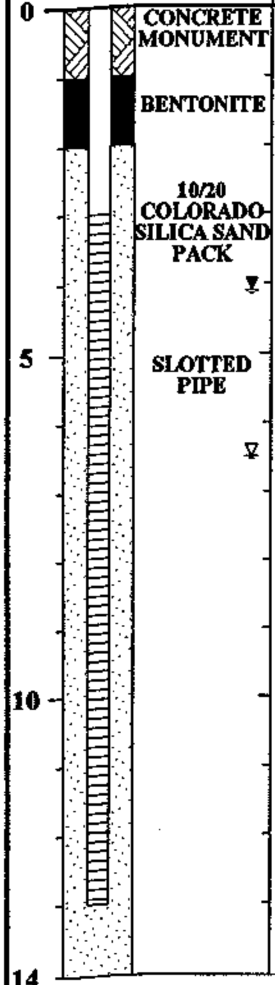
Mobile
Everett, Washington

BORING LOG
RW-15

FIGURE
A - 3

PAGE 1 of 1

DEPTH (feet)	WELL/PIEZO CONSTRUCTION	WATER LEVEL	TESTING PROGRAM: LABORATORY: MOISTURE CONTENT(%)	PLASTIC LIMIT(%)	LIQUID LIMIT(%)	% PASSING No. 200 SIEVE	OTHER TESTS	FIELD: PID (ppm)	BLOWS/6 in** (uncorrected)	SAMPLER *	SAMPLE NUMBER	U.S.C.S. NAME	U.S.C.S. SYMBOL	SOIL DESCRIPTION
														Surface: Ashpalt Paving
0												GW		6" ASPHALTIC CONCRETE, ATB, and FABRIC 6" CRUSHED ROCK BASE
												SP-SM		Light brown fine to medium SAND with silt and concrete fragments, (dense, moist), (FILL)
									33 32 17	⊠	RW-40-1			
		▽												
5												OL		Black - gray organic SILT with sand and wood, heavy petroleum staining, (very soft, wet)
		▽												
									1 1 1	⊠	RW-40-2			
10														
									4 6 6	⊠	RW-40-3			- becomes stiff / medium dense
14														



Boring completed at 14' on 10/01/99. Groundwater encountered from 6' to 7' bgs during drilling and at 4.1' before developing well. Developed / purged 10 gallons from well until water turned clear.

DATE DRILLED: 10-1-99	SURFACE ELEVATION (feet):	DRILLING METHOD: Mobile B-59
LOGGED BY: S. Lewis	TOTAL DEPTH (feet): 14.0	DRILLER: Holt Drilling
REVIEWED BY: Jim Schmidt	DIAMETER OF BORING (in): 8 OD	CASING SIZE: 2" DIAMETER WELL

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NUMBER: 60-1914-01

Mobile
Everett, Washington

BORING LOG
RMW-40

FIGURE
A - 4

PAGE 1 of 1

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

APPROV: ____

BY: ____

APPENDIX B
BORING LOGS

LOG OF BORING NO. UG-1

Sheet 1 of 1

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 25, 2000**
DATE COMPLETED: **September 25, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼ 4.00 ft
ELEVATION: **18 ft**
TOTAL DEPTH : **12.00 ft**
WEATHER:
FIELD ENGINEER: **T. Parkington**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:
- ■ Relatively undisturbed sample
- ☒ Disturbed sample
- ○ Sample attempt with no recovery
- ◩ SPT split spoon sample
- B Bag Sample
- Pocket Penetrometer
- ▽ Vane Shear (psf)

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						18	0			Asphaltic Concrete.	
								GP		Gravel subgrade	
					☒		▼	PT		Dark brown silty peat	PID = 3 ppm
					☒	13	5				PID = 24 ppm
								SM		Black silty sand with some woody peat	
					☒			SM		Brown sand with some silt. h.c. odor	PID = 2 ppm
					☒	8	10			Brown gray sand, wet.	PID = 0 ppm No odor
										Boring completed at 12 feet. Backfilled with Bentonite. Ground water at 4 feet bgs.	

NOTES:

URS

LOG OF BORING UG-1

FIGURE G 1

LOG OF BORING NO. UG-2

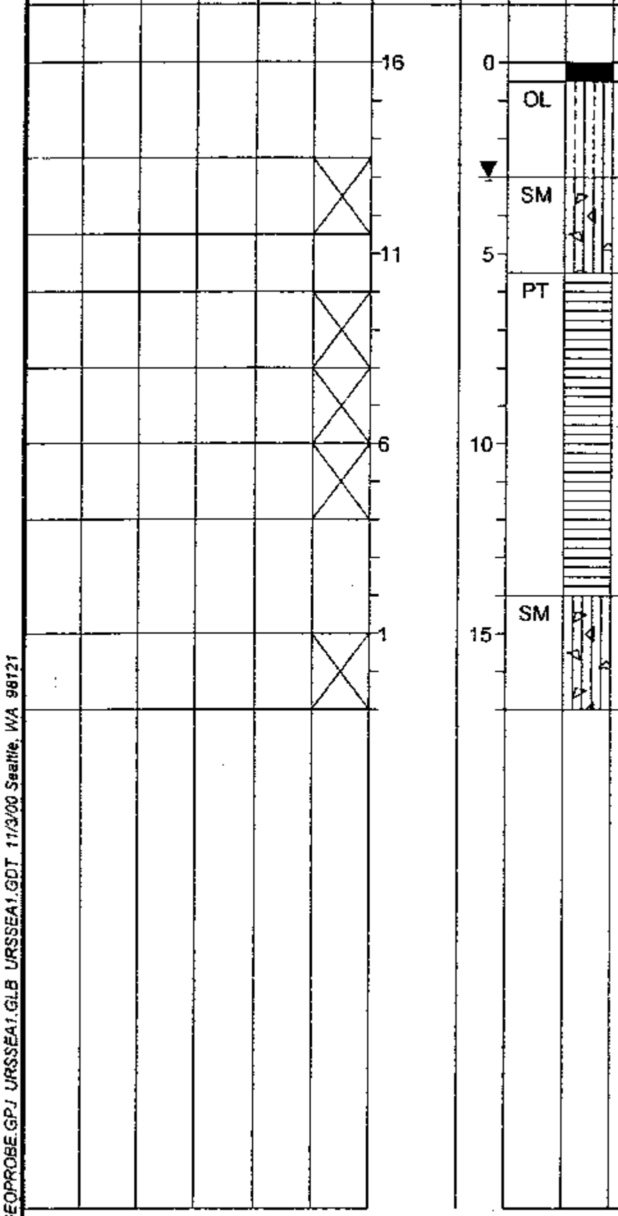
Sheet 1 of 1

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 25, 2000**
DATE COMPLETED: **September 25, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼ 3.00 ft
ELEVATION: **16 ft**
TOTAL DEPTH: **17.00 ft**
WEATHER:
FIELD ENGINEER: **T. Parkington**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

- ■ Relatively undisturbed sample
- ☒ Disturbed sample
- ○ Sample attempt with no recovery
- ◪ SPT split spoon sample
- B Bag Sample
- ↓ Pocket Penetrometer
- ▽ Vane Shear (psf)



ELEVATION (ft.)	DEPTH (ft.)	USCS	DESCRIPTION	REMARKS
16	0		Asphaltic Concrete.	
		OL	Black organic silt	
		SM	Black silty sand. Strong odor.	PID = 200 ppm
11	5	PT	Black woody peat	Very oily. PID = 200 ppm GW sample taken PID = 300 ppm PID = 12 ppm
1	15	SM	Brown silty sand.	PID = 0 ppm
			Boring completed at 17 feet. Backfilled with bentonite. Ground water at 3 feet	

NOTES:

URS

LOG OF BORING UG-2

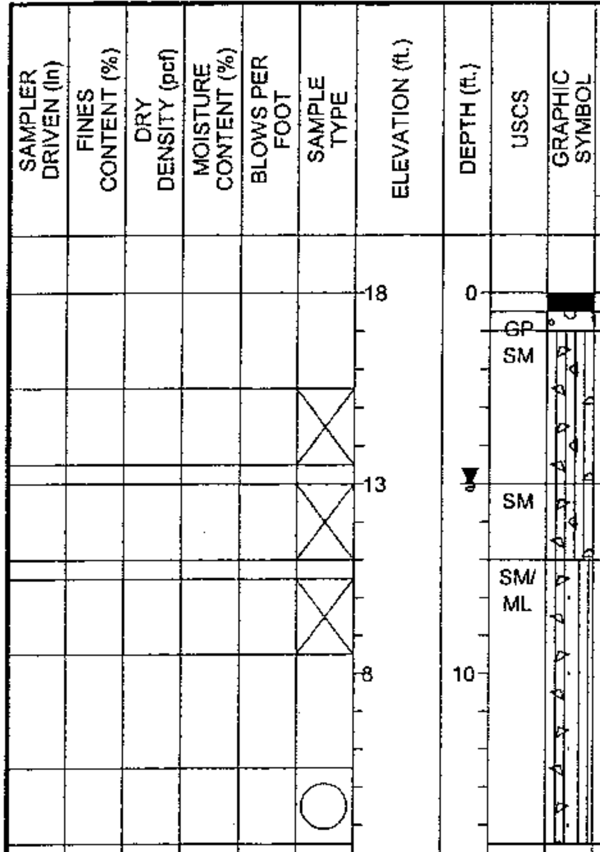
LOG OF BORING NO. UG-3

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 25, 2000**
DATE COMPLETED: **September 25, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼ **5.00 ft**
ELEVATION: **18 ft**
TOTAL DEPTH : **14.50 ft**
WEATHER:
FIELD ENGINEER: **T. Parkington**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

■	Relatively undisturbed sample	B	Bag Sample
☒	Disturbed sample	⫯	Pocket Penetrometer
○	Sample attempt with no recovery	▽	Vane Shear (psf)
◪	SPT split spoon sample		



USCS	DESCRIPTION	REMARKS
	Asphaltic Concrete.	
GP	Gravel subgrade	
SM	Gray brown silty sand	PID = 0 ppm
SM	Red-tan silty sand	PID = 0 ppm
SM/ML	Brown silty sand / sandy silt with lenses of woody peat.	PID = 1 ppm No evidence of hydrocarbons in water on rods
	Boring completed at 14.5 feet. Backfilled with bentonite. Groundwater at 5 feet bgs.	

NOTES:

LOB3 K:\1163\04333--1\GEOPROBE.GPJ URSSEA1.GLB URSSEA1.GDT 11/3/00 Seattle, WA 98121

URS

LOG OF BORING NO. UG-4

Sheet 1 of

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 25, 2000**
DATE COMPLETED: **September 25, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼ 4.00 ft
ELEVATION: **20 ft**
TOTAL DEPTH: **14.50 ft**
WEATHER:
FIELD ENGINEER: **T. Parkington**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

■	Relatively undisturbed sample	B	Bag Sample
☒	Disturbed sample	⊥	Pocket Penetrometer
○	Sample attempt with no recovery	V	Vane Shear (psf)
◩	SPT split spoon sample		

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						20	0	GP		Gravel	
								SM		Brown sand with some silt and gravel. No odor	
					☒		▼				PID = 0 ppm
					☒	15	5	ML		Gray silt	PID = 0 ppm
					☒			SM		Brown sand with some silt	PID = 0 ppm
						10	10				
					☒						
										Boring completed at 14.5 feet. Backfilled with bentonite. Groundwater at 4 feet.	

NOTES:

URS

LOG OF BORING UG-4

FIGURE G 4

LOG OF BORING NO. UG-5

Sheet 1 of 1

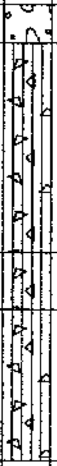
PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 25, 2000**
DATE COMPLETED: **September 25, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼ **6.00 ft**
ELEVATION: **19 ft**
TOTAL DEPTH : **12.00 ft**
WEATHER:
FIELD ENGINEER: **B. Strickler**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

- ■ Relatively undisturbed sample
- ☒ Disturbed sample
- ○ Sample attempt with no recovery
- ◪ SPT split spoon sample
- B Bag Sample
- Pocket Penetrometer
- ▽ Vane Shear (psf)

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						19	0	GP		Gravel	
								SM		Brown silty sand with trace gravel. No odor.	
					☒						PID = 0 ppm
					☒	14	5				PID = 0 ppm
							▼				
								SM		Gray silty sand	
					☒						PID = 0 ppm
								SM		Dark brown silty sand with trace gravel and wood fragments.	
					☒	9	10				PID = 0 ppm
										End of boring at 12 feet. Backfilled with bentonite. Ground water at 6 feet bgs.	



NOTES:

URS

LOG OF BORING UG-5

FIGURE G 5

LOG OF BORING NO. UG-6

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 26, 2000**
DATE COMPLETED: **September 26, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼ **5.00 ft**
ELEVATION: **18 ft**
TOTAL DEPTH : **12.00 ft**
WEATHER:
FIELD ENGINEER: **B. Strickler**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

■	Relatively undisturbed sample	B	Bag Sample
☒	Disturbed sample	⊥	Pocket Penetrometer
○	Sample attempt with no recovery	V	Vane Shear (psf)
◪	SPT split spoon sample		

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						18	0	SM/ GM		Brown silty gravel and sand	
					☒			SM		Gray silty sand, some gravel. No odor.	PID = 0 ppm
					☒	13	▼			Traces of brown color	PID = 0 ppm
					☒					Some wood fragments.	PID = 0 ppm
					☒	8	10	SP		Brown sand, silt and gravel.	PID = 0 ppm
										End of boring at 12 feet. Backfilled with bentonite. Ground water at 5 feet bgs.	

NOTES:

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URS

LOG OF BORING UG-6

FIGURE G 6

Sheet 1 of

LOG OF BORING NO. UG-7

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 26, 2000**
DATE COMPLETED: **September 26, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼ 2.00 ft
ELEVATION: **16 ft**
TOTAL DEPTH : **12.00 ft**
WEATHER:
FIELD ENGINEER: **B. Strickler**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

■	Relatively undisturbed sample	B	Bag Sample
☒	Disturbed sample	↓	Pocket Penetrometer
○	Sample attempt with no recovery	▽	Vane Shear (psf)
◣	SPT split spoon sample		

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						16	0		■	Asphaltic Concrete.	
							▼	SM			
					☒					Dark brown to gray silty sand with some gravel	PID = 0 ppm
					☒	11	5				PID = 0 ppm
					☒					Some wood fragments	PID = 0 ppm
					☒	6	10			Dark brown sand with some silt and gravel.	PID = 0 ppm
										End of boring at 12 feet. Backfilled with bentonite. Groundwater at 2 feet bgs.	

NOTES:

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URS

LOG OF BORING UG-7

FIGURE G 7

LOG OF BORING NO. UG-8

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 26, 2000**
DATE COMPLETED: **September 26, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼**4.00 ft**
ELEVATION: **17 ft**
TOTAL DEPTH : **19.50 ft**
WEATHER:
FIELD ENGINEER: **B. Strickler**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

■	Relatively undisturbed sample	B	Bag Sample
☒	Disturbed sample	⊥	Pocket Penetrometer
○	Sample attempt with no recovery	V	Vane Shear (psf)
◩	SPT split spoon sample		

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	DESCRIPTION	REMARKS
						17	0	GP	Gravel	
								SM	Gray silty sand with some gravel	
					☒		▼	SM	Dark brown to black silty sand with some gravel and wood fragmenst. Strong odor. Strong odor	PID = 186 ppm
					☒	12	5			PID = 180 ppm
					☒			SM	Gray silty sand with some gravel Black silty sand with some wood fragments. Strong odor	PID = 105 ppm
			364.4		☒	7	10	PT	Black woody peat, strong odor. Color grades to red with no odor.	PID = 5 ppm
					☒					PID = 0 ppm
					○	2	15		Brown sand with some silt and gravel. Faint odor	
					☒				No odor.	PID = 0 ppm
									End of boring at 19.5 feet. Backfilled with bentonite. Gound water at 4 feet bgs.	

NOTES:

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URS

LOG OF BORING UG-8

FIGURE G 8

LOG OF BORING NO. UG-9

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 26, 2000**
DATE COMPLETED: **September 26, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼**4.00 ft**
ELEVATION: **18 ft**
TOTAL DEPTH : **17.00 ft**
WEATHER:
FIELD ENGINEER: **B. Strickler**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

- ■ Relatively undisturbed sample
- ☒ Disturbed sample
- ○ Sample attempt with no recovery
- ◪ SPT split spoon sample
- B Bag Sample
- ⫰ Pocket Penetrometer
- V Vane Shear (psf)

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
					☒	18	0	GP		Gravel	
								SM		Gray silty sand with some gravel. Strong odor.	
					☒		▼				PID = 430 ppm
					☒	13	5			Strong odor.	PID = 175 ppm
					☒			PT		Woody peat. Strong odor.	PID = 200 ppm
					☒	8	10			Strong odor.	PID = 375 ppm
			827.4		☒						PID = 0 ppm
								SP		Brown sand with trace silt and some gravel. Some odor.	
						3	15			No odor	PID = 0 ppm
										End of boring at 17 feet. Backfill with bentonite. Groundwater at 4 feet bgs.	

NOTES:

URS

LOG OF BORING UG-9

FIGURE G 9

LOG OF BORING NO. UG-10

Sheet 1 of 1

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 26, 2000**
DATE COMPLETED: **September 26, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼ **3.00 ft**
ELEVATION: **18 ft**
TOTAL DEPTH : **12.00 ft**
WEATHER:
FIELD ENGINEER: **B. Strickler**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

■	Relatively undisturbed sample	B	Bag Sample
☒	Disturbed sample	⊥	Pocket Penetrometer
○	Sample attempt with no recovery	▽	Vane Shear (psf)
◪	SPT split spoon sample		

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						18	0	GP		Gravel	
								SP		Brown to dark brown sand with some to trace silt and gravel. No odor.	
					☒		▼				PID = 0 ppm
					☒	13	5				PID = 0 ppm
					☒						PID = 0 ppm
					☒	8	10				PID = 0 ppm
										End of boring at 12 feet. Backfilled with Bentonite. Groundwater at 3 feet bgs.	

NOTES:

URS

LOG OF BORING NO. UG-11

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 26, 2000**
DATE COMPLETED: **September 26, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼ **4.00 ft**

ELEVATION: **18 ft**
TOTAL DEPTH : **12.00 ft**
WEATHER:
FIELD ENGINEER: **B. Strickler**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

■	Relatively undisturbed sample	B	Bag Sample
☒	Disturbed sample	⊥	Pocket Penetrometer
○	Sample attempt with no recovery	▽	Vane Shear (psf)
◩	SPT split spoon sample		

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						18	0	GP		Gravel.	
								SP		Brown to gray sand with some to trace silt and gravel. Faint odor.	
					☒						PID = 0 ppm
							▼				
					☒	13	5			No odor	PID = 0 ppm
					☒						PID = 0 ppm
					☒	8	10				PID = 0 ppm
										End of boring at 12 feet. Backfilled with bentonite. Groundwater at 4 feet bgs.	

NOTES:

URS

LOG OF BORING UG-11

FIGURE G 11

LOG OF BORING NO. UG-12

PROJECT: **California Street Overcrossing**
PROJECT NO: **04333-041-189**
PROJECT LOCATION: **Everett, WA**
CLIENT NAME: **Port of Everett**
DATE STARTED: **September 26, 2000**
DATE COMPLETED: **September 26, 2000**
DRILLING CONTRACTOR: **Cascade Drilling**
DRILLER:
DRILLING METHOD: **Geoprobe**
SAMPLING METHOD: **Geoprobe**

WATER LEVEL: ▼ **4.00 ft**
ELEVATION: **18 ft**
TOTAL DEPTH : **12.00 ft**
WEATHER:
FIELD ENGINEER: **B. Strickler**
CHECKED BY: **M. McCabe**

SAMPLE TYPE KEY:

■	Relatively undisturbed sample	B	Bag Sample
☒	Disturbed sample	⊥	Pocket Penetrometer
○	Sample attempt with no recovery	V	Vane Shear (psf)
◪	SPT split spoon sample		

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						18	0				
					☒			SP	▒	Brown sand with trace silt and gravel. No odor.	PID = 0 ppm
							▼		▒		
					☒	13	5		▒	Some wood fragments.	PID = 0 ppm
					☒				▒		PID = 0 ppm
					☒	8	10		▒		PID = 0 ppm
								PT	═	Woody peat	
								SP	▒	Brown sand with trace silt and gravel.	
										End of boring at 12 feet. Groundwater at 4 feet bgs. Backfilled with bentonite.	

NOTES:

URS

LOG OF BORING UG-12

FIGURE G 12

URS

SOIL BORING AND WELL INSTALLATION DATA SHEET

Boring ID: JP-1/JP-1a

Project Information

Page 1 of 1

Project Name:	California Street Overcrossing	Location:	California St and Federal Ave
Project/Task No.:	53-04333041.00 00056	Weather:	sunny, 60F

Drilling Information

Date Started:	Thursday, June 21, 2001			Annulus Diameter:	2 inches
Date Completed:	Thursday, June 21, 2001			Hammer Weight and Drop:	NA lbs and NA inches
Drilled By:	Kasey Goble	of	Cascade Drilling	Sampler Type:	3' stainless steel split spoon
Logged By:	Kate Pineo	of	URS	Approximate Surface Elevation:	NA feet
Checked By:	Dave Raubvogel	of	URS	Groundwater Level:	4 below ground surface
Drilling Method:	Direct Push			Total Depth:	13 below ground surface
Drill Rig Type:	Truck-mounted GeoProbe			Backfill Material:	bentonite chips, asphalt patch

Well Installation Data

Type of Well Casing:	NA	Top of PVC Elevation:	NA
Screen Perforation:	NA	Type/Thickness of Seals:	NA
Diameter of Well:	NA	Type of Sand Pack:	NA
Screened Interval:	NA		

Depth (feet)	Blows per 6 inches	Penetration/ Recovery (inches)	Time	USCS Classification	USCS Graphic	Material Description	Well Completion Diagram	PID Readings (ppm)	Samples	Remarks
0						Asphalt, gravel road base.				
1										
		36/24		SM	▥	Gray to brown Silt and fine Sand, some very angular fine Gravel, dry.		16.1	JP1/1.5-4.5	Began sampling at 1.5'.
2				SP	●	Gray medium to coarse sand, mottled, moist.				
3										
				ML	▥	Gray Silt and Clay, wood debris, moist. Grading brown.				
4										
		36/27	8:15	SM	▥	Brown fine Sand and Silt, wet.		45	JP1/4.5-7.5	
5										
				ML	▥	Brown Silt and Clay, wet.				
6										
7										
		36/36	8:30	SM	▥	Brown Sand and Silt with silty clay interbeds, grading black.		15	JP1/7.5-10	
8										
9										
10		36/12	8:45	SP	●	Brown medium to coarse Sand, medium soft, mottled, wet.		5		Refusal at 10' bgs. Moved 6.5' west and sampled 10 - 13'.
11										
12										
13						BORING COMPLETED AT 13'				
14										
15										
16										
17										
18										
19										
20										

NOTES:

Groundwater level measured down-hole with water level indicator.

PID screening on black soil at 10' bgs = 14 ppm.

Sampled groundwater JP1/GW at 8:30. Slow recharge, very clear water.

Slight organic odor in 10 - 13' sample. Not collected for analysis.

URS

SOIL BORING AND WELL INSTALLATION DATA SHEET

Boring ID: JP-2

Page 1 of 1

Project Information

Project Name:	California Street Overcrossing	Location:	California St and Federal Ave
Project/Task No.:	53-04333041.00 00056	Weather:	sunny, 60F

Drilling Information

Date Started:	Thursday, June 21, 2001			Annulus Diameter:	2 inches
Date Completed:	Thursday, June 21, 2001			Hammer Weight and Drop:	NA lbs and NA inches
Drilled By:	Kasey Goble	of	Cascade Drilling	Sampler Type:	3' stainless steel split spoon
Logged By:	Kate Pineo	of	URS	Approximate Surface Elevation:	NA feet
Checked By:	Dave Raubvogel	of	URS	Groundwater Level:	2.3 below ground surface
Drilling Method:	Direct Push			Total Depth:	6 below ground surface
Drill Rig Type:	Truck-mounted GeoProbe			Backfill Material:	bentonite chips

Well Installation Data

Type of Well Casing:	NA	Top of PVC Elevation:	NA
Screen Perforation:	NA	Type/Thickenss of Seals:	NA
Diameter of Well:	NA	Type of Sand Pack:	NA
Screened Interval:	NA		

Depth (feet)	Blows per 6 inches	Penetration/ Recovery (inches)	Time	USCS Classification	USCS Graphic	Material Description	Well Completion Diagram	PID Readings (ppm)	Samples	Remarks
0		36/24	9:15	ML	▨	Brown Silt and Clay, some fine Gravel, dry.		0	JP2/0-3	
1				SM	▥	Fine Sand and Silt, some fine Gravel, wet.		0	JP2/3-6	
2										
3		36/24	9:15			Grading brown fine to coarse Sand and fine Gravel, some Silt.				
4						Grading brown-gray fine Sand and Silt, some fine to coarse Gravel.				
5						Black fine Sand, saturated.				
6						BORING COMPLETED AT 6'				
7										
8										
9										

NOTES:

Groundwater level measured down-hole with water level indicator.

URS

SOIL BORING AND WELL INSTALLATION DATA SHEET

Boring ID: JP-3

Page 1 of 1

Project Information

Project Name:	California Street Overcrossing	Location:	California St and Federal Ave
Project/Task No.:	53-04333041.00 00056	Weather:	sunny, 60F

Drilling Information

Date Started:	Thursday, June 21, 2001	Annulus Diameter:	2 inches
Date Completed:	Thursday, June 21, 2001	Hammer Weight and Drop:	NA lbs and NA inches
Drilled By:	Kasey Goble of Cascade Drilling	Sampler Type:	3' stainless steel split spoon
Logged By:	Kate Pineo of URS	Approximate Surface Elevation:	NA feet
Checked By:	Dave Raubvogel of URS	Groundwater Level:	2.5 below ground surface
Drilling Method:	Direct Push	Total Depth:	6 below ground surface
Drill Rig Type:	Truck-mounted GeoProbe	Backfill Material:	bentonite chips

Well Installation Data

Type of Well Casing:	NA	Top of PVC Elevation:	NA
Screen Perforation:	NA	Type/Thickenss of Seals:	NA
Diameter of Well:	NA	Type of Sand Pack:	NA
Screened Interval:	NA		

Depth (feet)	Blows per 6 inches	Penetration/ Recovery (inches)	Time	USCS Classification	USCS Graphic	Material Description	Well Completion Diagram	PID Readings (ppm)	Samples	Remarks
0		36/30	10:00	GP	∴	Brown fine to medium Sand and fine Gravel, dry.		8.5	JP3/0-3	
				ML	▨	Brown-gray Silt and Clay, some fine Gravel, damp.				
1										
2										
3		36/36	10:00	SM	▥	Brown fine Sand and Silt, wet.		6	JP3/3-6	
4										
5										
6						BORING COMPLETED AT 6'.				
7										
8										
9										

NOTES:

Groundwater level measured down-hole with water level indicator.

URS

SOIL BORING AND WELL INSTALLATION DATA SHEET

Boring ID: JP-4

Page 1 of 1

Project Information

Project Name:	California Street Overcrossing	Location:	California St and Federal Ave
Project/Task No.:	53-04333041.00 00056	Weather:	sunny, 60F

Drilling Information

Date Started:	Thursday, June 21, 2001			Annulus Diameter:	2 inches
Date Completed:	Thursday, June 21, 2001			Hammer Weight and Drop:	NA lbs and NA inches
Drilled By:	Kasey Goble	of	Cascade Drilling	Sampler Type:	3' stainless steel split spoon
Logged By:	Kate Pineo	of	URS	Approximate Surface Elevation:	NA feet
Checked By:	Dave Raubvogel	of	URS	Groundwater Level:	2 below ground surface
Drilling Method:	Direct Push			Total Depth:	10 below ground surface
Drill Rig Type:	Truck-mounted GeoProbe			Backfill Material:	bentonite chips

Well Installation Data

Type of Well Casing:	NA	Top of PVC Elevation:	NA
Screen Perforation:	NA	Type/Thickenss of Seals:	NA
Diameter of Well:	NA	Type of Sand Pack:	NA
Screened Interval:	NA		

Depth (feet)	Blows per 6 inches	Penetration/ Recovery (inches)	Time	USCS Classification	USCS Graphic	Material Description	Well Completion Diagram	PID Readings (ppm)	Samples	Remarks
0		36/24	10:30	GP		Brown-gray fine Sand and Gravel, dry		280 - 300	JP4/0-3	Odor.
				SM		Gray fine Sand and Silt, some fine Gravel, dark gray ash/sinder layer, dry.				
1										
2										
						Grading brown fine Sand and Silt, little coarse Gravel.				
3		36/12	10:45	SP		Brown fine to coarse SAND, little coarse Gravel, wet.		270	JP4/3-6	Odor.
4										
5										
6						No sample collected.				
7										
8		24/7	10:50	SM		Gray medium Sand and Silt, wet. Red-brown wood debris noted.		5.3	JP4/8-10	
9										
						BORING COMPLETED AT 10'.				

NOTES:

Groundwater level measured down-hole with water level indicator.
Groundwater sample JP4/GW collected at 10:50.

URS

SOIL BORING AND WELL INSTALLATION DATA SHEET

Boring ID: JP-5

Page 1 of 1

Project Information

Project Name:	California Street Overcrossing	Location:	California St and Federal Ave
Project/Task No.:	53-04333041.00 00056	Weather:	sunny, 60F

Drilling Information

Date Started:	Thursday, June 21, 2001	Annulus Diameter:	2 inches
Date Completed:	Thursday, June 21, 2001	Hammer Weight and Drop:	NA lbs and NA inches
Drilled By:	Kasey Goble of Cascade Drilling	Sampler Type:	3' stainless steel split spoon
Logged By:	Kate Pineo of URS	Approximate Surface Elevation:	NA feet
Checked By:	Dave Raubvogel of URS	Groundwater Level:	2 below ground surface
Drilling Method:	Direct Push	Total Depth:	6 below ground surface
Drill Rig Type:	Truck-mounted GeoProbe	Backfill Material:	bentonite chips

Well Installation Data

Type of Well Casing:	NA	Top of PVC Elevation:	NA
Screen Perforation:	NA	Type/Thickenss of Seals:	NA
Diameter of Well:	NA	Type of Sand Pack:	NA
Screened Interval:	NA		

Depth (feet)	Blows per 6 inches	Penetration/ Recovery (inches)	Time	USCS Classification	USCS Graphic	Material Description	Well Completion Diagram	PID Readings (ppm)	Samples	Remarks
0		36/36	11:05	SM	▥	Light gray fine Sand and Silt, some coarse Gravel, dry.		4.3	JP5/0-3	
1				ML	▦	Dark gray SILT and coarse Gravel				
		36/22	11:10	SM	▥	Brown dense fine Sand and Silt, wet, grading gray.		1.5		
2										
3						Grading brown.		5.3	JP5/3-6	
4										
5										
				SP	⁙	Black fine to medium Sand and Gravel.				
6						BORING COMPLETED AT 6'.				
7										
8										
9										

NOTES:

Groundwater level measured down-hole with water level indicator.

URS

SOIL BORING AND WELL INSTALLATION DATA SHEET

Boring ID: JP-6

Page 1 of 1

Project Information

Project Name:	California Street Overcrossing	Location:	California St and Federal Ave
Project/Task No.:	53-04333041.00 00056	Weather:	sunny, 60F

Drilling Information

Date Started:	Thursday, June 21, 2001			Annulus Diameter:	2 inches
Date Completed:	Thursday, June 21, 2001			Hammer Weight and Drop:	NA lbs and NA inches
Drilled By:	Kasey Goble	of	Cascade Drilling	Sampler Type:	3' stainless steel split spoon
Logged By:	Kate Pineo	of	URS	Approximate Surface Elevation:	NA feet
Checked By:	Dave Raubvogel	of	URS	Groundwater Level:	2 below ground surface
Drilling Method:	Direct Push			Total Depth:	9 below ground surface
Drill Rig Type:	Truck-mounted GeoProbe			Backfill Material:	bentonite chips

Well Installation Data

Type of Well Casing:	NA	Top of PVC Elevation:	NA
Screen Perforation:	NA	Type/Thickenss of Seals:	NA
Diameter of Well:	NA	Type of Sand Pack:	NA
Screened Interval:	NA		

Depth (feet)	Blows per 6 inches	Penetration/ Recovery (inches)	Time	USCS Classification	USCS Graphic	Material Description	Well Completion Diagram	PID Readings (ppm)	Samples	Remarks
0		36/24	11:50	SM		Gray-brown fine Sand and Silt, some coarse Gravel, mottled, dry.		4.3	JP5/0-3	
1										
2										
3		36/6	11:50			Grading wet.		14		Poor recovery.
4										
5										
6		36/18	11:50			Grading peat noted.		1.5	JP5/6-9	
7										
8										
9						BORING COMPLETED AT 9'.				

NOTES:

Groundwater level measured down-hole with water level indicator.

URS

SOIL BORING AND WELL INSTALLATION DATA SHEET

Boring ID: JP-7

Project Information

Page 1 of 1

Project Name:	California Street Overcrossing	Location:	California St and Federal Ave
Project/Task No.:	53-04333041.00 00056	Weather:	sunny, 60F

Drilling Information

Date Started:	Thursday, June 21, 2001	Annulus Diameter:	2 inches
Date Completed:	Thursday, June 21, 2001	Hammer Weight and Drop:	NA lbs and NA inches
Drilled By:	Kasey Goble of Cascade Drilling	Sampler Type:	3' stainless steel split spoon
Logged By:	Kate Pineo of URS	Approximate Surface Elevation:	NA feet
Checked By:	Dave Raubvogel of URS	Groundwater Level:	2 below ground surface
Drilling Method:	Direct Push	Total Depth:	9 below ground surface
Drill Rig Type:	Truck-mounted GeoProbe	Backfill Material:	bentonite chips

Well Installation Data

Type of Well Casing:	NA	Top of PVC Elevation:	NA
Screen Perforation:	NA	Type/Thickenss of Seals:	NA
Diameter of Well:	NA	Type of Sand Pack:	NA
Screened Interval:	NA		

Depth (feet)	Blows per 6 inches	Penetration/ Recovery (inches)	Time	USCS Classification	USCS Graphic	Material Description	Well Completion Diagram	PID Readings (ppm)	Samples	Remarks
0		36/30		SM		Light brown fine Sand and Silt, some fine Gravel, dry.				Odor.
								75	JP7/1-2	
1						Grading dark gray.		20	JP7/2-3	
2				SP		Brown fine to medium Sand, little coarse Gravel, wet.				
3		36/0								No recovery.
4										
5										
6		36/24	12:20			Grading brown fine to medium Sand.		9	JP7/6-9	
7										
8										
9						BORING COMPLETED AT 9'.				

NOTES:

Groundwater level measured down-hole with water level indicator.
Groundwater sample JP7/GW collected at 12:20.

ERI ENVIRONMENTAL RESOLUTIONS, INC.

Project No.: 31174 Boring: MW20 Plate: 1 OF 1
Site: Former Mobil Oil Terminal 46-108 Date: 07/03/02
Drill Contractor: Cascade Drilling, Inc. of Woodinville, WA
Sample Method: None Geologist: Antonio Luna
Drill Rig: CME-55 Bore Hole Diameter: 8" Signature:
Location: Southwest corner of property
in gravel next to Federal Avenue. Registration:
Logged by: Antonio Luna

DEPTH (ft)	BLOW COUNTS	PID/OVM (ppm)	SAMPLE	COLUMN	USCS	GEOLOGIC DESCRIPTION	WELL DESIGN
						Removed steel well and point, backfilled with bentonite, capped with 1 foot of cement	
5						Total depth, 5 feet below ground surface	

Casing Diameter: N/A , Slot Size: N/A , Sand Size: N/A , Grout: N/A

EN ENVIRONMENTAL RESOLUTIONS, INC.

Project No.: 31174 Boring: MW21 Plate: 1 OF 1
Site: Former Mobil Oil Terminal 46-108 Date: 07/03/02
Drill Contractor: Cascade Drilling, Inc. of Woodinville, WA

Sample Method: None Geologist: Antonio Luna
Drill Rig: CME-55 Bore Hole Diameter: 10" Signature:
Location: Southwest corner of property Registration:
in gravel next to Federal Avenue. Logged by: Antonio Luna

DEPTH (ft)	BLOW COUNTS	PID/OVM (ppm)	SAMPLE	COLUMN	USCS	GEOLOGIC DESCRIPTION	WELL DESIGN
						Removed schedule 40 PVC well casing, overdrilled to remove seal and sand pack, backfilled with bentonite, capped with 1 foot of cement	
5							
						Total depth, 6 feet below ground surface	

Casing Diameter: N/A, Slot Size: N/A, Sand Size: N/A, Grout: N/A

ENVIRONMENTAL RESOLUTIONS, INC.

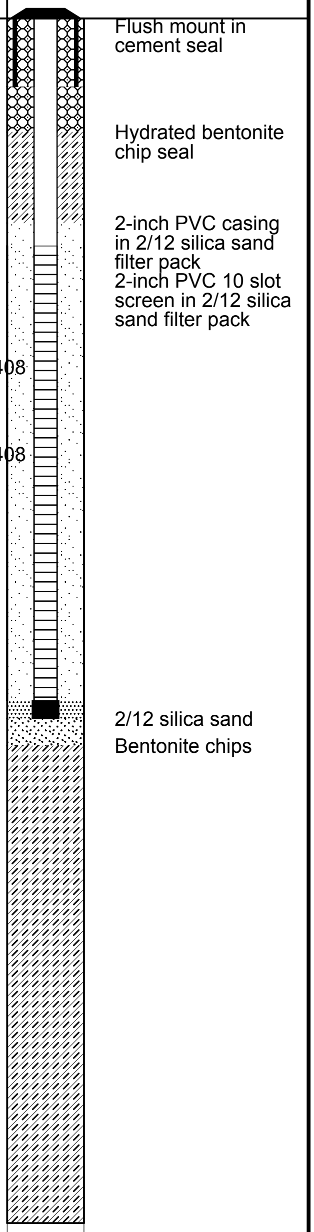
Project No.: 31174 Boring: Unknown Plate: 1 OF 1
Site: Former Mobil Oil Terminal 46-108 Date: 07/03/02
Drill Contractor: Cascade Drilling, Inc. of Woodinville, WA
Sample Method: None Geologist: Antonio Luna
Drill Rig: CME-55 Bore Hole Diameter: 10" Signature:
Location: Southwest corner of property in gravel next to Federal Avenue. Registration:
Logged by: Antonio Luna

DEPTH (ft)	BLOW COUNTS	PID/OVM (ppm)	SAMPLE	COLUMN	USCS	GEOLOGIC DESCRIPTION	WELL DESIGN
						Well overdrilled to remove well casing, seal, and sand pack, backfilled with bentonite, capped with 1 foot of cement	
5							
						Total depth, 6 feet below ground surface	

Casing Diameter: N/A , Slot Size: N/A , Sand Size: N/A , Grout: N/A

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING
0			Surface: 0.2 feet of asphalt over 1.6 feet of gray fine to medium angular gravel (crushed rock base course) A vac-truck was utilized from 0 to 5 feet below the ground surface to ensure utilities were cleared.					
5		SP-SM	Medium dense, moist, brown, fine to coarse SAND wtih some silt and trace fine gravel		22	0.0		
			Moist to wet, wood; possibly a large block				▼	
		SP	Loose, wet, brown, fine to medium SAND with trace silt and petroleum odor Becomes saturated and gray at 8.3 feet Water appeared viscus and sediments appeared to have a metalic luster from 8.3 to 9 feet Becomes medium dense at 9.5 feet		6	0.0	▽	A1_S-1_020408 Sheen Test None Observed A1_S-2_020408
10			Becomes gray and brown, with some fine gravel and trace silt and no odor observed at 10.4 feet Cobbel in sampler shoe		21	0.0		
		GP-GM	Medium dense, saturated, dark gray, fine GRAVEL with some fine to medium sand and silt, light to medium sheen			0.0		
		SP	Medium dense, saturated, gray fine to medium SAND with trace silt and fine gravel and occasional organics (wood splinters) Approximatley 0.01 foot thick layers of wood splinters at 13, 14, and 15 feet		16			Sheen Test Light Observed
15			Becomes loose, with petroleum odor and no visible gravel at 14.5 feet		14	0.0		
			Approximatley 0.1 foot thick layer of stiff, moist, brown, SILT with numerous organics / organic SILT (plant fragments, wood fibers, roots) at 18 feet		14	0.0		Sheen Test Light Observed
20					24	0.0		Sheen Test None Observed
					20	0.0		
		ML	Very stiff, moist, brown, SILT with trace fine to coarse sand and numerous organics / organic SILT with trace fine to coarse sand					
25			Becomes with occasional organics (roots) at 25 feet		17	0.0		
		SP	Medium dense, saturated, gray, fine to medium SAND with trace silt					
			Exploration terminated at 26.5 feet below the existing ground surface.					
30								

WELL SCHEMATIC



BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG: CME

CONTRACTOR: Cascade Drilling, Inc./Scott

LOGGED BY: LME

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

START CARD/TAG ID: /BAB238

DRILLING DATES: 02/04/2008 - 02/04/2008

REMARKS:

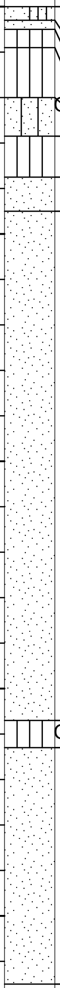
ExxonMobil / American Distributing Company

7-915-15716-B

AMEC Earth and Environmental, Inc.
11335 NE 122nd Way, Suite 100
Kirkland, Washington
USA 98034
Tel (425) 820-4669
Fax (425) 821-3914

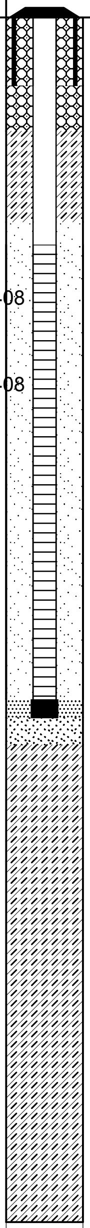
LOG OF BORING MWA1

USCS SYMBOL	SOIL DESCRIPTION
	Surface: moist, dark gray, angular fine to medium gravel (crushed rock) A vac-truck was utilized from 0 to 5 feet below the ground surface to ensure utilities were cleared. Approximatley 2 feet of wood with creosote odor (appeared to be blocks of wood treated with creosote)
SP-SM	Very loose, moist, black, fine to medium SAND with some silt and numerous organics (wood splinters)
SP	Very loose, moist, brown, fine to medium SAND with trace silt
ML	Stiff, wet to saturated, blue-gray, sandy SILT with slight petroleum odor and light sheen
OL/ML	Stiff, moist, dark brown to black, organic SILT / SILT with numerous organics (roots, plant fragments) and petroleum odor
SM	Loose, wet to saturated, silty, fine to medium SAND with trace fine gravel and petroleum odor and light sheen
ML	Stiff, moist, brown, SILT with some clay and numerous organics (roots)
SP	Loose, moist to wet, gray, fine to medium SAND with trace silt and scattered organics (roots)
SP	Medium dense, saturated, gray, fine to medium SAND with trace silt Becomes with occasional organics (roots, plant fragments) at 15 feet Tip of sampler shoe contained wet, brown, organic SILT / SILT with numerous organics (roots, plant fragments)
OL/ML	Stiff, moist, brown, organic stratified SILT with some clay and trace fine to medium sand / stratified SILT with some clay and trace fine to medium sand and numerous organics (roots, plant fragments)
SP	Medium dense, saturated, gray, fine to medium SAND with trace silt and occasional organics (roots, plant fragments) Becomes no visible organics at 22 feet
	Exploration terminated at 26.5 feet below the existing ground surface.



DEPTH (ft bgs)	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING
5	5	0.0	▼	A2_S-1_020408 Sheen Test Light
	11	0.0	▽	Observed A2_S-2_020408
10	25	0.0		Sheen Test None Observed
	17	0.0		
15	11	0.0		Sheen Test None Observed
	14	0.0		
20	16	0.0		Sheen Test None Observed
	25	0.0		
25	25	0.0		Sheen Test None Observed

WELL SCHEMATIC



BORING METHOD: HSA
BOREHOLE DIAMETER: 8 (in)
DRILL RIG: CME
CONTRACTOR: Cascade Drilling, Inc./Scott
LOGGED BY: LME

ELEVATION REFERENCE: NA
GROUND SURFACE ELEVATION: NA
CASING ELEVATION: NA
START CARD/TAG ID: /BAB237
DRILLING DATES: 02/04/2008 - 02/04/2008

REMARKS:

ExxonMobil / American Distributing Company

7-915-15716-B

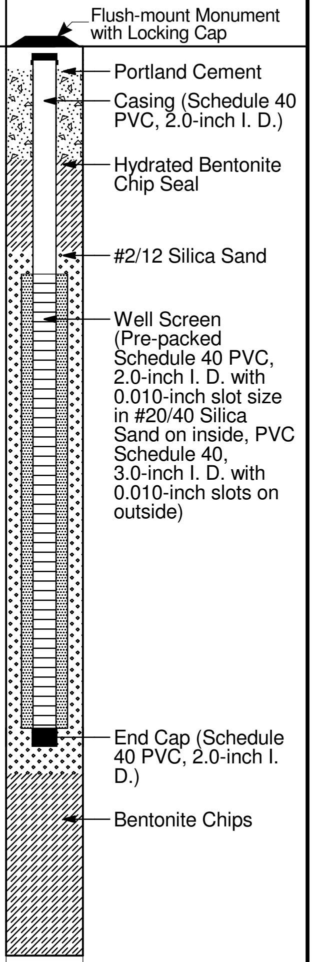
AMEC Earth and Environmental, Inc.
11335 NE 122nd Way, Suite 100
Kirkland, Washington
USA 98034
Tel (425) 820-4669
Fax (425) 821-3914

LOG OF BORING
MWA2

AGENCY DRAFT

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING
0		Asphalt.				
	SM	Gray, silty SAND (SM) with gravel (Fill).				
5	SM	Medium dense, slightly moist, gray, fine to coarse, silty SAND (SM) with some gravel; no discoloration, no odor.	17	1.6		MWA3-5'
10	SP	Medium dense, wet, gray, fine to coarse SAND (SP) with some gravel and abundant white shells, some organics (wood); no discoloration, no odor, no sheen.	12	1.3	▽	MWA3-10' TPH-D = 791
15	SM	Medium dense, wet, gray, fine to coarse, silty SAND (SM) with trace subrounded to subangular gravel; no discoloration, no odor.	18	1.0		MWA3-15'
20	SP	Very dense, wet, gray, medium to coarse SAND (SP) with some silt, some shells, trace gravel; no discoloration, no odor.	50/6"	1.2		MWA3-20'
		Boring terminated at 20 feet bgs.				
25						
30						

WELL SCHEMATIC



BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG: NA

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

START CARD/TAG ID: /BCM 305

DRILLING DATES: 6/23/2010 - 6/24/2010

REMARKS:

Air knife to 4 feet bgs for utilities clearance.

D&M sampler; field density is approximate.

ENVR+WELL BORING 1-915-15716E.02LS.GPJ AMEC PORTLAND.GDT 3/31/11

ExxonMobil / American Distributing Company

1-915-15716E

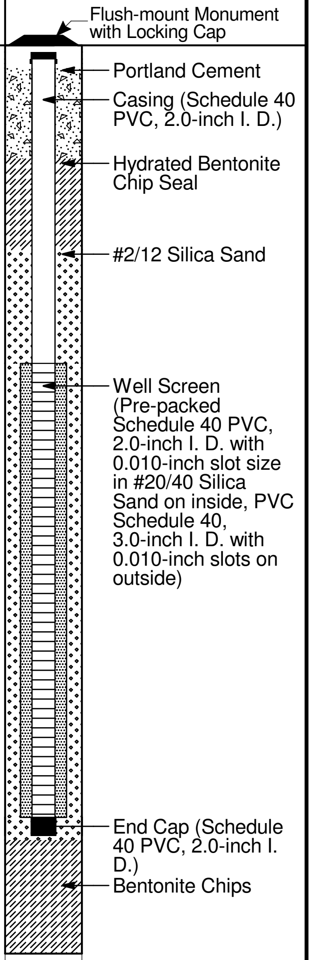
AMEC Earth and Environmental, Inc.
600 University Street, Suite 1020
Seattle, Washington
USA 98101
Tel (206) 342-1760
Fax (206) 342-1761

LOG OF BORING MW-A3

AGENCY DRAFT

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING
0	SM	Asphalt (0.3 feet). Silty SAND (SM) with gravel (Fill).					
5	SM	Medium dense, slightly moist, gray, fine to coarse, silty SAND (SM) with some gravel; no discoloration, no odor.	▬	16	4.3		▬ MW-A4-5'
10		Moist to wet; no discoloration, no odor, no sheen.	▬	21	4.5		▬ MW-A4-10'
						∇	
15		Same as above. wood (< 1 inch); petroleum hydrocarbon-like odor.	▬	26	6.7		▬ MW-A4-15'
							TPH-D = 667; TPH-O = 515
20	SP	Medium dense, wet, gray, medium to coarse SAND (SP) with some silt and gravel, some organics (wood), abundant shells; no discoloration, no odor.	▬	26	4.6		▬ MW-A4-20'
		Boring terminated at 20 feet bgs.					
25							
30							

WELL SCHEMATIC



BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG: NA

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

START CARD/TAG ID: /BCM 306

DRILLING DATES: 6/22/2010 - 6/24/2010

REMARKS:

Air knife to 4 feet bgs for utilities clearance.

D&M sampler; field density is approximate.

ExxonMobil / American Distributing Company

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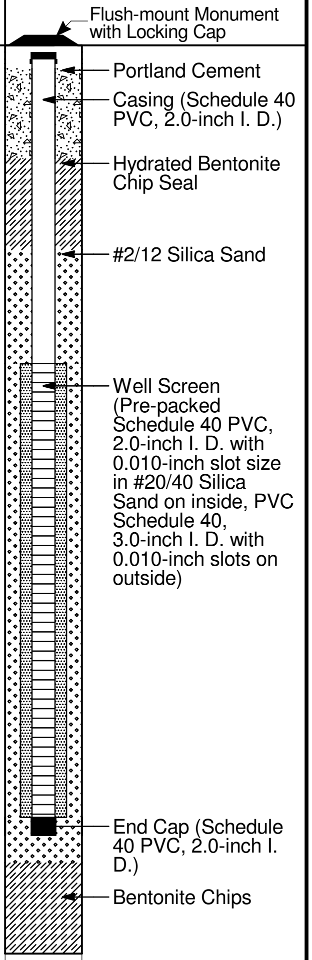
LOG OF BORING MW-A4

AGENCY DRAFT

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING
0		Asphalt.				
	SM	Gray, fine to coarse, silty SAND (SM) with gravel. (Logged from cuttings.)				
5	SP-SW	Very dense, slightly moist, gray, medium to coarse SAND (SP/SW) with silt and coarse gravel; no discoloration, no odor.	65	3.6		MWA5-5'
10	SP	Dense, moist to wet (bottom of sampler), gray, medium to coarse SAND (SP) with some fine sand with gravel; no discoloration, no odor.	17	11		MWA5-10'
					▽	
15		Very dense, wet, gray, fine to coarse SAND (SP) with silt, trace gravel.	67	3.2		MWA5-15' TPH-D = 2,800; TPH-O = 523
20		Becomes coarse SAND (SP) with fine sand, some silt, trace gravel.	50/2"	3.5		MWA5-20'
		Boring terminated at 20 feet bgs. Tide is 2 feet above MSL.				
25						
30						

WELL SCHEMATIC



BORING METHOD: HSA
BOREHOLE DIAMETER: 8 (in)
DRILL RIG: NA
CONTRACTOR: Cascade Drilling, Inc.
LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA
GROUND SURFACE ELEVATION: NA
CASING ELEVATION: NA
START CARD/TAG ID: /BCM 301
DRILLING DATES: 6/23/2010 - 6/24/2010

REMARKS:
Air knife to 4 feet bgs for utilities clearance.
D&M sampler; field density is approximate.

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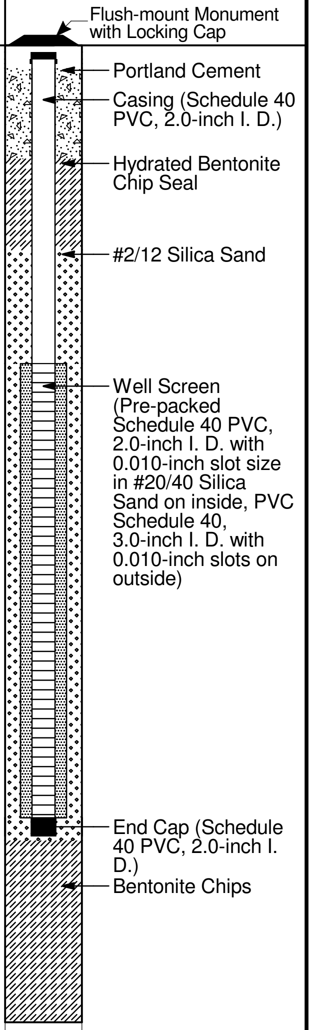
LOG OF BORING MW-A5

AGENCY DRAFT

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING
0	SM	Asphalt (0.3 feet).					
5		Dense, moist, gray, fine to medium, silty SAND (SM), some gravel, bricks, burnt wood (Fill); no discoloration, no odor, no sheen.	▬	41	1.5		▬ MWA6-5'
10		Cobble; drilled through.					
		Same as above; petroleum hydrocarbon-like odor, some sheen.	▬	26	2.2	▽	▬ MWA6-12'
15	SM	Medium dense, wet, gray, fine, silty SAND (SM) with coarse sand and silt lenses (< 2 inches), abundant organics (wood chips < 1 inch).	▬	12			▬ MWA6-15 TPH-D = 1,500
20	SP	Laminated peat to silty SAND to SILT (PT/SM/ML) at 20 feet bgs. Medium dense, wet, gray, fine to medium SAND (SP) with wood in shoe; petroleum hydrocarbon-like odor, ~15% sheen.	▬	9	2.8		▬ MWA6-20'
		Boring terminated at 21.5 feet bgs.					
25							
30							

WELL SCHEMATIC



BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG: NA

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

START CARD/TAG ID: /BCM 304

DRILLING DATES: 6/25/2010

REMARKS:

Air knife to 4 feet bgs for utilities clearance.

D&M sampler; field density is approximate.

ExxonMobil / American Distributing Company

1-915-15716E

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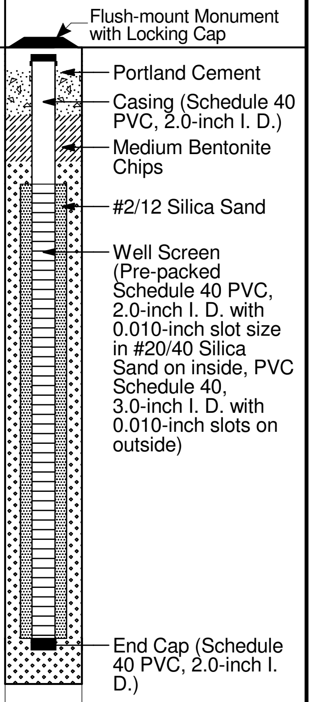
LOG OF BORING MW-A6

AGENCY DRAFT

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING	WELL SCHEMATIC
0			No samples collected, for lithology descriptions refer to MW-7AB boring log.						
5									
10									
15			Boring terminated at 15 feet bgs.						
20									
25									
30									



BORING METHOD: HSA
BOREHOLE DIAMETER: 8 (in)
DRILL RIG: Hollow Stem Auger
CONTRACTOR: Cascade Drilling, Inc.
LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA
GROUND SURFACE ELEVATION: NA
CASING ELEVATION: NA
START CARD/TAG ID: /BLT 570
DRILLING DATES: 12/2/2010

REMARKS:

ExxonMobil / American Distributing Company

1-915-15716E

AMEC Earth and Environmental, Inc.
600 University Street, Suite 1020
Seattle, Washington
USA 98101
Tel (206) 342-1760
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LOG OF BORING
MW-A7

AGENCY DRAFT

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
0	SP	Surface: 0.3 feet of asphalt over 0.5 feet asphalt base. Wet, olive-brown, medium to coarse SAND (SP) with some fine sand and silt; no discoloration, no odor.		61	▽		MW-7A-1 11/30/10
		Very loose.	2	3.2 - 6.1			S-1
		Becomes fine to coarse SAND (SP).	2				S-2
5			2	12			S-3
		No recovery. Driller reports very loose SAND.	0				
		No recovery.	0				
10	SM	Very loose, wet, olive to brown, fine to coarse, silty SAND (SM), organics.	10				S-5
	SM-SP	Medium dense, wet, yellow to yellow-brown, fine to coarse, silty SAND (SM/SP), trace gravel.	19	23 - 30			MW-7AB-12 12/1/10 S-6
		Sand increases.	25	80			S-7
			42	7.0			S-8
15	SM	Dense, wet, brown to olive-brown, fine to coarse, silty SAND (SM); no discoloration, no odor.					
		Becomes, moist, iron oxidation discoloration, approximately 1 foot heave.	26	1.3			S-9
			17	2.5			S-10
	SM	Medium dense, wet, orange-brown, fine, silty SAND (SM), trace gravel.					
20	SM-ML	Medium dense, moist, gray to olive-gray, fine, silty SAND to SILT (SM/ML) with iron oxidation discoloration.	18				S-11
				4.4			S-12 (Shelby)
	ML	Soft, gray SILT (ML).					
	ML	Stiff, moist, olive-gray SILT (ML) with brown, fine organics.	63	0.0			S-13
25	SP	Very dense, wet, olive, fine to coarse SAND (SP) with some silt, trace gravel, micaceous; no discoloration, no odor.	94				S-14
		Gravel increases in last 6 inches of sampler shoe.	56	1.5 - 2.5			S-15
		Becomes with gravel.	50/6"	7.0			S-16
		Becomes with trace gravel. Lenses of moist, brown, silty SAND (SM) with brown, very fine organics (approximately 4 inches thick).	50/5"				S-17
30							

BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG: Hollow Stem Auger

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 11/30/2010 - 12/1/2010

REMARKS:
Cleared to 5 feet bgs with hand auger and vacuum truck.

ExxonMobil / American Distributing Company

1-915-15716E

AMEC Earth and Environmental, Inc.
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Seattle, Washington
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Tel (206) 342-1760
Fax (206) 342-1761

LOG OF BORING MW-7AB

AGENCY DRAFT

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
30		SP-SM	Very dense, wet, olive, fine to coarse SAND (SP/SM) with silt and silty sand; no discoloration, no odor. No samples collected due to reported heave.		0 0 50/5"	NA			▪ S-18
35			Boring terminated at 35.5 feet bgs; backfilled with bentonite slurry via tremmie pipe.						
40									
45									
50									
55									
60									

BORING METHOD: HSA	**ELEVATION REFERENCE:** NA	**REMARKS:** Cleared to 5 feet bgs with hand auger and vacuum truck.
BOREHOLE DIAMETER: 8 (in)	**GROUND SURFACE ELEVATION:** NA	
DRILL RIG: Hollow Stem Auger	**CASING ELEVATION:** NA	
CONTRACTOR: Cascade Drilling, Inc.		
LOGGED BY: A.Speransky	**DRILLING DATES:** 11/30/2010 - 12/1/2010	

ENVIRONMENTAL BORING 1-915-15716E.02LS.GPJ AMEC PORTLAND.GDT 3/31/11

ExxonMobil / American Distributing Company

1-915-15716E

AMEC Earth and Environmental, Inc.
600 University Street, Suite 1020
Seattle, Washington
USA 98101
Tel (206) 342-1760
Fax (206) 342-1761

LOG OF BORING MW-7AB

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
0		Asphalt (5 inches), base gravel, CAP fabric at 1 foot bgs.						
	SM	Silty SAND (SM), wood waste; petroleum hydrocarbon-like odor from 1 to 4 feet bgs.			60			
					61			
	SM	Medium dense, moist, fine to coarse, silty SAND (SM) with gravel; gray discoloration, strong petroleum hydrocarbon-like odor.			50			S-1
5				23		▽		
					80			S-2
		Becomes loose; gray discoloration, strong petroleum hydrocarbon-like odor.		4				
		Becomes olive-gray; some odor.			19			S-3
				16				
					7.0			S-4
				8				
10	SM	Medium dense, wet, dark brown, fine to coarse, silty SAND with organics (decayed wood); some discoloration, slight petroleum hydrocarbon-like odor.			18			S-5
				11				
					1.5			S-6
	SP	Loose, wet, gray, fine to medium SAND (SP) with silt, some gravel and coarse sand, some fine organics.		6				
								S-7
				9	0.4			AB1-14' @1015 12/03/10
		Driller reports soft material at 14 feet bgs.						
								S-8 (Shelby)
15								
	SP-SM	Loose, wet, dark gray, fine to coarse SAND (SP/SM) with some silt to silty sand with fine organics; no discoloration, no odor.			0.1			S-9
				7				
					0.0			S-10
				7				
20	SP	Very loose, wet, gray, fine to coarse SAND (SP) with silt, fine organics and some decayed wood; no discoloration, no odor.						S-11
				2				
		Wood waste in sampler shoe.			0.0			S-12
		Becomes loose.		7				
		Becomes medium dense, with organics (fine wood).			0.0			S-13
				13				
					0.0			S-14
25				13				
								S-15
				19				AB1-27' @ 1115 12/03/10 S-16
		Decayed wood (4 inches).		14				
		Becomes very dense, gray.						S-17
30				50/6"				

BORING METHOD: HSA

BOREHOLE DIAMETER:

DRILL RIG: Hollow Stem Auger

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 6/22/2010 - 12/3/2010

REMARKS:
Air knife to 4 feet bgs for utilities clearance.

ExxonMobil / American Distributing Company

1-915-15716E

AMEC Earth and Environmental, Inc.
11810 North Creek Parkway N
Bothell, Washington
USA 98011
Tel (425) 368-1000
Fax (425) 368-1001

LOG OF BORING
AB-1

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
30		SP	Very loose, wet, gray, fine to coarse SAND (SP) with silt, fine organics and some decayed wood; no discoloration, no odor. Wood (last 6 inches of sampler).		19				■ S-18
			Wood (last 6 inches).						■ S-19
		SM	Loose, wet, olive-brown, fine to medium, silty SAND (SM) with brown, fine gravel, some dark brown, decayed organics.		8				
		SP-SM	Medium dense, wet, gray, fine to medium SAND (SP/SM) with silt to silty sand, some fine gravel.		19				
35			Boring terminated at 35 feet bgs; backfilled with bentonite slurry via tremmie pipe then patched with concrete on top.						
40									
45									
50									
55									
60									

BORING METHOD: HSA

BOREHOLE DIAMETER:

DRILL RIG: Hollow Stem Auger

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 6/22/2010 - 12/3/2010

REMARKS:
Air knife to 4 feet bgs for utilities clearance.

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LOG OF BORING AB-1

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
0		GW	Gravel surface.						
		SM	Gray, moist, fine to coarse, silty SAND (SM) with gravel (Fill); some petroleum hydrocarbon-like odor.		NA NA NA	30 21 29			
		SM	Brownish, oily discolored, silty SAND (SM), silt content increased; strong hydrocarbon-like odor.	▮	NA	61			▮ AB1A 3.5-4.5 6/22/10
5		SM	Dark brown, silty SAND (SM); free product; strong petroleum hydrocarbon-like odor.		NA	49	▽		
			Boring terminated at 5.5 feet bgs; backfilled with medium bentonite chips.						
10									
15									
20									
25									
30									

BORING METHOD: Hand Auger

BOREHOLE DIAMETER: 3 (in)

DRILL RIG:

CONTRACTOR: Cascade Drilling, Inc./AS

LOGGED BY: A.Speranksy

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 6/22/2010

REMARKS:
Air knife to 5 feet bgs, sampled using hand auger.

ENVIRONMENTAL BORING 1-915-15716E.02LS.GPJ AMEC PORTLAND.GDT 2/22/11

ExxonMobil / American Distributing Company

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LOG OF BORING
AB-1A

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
0		Asphalt (0.5 feet).					
	GW	Drain gravel. CAP fabric at 1.5 feet bgs.					
	SM	Silty SAND and GRAVEL (SM).					
	PT	Brown, gravel, sand, silt, wood waste, bricks (PT); strong organic odor.		2.5	▽		AB-2-4.5-5' 6/21/10
5	SM	Very loose, wet, brown, silty SAND (SM) with gravel, decayed organics; some organic odor, 50% sheen.	3	3.1			S-1
			1	27			S-2
	PT	Dark brown wood waste, organics, some silt and sand, very light material (PT); no sheen.	2	5.9			S-3
10			2	3.6			S-4
		Increasing sand content.		4.5			S-5 (Shelby)
	SP	Medium dense, wet, gray, fine to coarse SAND (SP) with silt, trace subrounded to subangular gravel; no discoloration, no odor.	12	0.0			S-6
15			10	0.0			S-7 AB-2-14 6/23/10, Dup 1
		Some decayed organics.	10				S-8
		Silt increases.	17				S-9
			24				S-10
20		Wood at 20.5 feet. Some organics (wood chips < 1 inch), trace gravel; no odor or sheen.	15	2.3			S-11
			28				S-12
		Becomes dense, trace organics.	40	2.7			S-13
25		No samples collected from 25 to 27 feet bgs.					
	SP	Very dense, wet, gray, fine to coarse SAND (SP) with silt, some dark brown organics (wood chips).	27	1.9			S-14
	PT	Peat (PT).					
	SP	Very dense, wet, gray, fine to coarse SAND (SP) with silt, some organics (wood chips); no odor.	62	1.5			S-15
30							

BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG:

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 6/21/2010 - 6/23/2010

REMARKS:
Air knife to 5 feet bgs for utilities clearance.

From 30 feet bgs changed to D&M sampler; field density is approximate.

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LOG OF BORING AB-2

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
30		SM	Dense, wet, brown, fine to coarse, silty SAND (SM) with organics (wood > 2 inches thick), 50% wood in sampler with some gravel. Changed to D & M sampler at 30 feet bgs. Heaving sand.		37	1.1			S-16 S-17
		SM	Dense, wet, yellow-brown, fine to medium, silty SAND (SM) with coarse sand, some gravel; no odor.		34	0.6			S-18
35		SP	Very dense, wet, olive-grey, medium to coarse SAND (SP), little to no fines, some gravel.		51				S-19
		SM	Very dense, wet, yellow-brown, fine to medium, silty SAND (SM) with coarse sand, some gravel; no odor.		65 72 50/6"	0.7			S-20 S-21
40			Boring terminated at 40 feet bgs; backfilled with medium bentonite chips and capped with concrete patch.						
45									
50									
55									
60									

BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG:

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 6/21/2010 - 6/23/2010

REMARKS:
Air knife to 5 feet bgs for utilities clearance.

From 30 feet bgs changed to D&M sampler; field density is approximate.

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LOG OF BORING
AB-2

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
0			Asphalt (5 inches); CAP fabric @ 0.5 bgs.						
		SM	Moist to wet, gray, fine to coarse, silty SAND (SM) with gravel (Fill); gray discoloration, some petroleum hydrocarbon-like odor. (Logged using a hand auger.)						
5						1.1	▽		AB3-4.5-5' 6/21/10 S-1
			Medium dense, wet, olive-gray, fine to coarse, silty SAND (SM) with gravel (Fill); no discoloration, weak petroleum hydrocarbon-like odor.		18				
						3.7			S-2
					21				
						3.7			
			Becomes loose with increased silt content.		9				
						3.3			S-3
10					5				
		SP	Very dense, wet, olive-brown SAND (SP) with silt, occasional gravel; no discoloration, no odor.			1.4			S-4
					50/1"				
		SP	Loose, wet, gray, fine to coarse SAND (SP); no discoloration, no odor.						
		PT	Wood waste (PT), some very loose, gray, silty sand and trace gravel; organic odor.			5.9			S-5
15					3				
			No recovery.						S-6 (Shelby)
			Soft material.						
20		SP	Dense, wet, olive-brown SAND (SP) with silt, gravel and some wood; no odor.			0.0			AB3-20' 6/22/10 S-7
					21				
									S-8
					24				
			Becomes olive-gray, some gravel; no discoloration, no odor.			0.0			S-9
					31				
						0.0			S-10
25					42				
			Heave; added water to hole.			0.0			S-11
					30				
			Becomes gray with occasional wood (non-decayed) and little no fines.			0.0			S-12
					64				
						0.0			S-13
30					83				

BORING METHOD: HSA

ELEVATION REFERENCE: NA

BOREHOLE DIAMETER: 8 (in)

GROUND SURFACE ELEVATION: NA

DRILL RIG:

CASING ELEVATION: NA

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A. Speransky

DRILLING DATES: 6/21/2010 - 6/22/2010

REMARKS:
Air knife and vactor truck to 5 feet bgs for utilities clearance.

At 34 feet bgs changed to D&M sampler; field density is approximate.

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LOG OF BORING AB-3

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
30		SP	Dense, wet, olive-brown SAND (SP) with silt, gravel and some wood; no odor.			0.0			S-14
			Becomes olive-gray, no organics, trace gravel and some silt.		77				
						0.0			S-15
					50/2"				S-16
			D&M sampler.		50/5"				
35									S-17
					50/5"				
			No recovery.						
		SP	Very dense, wet, yellow-brown, fine to coarse SAND (SP) with fine sand lenses stained with iron-oxide.						
					50/2"				S-18
40			Boring terminated at 40 feet bgs; backfilled with medium bentonite chips.						
45									
50									
55									
60									

BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG:

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A. Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 6/21/2010 - 6/22/2010

REMARKS:
Air knife and vactor truck to 5 feet bgs for utilities clearance.

At 34 feet bgs changed to D&M sampler; field density is approximate.

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LOG OF BORING
AB-3

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
0			Asphalt (4 inches thick), gravel base (2 inches thick), CAP fabric at 1 foot bgs.						
		SM	Moist, gray, fine to coarse, silty SAND (SM) with gravel (Fill), organics (wood chips); strong organic odor.						
5		SM	Medium dense, moist, gray, fine to coarse, silty SAND (SM) with gravel; gray discoloration, strong petroleum hydrocarbon-like odor.		18	>455			S-1
					7	>500	∇		S-2
					3				S-3
10			Wood waste, silt and sand.			3.3			S-4 (Shelby)
		PT	Medium dense, brown peat (decayed wood waste) with some silt and sand; no odor.		13	1.4			S-5
					3	7.3			S-6
15			Wood waste.		4	8.3			S-7
		SP	Medium dense, wet, gray, medium to coarse SAND (SP) with silt, trace gravel; no discoloration, no odor.		21	2.0			S-8
					24	0.0			AB4-17' 6/23/10 S-9
					12	0.0			S-10
20			Some gravel; no discoloration, no odor.		25	0.0			S-11
			Becomes fine to coarse SAND (SP); no discoloration, no odor.		22	0.0			S-12
			Becomes dense.		36	0.0			S-13
25			Becomes very dense, fine organics; no discoloration, no odor.		50	0.0			S-14
					38	0.0			S-15
			No organics; no discoloration, no odor.		50	0.0			S-16
30		SM				0.0			S-17

BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG:

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 6/21/2010

REMARKS:
Air knife to 4 feet bgs for utilities clearance.

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LOG OF BORING AB-4

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
30		SM	Dense to very dense, wet, yellow-brown, fine to medium coarse, silty SAND (SM) with trace subrounded gravel, micaceous.		61				
						0.0			S-18
			Becomes dense, olive-gray, fine, silty SAND (SM) with some medium sand.		31				
		ML	Stiff, moist, gray SILT (ML), some fine sand with clay, trace gravel, slightly plastic, iron-oxide staining.			0.0			S-19
					31				
									S-19A
		SP	Very dense, gray, fine to coarse SAND (SP), little fines; no discoloration, no odor.						S-20
35					61				
			Boring terminated at 35.5 feet bgs. Backfilled with medium bentonite chips, concrete patch at top.						
40									
45									
50									
55									
60									

BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG:

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 6/21/2010

REMARKS:
Air knife to 4 feet bgs for utilities clearance.

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LOG OF BORING
AB-4

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
0		Asphalt (6 inches thick), rock drain beneath, CAP fabric at 1 foot bgs.					
	SM	Moist, gray, silty SAND (SM) with fine to coarse gravel (Fill); strong petroleum hydrocarbon-like odor, sheen.					
				4.4			
				30			
		Becomes moist; very strong petroleum hydrocarbon-like odor; 50% sheen; oily.					
5				>100	▽		
	SM	Wet wood waste, bricks, silty SAND (SM) mixture (Fill); oily; 100% sheen.	10				■ AB5-5' 6/25/10 S-1
	SM-PT	Very loose, wet, brown, fine to coarse, silty SAND (SM), with organics (peat); 100% sheen. Trace gravel.	3	125			■ S-2
			2	400			■ S-3
		Very loose, wet, gray, silty SAND (SM), wood waste; strong petroleum hydrocarbon-like odor, 75% sheen.					
10			2	>200			■ S-4
		Wood waste, some gray sand.					
							■ S-5 (Shelby)
	PT	Becomes loose, wood waste (PT); strong petroleum hydrocarbon-like odor, sheen.	9	75.7			■ S-6
15			13	>200			■ S-7
			11	>200			■ S-8
		Very strong petroleum hydrocarbon-like odor, 100% sheen.	8	>200			■ S-9
20	SM	Medium dense, wet, gray, fine to coarse, silty SAND (SM).	11	321			■ S-10
	SP	Medium dense, wet, yellow-brown, fine to coarse SAND (SP) with silt and some organics (wood); slight petroleum hydrocarbon-like odor, 25% sheen.	12	9			■ S-11
	SM	Dense, wet, olive-brown, fine to coarse, silty SAND (SM); no discoloration, no odor.	26	3.8			■ AB5-22' 6/25/10 S-12
		Becomes loose.	9	3.5			■ S-13
25			30	4.2			■ S-14
		Becomes medium dense, trace gravel, trace organics (< 1 inch). Trace to some gravel; no discoloration, no odor.	26	3.2			■ S-15
			34	5.2			■ S-16
30		Becomes dense, fine organics.					■ S-17

BORING METHOD: HSA

BOREHOLE DIAMETER:

DRILL RIG:

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 6/25/2010

REMARKS:
Air knife to 5 feet bgs, samples collected using hand auger to 5 feet bgs. At 31 feet bgs changed to D&M sampler; field density is approximate.

ExxonMobil / American Distributing Company

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LOG OF BORING AB-5

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
30		SM	Dense, wet, olive-brown, fine to coarse, silty SAND (SM); no discoloration, no odor. Heave. D&M sampler at 31 feet bgs.		37 44				S-18
		SM	Wet. olive-brown, medium to coarse, silty SAND (SM) with some medium to coarse sand, trace subangular to subrounded gravel. No recovery.		50/4" 59				AB5-35' 6/25/10 S-19
35									
			Boring terminated at 35.5 feet bgs. Boring backfilled with medium bentonite chips and cement patch at surface.						
40									
45									
50									
55									
60									

BORING METHOD: HSA

BOREHOLE DIAMETER:

DRILL RIG:

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 6/25/2010

REMARKS:
Air knife to 5 feet bgs, samples collected using hand auger to 5 feet bgs. At 31 feet bgs changed to D&M sampler; field density is approximate.

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LOG OF BORING
AB-5

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING	WELL SCHEMATIC
0		GW	Gravel surface.						
		SM	Gray, moist, silty SAND (SM) with gravel; gray discoloration, strong petroleum hydrocarbon-like odor.	▮	NA	90		▮ AB5A 0.5-1.1'	
				▮	NA	99 >110		▮ AB5A 1.5-2.5'	
			Very strong petroleum hydrocarbon-like odor. Moist, dark brown, wood waste; oily free product, oily discoloration, strong petroleum hydrocarbon-like odor.	▮	NA	>300		▮ AB5A 3-3.5'	
				▮	NA	>1,000 >1,500		▮ AB5A 4-4.5'	
5			Becomes wet; free product.	▮	NA	700	▽	▮ AB5A 5-5.5'	
			Boring terminated at 5.5 feet bgs.						
10									
15									
20									
25									
30									

BORING METHOD: Hand Auger

BOREHOLE DIAMETER: 3 (in)

DRILL RIG: NA

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speranksy

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

START CARD/TAG ID: NA

DRILLING DATES: 6/22/2010

REMARKS:
Air knife to 5 feet bgs, sampled using hand auger.

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LOG OF BORING AB-5A

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING	WELL SCHEMATIC
0	▨		Asphalt (6 inches), gravel base, cap fabric at 1 foot bgs.						
			Brown, free product on water approximately 25%.						
			Water seeps into drain rock, impossible to vacuum. Brown, free product on water table approximately 25%.						
			Boring terminated at 3.5 feet bgs; backfilled with medium bentonite chips and capped with concrete patch.						
5									
10									
15									
20									
25									
30									

BORING METHOD: Air Knife

BOREHOLE DIAMETER:

DRILL RIG: NA

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speranksy

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

START CARD/TAG ID: NA

DRILLING DATES: 6/21/2010

REMARKS:
Air knife to 3 feet bgs, no samples collected.

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LOG OF BORING
AB-6

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
0			Asphalt (5 inches).						
		SM	Gray, moist, silty, fine to coarse SAND (SM) with gravel, wood, glass (Fill); grayish discoloration, petroleum hydrocarbon-like odor, staining.						
5		SM	Medium dense, moist to wet (at bottom), gray, fine to medium, silty SAND (SM) with gravel; grayish discoloration, strong petroleum hydrocarbon-like odor, sheen ~50%.		9	12	▽		AP1-5'
10		SM	Dense, wet, gray, fine to coarse, silty SAND (SM) with some subrounded gravel; no discoloration, some petroleum hydrocarbon-like odor, no sheen.		25	3.1			AP1-10'
15			Organics.		26	5.1			AP1-15'
		ML	Brown wood waste with silt (ML), laminated; no discoloration, some organic odor.						
			Boring terminated at 17 feet bgs; sand installed to 15 feet bgs; installed and sampled temporary well with screened interval from 5 to 15 feet bgs.						
20			Backfilled with medium bentonite chips; cement patch at surface.						
25									
30									

BORING METHOD: HSA

ELEVATION REFERENCE: NA

BOREHOLE DIAMETER: 8 (in)

GROUND SURFACE ELEVATION: NA

DRILL RIG:

CASING ELEVATION: NA

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

DRILLING DATES: 6/23/2010 - 6/24/2010

REMARKS:
Air knife and vactor truck to 4 feet bgs for utilities clearance.

Sampled with hand auger to 5 feet bgs, D&M sampler to 17 feet bgs; field density is approximate.

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LOG OF BORING
AP-1

PAGE 1 OF 1

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	VOLATILE READING (ppm)	GROUNDWATER	GW SCREENED INTERVAL	FIELD TESTING	TESTING AND LABORATORY DATA
0	SP	Asphalt (0.3 feet). Olive-brown, fine to coarse SAND (SP) with silt.					
	SM	Moist to wet, fine, silty SAND (SM), with some dark brown organics, micaceous; gray discoloration, strong petroleum hydrocarbon-like odor.	>100	▽			AP2-1' 11/30/10
			25				
5	SM-PT	Wet, dark brown, fine to coarse, silty SAND (SM) with wood waste; strong petroleum hydrocarbon-like odor. Oily wood waste.					
		Dark brown, silty SAND; strong petroleum hydrocarbon-like odor, sheen. Orange to dark brown, wood waste (PT); no discoloration, no odor.					
10			3.5 - 6.0				
	SM	Wet, brown, fine to coarse, silty SAND (SM) with organics; some petroleum hydrocarbon-like odor, 30% sheen.					
	SP	Wet, yellow-brown, medium to coarse SAND (SP) with fine sand and some silt, trace gravel; no discoloration, no odor.	0.0				AP2-14' 12/07/10
15		Boring terminated at 15 feet bgs; backfilled with fine bentonite chips.					
20							
25							
30							

BORING METHOD: Push-probe

ELEVATION REFERENCE: NA

BOREHOLE DIAMETER: 4 (in)

DRILL RIG: Push-probe

GROUND SURFACE ELEVATION: NA

CONTRACTOR: Cascade Drilling, Inc.

START CARD/TAG ID: NA

LOGGED BY: A.Speransky

DRILLING DATES: 11/30/2010 - 12/7/2010

REMARKS:
Air knife and vactor truck to 5 feet bgs for utilities clearance.

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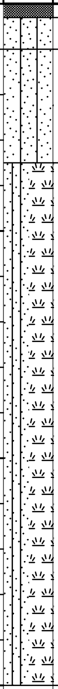
LOG OF BORING AP-2



DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	VOLATILE READING (ppm)	GROUNDWATER	GW SCREENED INTERVAL	FIELD TESTING	TESTING AND LABORATORY DATA
0		Asphalt (0.3 feet).		2.2				
	SM	Moist to wet, gray, fine to coarse, silty SAND (SM) with gravel (Fill); no discoloration, no odor.	▬		∇			▬ AP3-1' 11/30/10
	SM	Wet, olive-gray, fine, silty SAND (SM), trace gravel, micaceous; gray discoloration, petroleum hydrocarbon-like odor, 30% sheen.						
	SM-PT	Wet, brown, fine to coarse, silty SAND (SM) with gravel, organics, bricks.		80				
5		Wood waste; product, 100% sheen, strong petroleum hydrocarbon-like odor.						
		Trace gravel; sheen.	■	0.2				■ AP3-9' 12/07/10
10		Dark brown wood waste with some silt; some petroleum hydrocarbon-like odor.						
		Driller reports soft material. Groundwater rose up to surface.						
15		Boring terminated at 15 feet bgs; backfilled with fine bentonite chips.						
20								
25								
30								

BORING METHOD: Push-probe

ELEVATION REFERENCE: NA

BOREHOLE DIAMETER: 4 (in)

DRILL RIG: Push-probe

GROUND SURFACE ELEVATION: NA

CONTRACTOR: Cascade Drilling, Inc.

START CARD/TAG ID: NA

LOGGED BY: A.Speransky

DRILLING DATES: 11/30/2010 - 12/7/2010

REMARKS:
Air knife and vactor truck to 5 feet bgs for utilities clearance.

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LOG OF BORING AP-3

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	VOLATILE READING (ppm)	GROUNDWATER	GW SCREENED INTERVAL	FIELD TESTING	TESTING AND LABORATORY DATA
0		Asphalt (0.3 feet).	1.7				
	SM	Moist to wet, olive-gray, fine to medium, silty SAND (SM), trace gravel; iron-oxide discoloration.		∇			▪ AP4-1' 11/30/10
	SM	Wet, gray, fine to coarse, silty SAND (SM) with gravel; no discoloration, no odor.	0.0				
	SP	Wet, olive-gray, fine to coarse SAND (SP) with some silt.					
5	SM	Wet, olive, fine to medium, silty SAND (SM); no discoloration, no odor.					
	SM-PT	Wet, red-brown, fine to medium, silty SAND (SM) with trace fine gravel. brown organics. Dark brown wood waste.	0.0				▪ AP4-6' 12/07/10
10	SP	Wet, olive-gray, fine to coarse SAND (SP) with silt, trace fine gravel; no discoloration, no odor. Dark brown, wood waste (decayed) with some silt; no odor.					
	SM	Brown, silty SAND (SM).					
	SP	Wet, yellow-brown, coarse SAND (SP) with some fine and medium sand, little to no fines, trace fine gravel; no discoloration, no odor.					▪ AP4-15' 12/07/10
15		Boring terminated at 15 feet bgs; backfilled with fine bentonite chips.					
20							
25							
30							

BORING METHOD: Push-probe

BOREHOLE DIAMETER: 4 (in)

DRILL RIG: Push-probe

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

START CARD/TAG ID: NA

DRILLING DATES: 11/30/2010 - 12/7/2010

REMARKS:

Air knife and vactor truck to 5 feet bgs for utilities clearance.

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LOG OF BORING AP-4

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	VOLATILE READING (ppm)	GROUNDWATER	TESTING AND LABORATORY DATA
0	SM	Asphalt (0.3 feet). Wet, gray, fine to coarse, silty SAND (SM) with gravel; no discoloration, no odor. Trace gravel, some organics (wood waste); gray discoloration, strong petroleum hydrocarbon-like odor, 100% sheen.	>200	▽	AP5-1' 11/30/10 AP5-1.5' 12/07/10
		Some gravel, refuse (bricks), dark brown wood waste; petroleum product on wood waste.	>300		
5	SM-PT	Wood waste; strong petroleum hydrocarbon-like odor.			
			>300		
10		Petroleum product on liner.			
		Wet, dark brown, fine to coarse, silty SAND (SM) with wood waste, refuse (bricks); petroleum product, strong petroleum hydrocarbon-like odor.			
		Wood waste; some petroleum.	36		AP5-14.5' 12/07/10
15		Boring terminated at 15 feet bgs; backfilled with fine bentonite chips.			
20					
25					
30					

SAMPLE | GW SCREENED INTERVAL | FIELD TESTING

BORING METHOD: Push-probe

ELEVATION REFERENCE: NA

BOREHOLE DIAMETER: 4 (in)

DRILL RIG: Push-probe

GROUND SURFACE ELEVATION: NA

CONTRACTOR: Cascade Drilling, Inc.

START CARD/TAG ID: NA

LOGGED BY: A.Speransky

DRILLING DATES: 11/30/2010 - 12/7/2010

REMARKS:
Air knife and vactor truck to 5 feet bgs for utilities clearance.

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LOG OF BORING
AP-5

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
0		Asphalt (0.3 feet), 0.5 feet asphalt base.					
	SP	Gray, fine to coarse SAND (SP) with silt and gravel; gray discoloration, petroleum hydrocarbon-like odor.			▽		■ AP6-1 11/30/10
		Petroleum product was rising to the surface.					
5							
		Rod dropped to 7 feet bgs unexpectedly. Oil is dripping from the rod.					
	SM-PT	Dark brown, wet, silty SAND (SM) and wood waste; petroleum product, strong petroleum hydrocarbon-like odor.	5				■ S-1
			2				■ S-2
10	PT						
		No recovery (wood waste). (Logged from drill cuttings.)	0				
		No recovery (wood waste).	1				
							■ S-3
		Dark brown, wood waste (decayed, fine and large, 6 inch thick wood) (PT); petroleum product, petroleum hydrocarbon-like odor.	24				■ S-4
15			4				
		No recovery (wood waste); petroleum product. (Logged from drill cuttings.)	1				
			0				
	ML-PT	Soft, wet, dark brown, SILT (ML) and wood waste (PT); petroleum product; petroleum hydrocarbon-like odor.	4				■ S-5
20							
	SM	No recovery. Silty SAND (SM) on ring lines.	18				
		Medium dense, wet, yellow-brown, fine to coarse, silty SAND (SM) with trace fine organics; no discoloration, no odor.	29				■ S-6
				0.4 - 16			■ AP6-23' 12/02/10 ■ S-7
			50/6"				
25		Abundant fine organics, trace fine gravel.	20	1.5			■ S-8
	SP	Fine to coarse SAND (SP) with some gravel.	23	3.1 - 4.5			■ S-9
	ML	Stiff, olive to gray SILT (ML) with sand, trace gravel, slightly plastic.	8	1.4			■ S-10
				0.0			■ S-11
30							

BORING METHOD: HSA

BOREHOLE DIAMETER:

DRILL RIG: Hollow Stem Auger

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 11/30/2010 - 12/2/2010

REMARKS:
Air knife and vactor truck to 5 feet bgs for utilities clearance.

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LOG OF BORING AP-6

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
30	ML	Stiff to very stiff, moist, gray to olive-gray SILT (ML) with fine sand, iron oxidation; no discoloration, no odor.	16	0.0			AP6-30' 12/02/10 S-12
		Becomes very stiff, gray, trace organics; no discoloration, no odor.	31				S-13
	SM	Brown, wet, fine to medium, silty SAND (SM).	38				
	SP	Dense, wet, olive-gray, fine to coarse SAND (SP) with gravel					S-14
35	SM	Becomes silty SAND (SM) with gravel.	31				
		Boring terminated at 35.5 feet bgs; backfilled with bentonite slurry via tremmie pipe.					
40							
45							
50							
55							
60							

BORING METHOD: HSA

BOREHOLE DIAMETER:

DRILL RIG: Hollow Stem Auger

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 11/30/2010 - 12/2/2010

REMARKS:
Air knife and vactor truck to 5 feet bgs for utilities clearance.

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LOG OF BORING AP-6

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	VOLATILE READING (ppm)	GROUNDWATER	GW SCREENED INTERVAL	FIELD TESTING	TESTING AND LABORATORY DATA
0		SP	Asphalt (0.3 feet). Moist, gray, fine to coarse SAND (SP), some gravel, shells; sheen.	■	11	▽			■ AP7-1' 10/28/10
		SM	Wet, gray, fine to medium, silty SAND (SM), some gravel, shells; gray discoloration, strong petroleum hydrocarbon-like odor, 100% sheen.						
5		SM-PT	Wet, gray to dark brown (organics), fine to medium, silty SAND (SM) with wood waste; some product, 100% sheen.		90				
10		SP	Wet, olive-gray, coarse SAND (SP) with gravel, some fine to medium sand, some silt; slight petroleum hydrocarbon-like odor.	■	16 13				■ AP7-10' 12/02/10 DUP6
		PT	Decayed wood waste.						
		SP-PT	Wet, olive-gray, coarse SAND (SP) with gravel and fine to coarse sand. Dark brown wood waste.						
15		SP	Wet, olive, fine to medium SAND (SP) with silt and trace gravel; no discoloration, no odor, no sheen.	■	2.8				■ AP7-15' 12/02/10
20			Boring terminated at 15 feet bgs; backfilled with fine bentonite chips.						
25									
30									

BORING METHOD: Push-probe

ELEVATION REFERENCE: NA

BOREHOLE DIAMETER: 4 (in)

DRILL RIG: Push-probe

GROUND SURFACE ELEVATION: NA

CONTRACTOR: Cascade Drilling, Inc.

START CARD/TAG ID: NA

LOGGED BY: A.Speransky

DRILLING DATES: 10/28/2010 - 12/2/2010

REMARKS:
Air knife and vactor truck to 5 feet bgs for utilities clearance.

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LOG OF BORING AP-7

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
0	SP	Surface: 0.3 feet of asphalt over 0.5 feet asphalt base. Wet, olive-brown, medium to coarse SAND (SP) with some fine sand and silt; no discoloration, no odor.		61	∇		MW-7A-1 11/30/10
				3.2 - 6.1			S-1
		Very loose.	2				
		Becomes fine to coarse SAND (SP).					S-2
5			2				
				12			S-3
			2				
			0				
		No recovery. Driller reports very loose SAND.					
			0				
		No recovery.					
10	SM	Very loose, wet, olive to brown, fine to coarse, silty SAND (SM), organics.	10				S-5
	SM-SP	Medium dense, wet, yellow to yellow-brown, fine to coarse, silty SAND (SM/SP), trace gravel.	19	23 - 30			MW-7A-12 12/1/10 S-6
		Sand increases.	25	80			S-7
				7.0			S-8
15	SM	Dense, wet, brown to olive-brown, fine to coarse, silty SAND (SM); no discoloration, no odor.	42				
				1.3			S-9
		Becomes, moist, iron oxidation discoloration, approximately 1 foot heave.	26				
				2.5			S-10
	SM	Medium dense, wet, orange-brown, fine, silty SAND (SM), trace gravel.	17				
20	SM-ML	Medium dense, moist, gray to olive-gray, fine, silty SAND to SILT (SM/ML) with iron oxidation discoloration.	18				S-11
				4.4			S-12 (Shelby)
	ML	Soft, gray SILT (ML).					
	ML	Stiff, moist, olive-gray SILT (ML) with brown, fine organics.	63	0.0			S-13
25	SP	Very dense, wet, olive, fine to coarse SAND (SP) with some silt, trace gravel, micaceous; no discoloration, no odor.	94				S-14
		Gravel increases in last 6 inches of sampler shoe.	56	1.5 - 2.5			S-15
		Becomes with gravel.	50/6"	7.0			S-16
		Becomes with trace gravel. Lenses of moist, brown, silty SAND (SM) with brown, very fine organics (approximately 4 inches thick).	50/5"				S-17
30							

BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG: Hollow Stem Auger

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 11/30/2010 - 12/1/2010

REMARKS:
Cleared to 5 feet bgs with hand auger and vacuum truck.

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amec

LOG OF BORING MW-7AB

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD TESTING	TESTING AND LABORATORY DATA
30		SP-SM	Very dense, wet, olive, fine to coarse SAND (SP/SM) with silt and silty sand; no discoloration, no odor. No samples collected due to reported heave.		0 0 50/5"	NA			▬ S-18
35			Boring terminated at 35.5 feet bgs; backfilled with bentonite slurry via tremmie pipe.						
40									
45									
50									
55									
60									

BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG: Hollow Stem Auger

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

DRILLING DATES: 11/30/2010 - 12/1/2010

REMARKS:
Cleared to 5 feet bgs with hand auger and vacuum truck.

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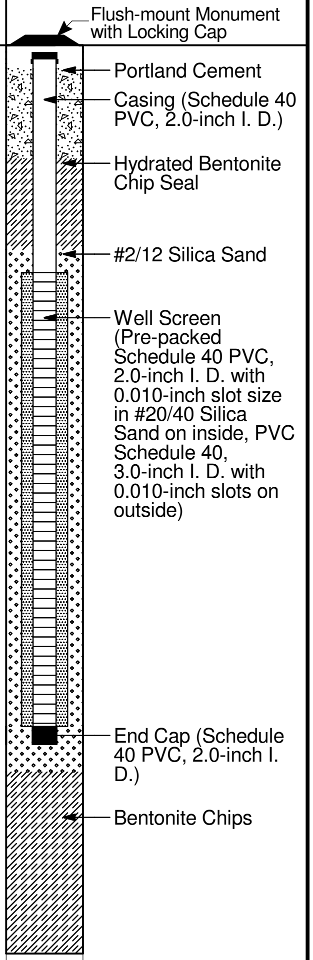
LOG OF BORING MW-7AB

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING
0		Asphalt.				
	SM	Gray, silty SAND (SM) with gravel (Fill).				
5	SM	Medium dense, slightly moist, gray, fine to coarse, silty SAND (SM) with some gravel; no discoloration, no odor.	17	1.6		MWA3-5'
10	SP	Medium dense, wet, gray, fine to coarse SAND (SP) with some gravel and abundant white shells, some organics (wood); no discoloration, no odor, no sheen.	12	1.3	▽	MWA3-10'
15	SM	Medium dense, wet, gray, fine to coarse, silty SAND (SM) with trace subrounded to subangular gravel; no discoloration, no odor.	18	1.0		MWA3-15'
20	SP	Very dense, wet, gray, medium to coarse SAND (SP) with some silt, some shells, trace gravel; no discoloration, no odor.	50/6"	1.2		MWA3-20'
		Boring terminated at 20 feet bgs.				
25						
30						

WELL SCHEMATIC



BORING METHOD: HSA
BOREHOLE DIAMETER: 8 (in)
DRILL RIG: NA
CONTRACTOR: Cascade Drilling, Inc.
LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA
GROUND SURFACE ELEVATION: NA
CASING ELEVATION: NA
START CARD/TAG ID: /BCM 305
DRILLING DATES: 6/23/2010 - 6/24/2010

REMARKS:
Air knife to 4 feet bgs for utilities clearance.

D&M sampler; field density is approximate.

ENVR+WELL BORING 1-915-15716E.02LS.GPJ AMEC PORTLAND.GDT 2/16/11

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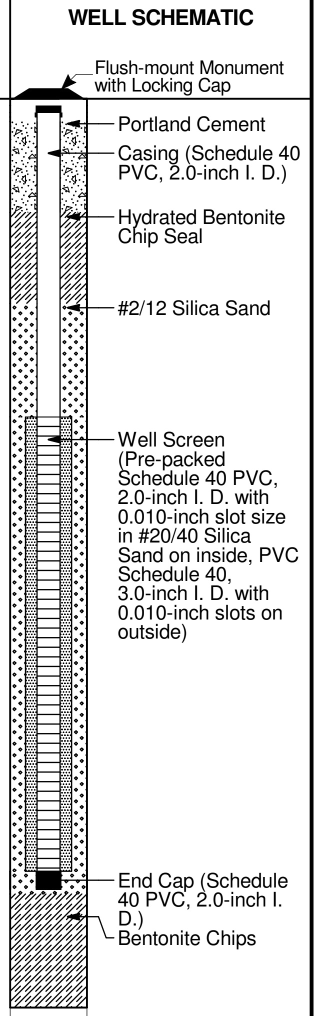
LOG OF BORING
MW-A3

PAGE 1 OF 1

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING
0	SM	Asphalt (0.3 feet). Silty SAND (SM) with gravel (Fill).					
5	SM	Medium dense, slightly moist, gray, fine to coarse, silty SAND (SM) with some gravel; no discoloration, no odor.	■	16	4.3		■ MW-A4-5'
10		Moist to wet; no discoloration, no odor, no sheen.	■	21	4.5		■ MW-A4-10'
						∇	
15		Same as above. wood (< 1 inch); some petroleum hydrocarbon-like odor.	■	26	6.7		■ MW-A4-15'
20	SP	Medium dense, wet, gray, medium to coarse SAND (SP) with some silt and gravel, some organics (wood), abundant shells; no discoloration, no odor.	■	26	4.6		■ MW-A4-20'
		Boring terminated at 20 feet bgs.					
25							
30							



BORING METHOD: HSA	**ELEVATION REFERENCE:** NA
BOREHOLE DIAMETER: 8 (in)	**GROUND SURFACE ELEVATION:** NA
DRILL RIG: NA	**CASING ELEVATION:** NA
CONTRACTOR: Cascade Drilling, Inc.	**START CARD/TAG ID:** /BCM 306
LOGGED BY: A.Speransky	**DRILLING DATES:** 6/22/2010 - 6/24/2010

REMARKS:

Air knife to 4 feet bgs for utilities clearance.

D&M sampler; field density is approximate.

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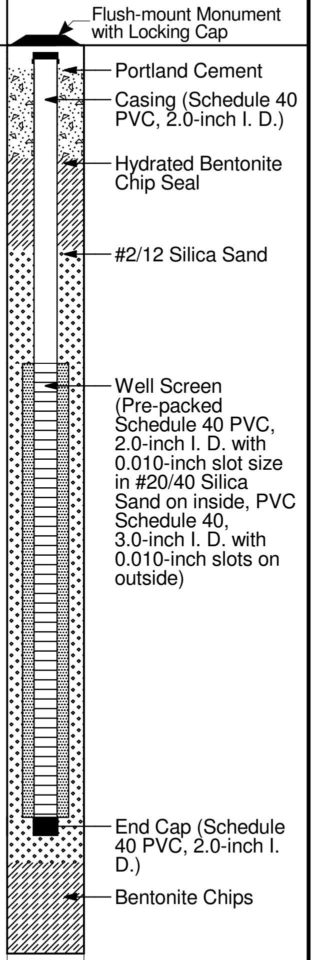
LOG OF BORING
MW-A4

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING
0		Asphalt.					
	SM	Gray, fine to coarse, silty SAND (SM) with gravel. (Logged from cuttings.)					
5	SP-SW	Very dense, slightly moist, gray, medium to coarse SAND (SP/SW) with silt and coarse gravel; no discoloration, no odor.	■	65	3.6		■ MWA5-5'
10	SP	Dense, moist to wet (bottom of sampler), gray, medium to coarse SAND (SP) with some fine sand with gravel; no discoloration, no odor.	■	17	11		■ MWA5-10'
						▽	
15		Very dense, wet, gray, fine to coarse SAND (SP) with silt, trace gravel.	■	67	3.2		■ MWA5-15'
20		Becomes coarse SAND (SP) with fine sand, some silt, trace gravel.	■	50/2"	3.5		■ MWA5-20'
		Boring terminated at 20 feet bgs. Tide is 2 feet above MSL.					
25							
30							

WELL SCHEMATIC



BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG: NA

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

START CARD/TAG ID: /BCM 301

DRILLING DATES: 6/23/2010 - 6/24/2010

REMARKS:

Air knife to 4 feet bgs for utilities clearance.

D&M sampler; field density is approximate.

ExxonMobil / American Distributing Company

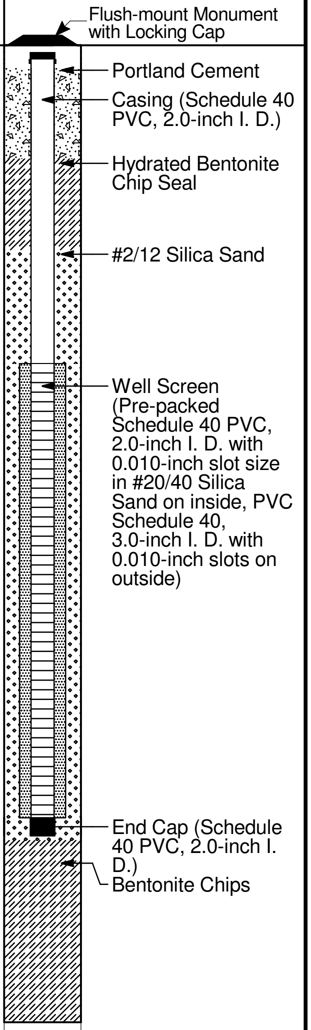
1-915-15716E

AMEC Earth and Environmental, Inc.
11810 North Creek Parkway N
Bothell, Washington
USA 98011
Tel (425) 368-1000
Fax (425) 368-1001

LOG OF BORING
MW-A5

DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING
0		Asphalt (0.3 feet).					
	SM						
5		Dense, moist, gray, fine to medium, silty SAND (SM), some gravel, bricks, burnt wood (Fill); no discoloration, no odor, no sheen.		41	1.5		▪ MWA6-5'
10		Cobble; drilled through.					
		Same as above; slight petroleum hydrocarbon-like odor, some sheen.		26	2.2	▽	▪ MWA6-12'
15	SM	Medium dense, wet, gray, fine, silty SAND (SM) with coarse sand and silt lenses (< 2 inches), abundant organics (wood chips < 1 inch).		12			▪ MWA6-15
20		Laminated peat to silty SAND to SILT (PT/SM/ML) at 20 feet bgs.					
	SP	Medium dense, wet, gray, fine to medium SAND (SP) with wood in shoe; some petroleum hydrocarbon-like odor, ~15% sheen.		9	2.8		▪ MWA6-20'
		Boring terminated at 21.5 feet bgs.					
25							
30							

WELL SCHEMATIC



BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG: NA

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

START CARD/TAG ID: /BCM 304

DRILLING DATES: 6/25/2010

REMARKS:

Air knife to 4 feet bgs for utilities clearance.

D&M sampler; field density is approximate.

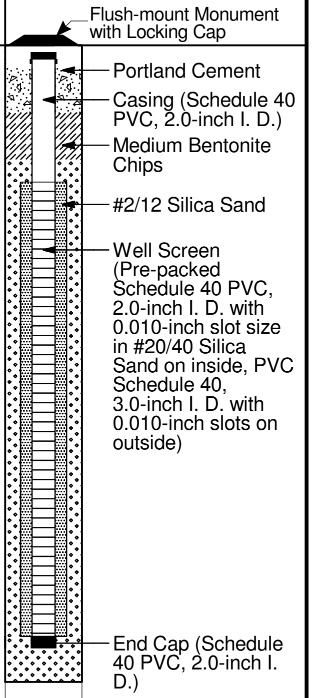
ExxonMobil / American Distributing Company

1-915-15716E

**AMEC Earth and Environmental, Inc.
11810 North Creek Parkway N
Bothell, Washington
USA 98011
Tel (425) 368-1000
Fax (425) 368-1001**

amec

LOG OF BORING
MW-A6

DEPTH (ft bgs)	GRAPHIC LOG	USCS SYMBOL	SOIL DESCRIPTION	SAMPLE	BLOW COUNT SPT N VALUE	VOLATILE READING (ppm)	GROUNDWATER	FIELD AND LABORATORY TESTING	WELL SCHEMATIC
0			No samples collected, for lithology descriptions refer to MW-7AB boring log.						
5									
10									
15			Boring terminated at 15 feet bgs.						
20									
25									
30									

BORING METHOD: HSA

BOREHOLE DIAMETER: 8 (in)

DRILL RIG: Hollow Stem Auger

CONTRACTOR: Cascade Drilling, Inc.

LOGGED BY: A.Speransky

ELEVATION REFERENCE: NA

GROUND SURFACE ELEVATION: NA

CASING ELEVATION: NA

START CARD/TAG ID: /BLT 570

DRILLING DATES: 12/2/2010

REMARKS:

ExxonMobil / American Distributing Company

1-915-15716E

AMEC Earth and Environmental, Inc.
11810 North Creek Parkway N
Bothell, Washington
USA 98011
Tel (425) 368-1000
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LOG OF BORING
MW-A7

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. BN-SB04**
BORING LOCATION: BNSF Property	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/21/13 | DATE FINISHED: 10/21/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 25.0 | MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA | COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb | DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long | REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), moist, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75" in size).	
1						Cleared to 10 feet bgs with vacuum truck.
2						BN-SB04-102113 is collected from interval 0 to 10 FT.
3						
4	BN-SB04-4-102113	■		0.1		
5					wet at 5.3 FT.	No sheen.
6						
7						
8						
9						
10		☒		0.2		No sheen.
11		☒	10 10 9	0.3		No sheen.
12		☒	14 11 13			No sheen.
12.5					WELL-GRADED SAND with SILT (SW-SM): yellowish brown (10YR 5/6), moist, medium dense, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75" in size), mottling.	
13				0.3		No sheen.
14		☒	12 15 16	0.3 0.4	SILTY SAND (SM): dark yellowish brown (10YR 3/4), wet, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 0.75" in size).	No sheen.
15						

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. BN-SB04 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
15–16		☒	17 21 20	0.4	▽ very dark grayish brown (10YR 3/2),	No sheen.
16–17.5		☒	20 21 20	0.4 0.4	WELL-GRADED SAND with SILT (SW-SM): very dark grayish brown (10YR 3/2), wet, medium dense, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75" in size). Heaving Sand.	No sheen. No sheen.
17.5–19		☒	17 26 27	0.3		No sheen.
19–20.5		☒	17 22 21	0.3 0.3		No sheen. No sheen.
20.5–22		☒	18 27 25	0.3	SILTY SAND (SM): dark yellowish brown (10YR 4/4), wet, medium dense, 75% fine to coarse sand, 20% fines, 5% fine subrounded gravel (up to 0.75" in size).	No sheen.
22–23.5		☒	10 12 20	0.4	SILTY SAND (SM): dark yellowish brown (10YR 4/4), wet, medium dense, 60% fine to coarse sand, 35% fines, 5% fine subrounded gravel (up to 0.75" in size), mottled.	No sheen. No sheen.
23.5–25	BN-SB04-24.5-102113	☒ ■	13 14 17		SILT (ML): very dark gray (10YR 3/1), wet, no plasticity, stiff, 85% fines, 10% fine sand, 5% fine subrounded gravel (up to 0.75" in size), trace shells.	No sheen.
25					Bottom of Boring @ 25.0 FT. Abandoned with bentonite to surface.	
26						
27						
28						
29						
30						
31						
32						
33						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. BN-SB05**
BORING LOCATION: BNSF Property	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/21/13 DATE FINISHED: 10/21/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 24.5 MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0				0.6	WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), moist, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75" in size), trace rounded cobbles, trace brick and wood debris. FILL.	
1						Cleared to 5 feet bgs with vacuum truck.
2						BN-SB05-102113 is collected from interval 0 to 5 FT.
4–5	BN-SB05-4-102113	■				
5		☒		0.0	Wet @ 5 FT.	No sheen.
6			7 8 10	0.0		No sheen.
6.5		☒			WELL-GRADED SAND with SILT (SW-SM): dark grayish brown (10YR 3/2), wet, medium dense, 90% fine to coarse sand, 5% fines, 5% fine subrounded gravel (up to 0.75" in size).	
7			10 11 10			No sheen.
8		☒		0.0 0.1		No sheen.
9			11 26 15	0.1 0.1		No sheen.
9.5		☒				
10			11 14 16			No sheen.
11		☒		0.1		No sheen.
12			14 14 19	0.1 0.2		No sheen.
12.5		☒			WELL-GRADED SAND with SILT (SW-SM): very dark grayish brown (10YR 3/2), wet, medium dense, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75" in size).	
13			15 15 15			No sheen.
14		☒		0.2		No sheen.
15			12			

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. BN-SB05 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
15		16 12	0.2 0.2	Heaving Sand.	No sheen.
16		16 21 19	0.1		No sheen. No sheen.
17		17 21 21			
18				SANDY SILT (ML): yellowish brown (10YR 5/4), wet, low plasticity, very stiff, 60% fines, 40% fine to medium sand.	No sheen.
19		21 10 10		SILT (ML): very dark gray (10YR 3/1), wet, low plasticity, stiff, 93% fines, 5% fine sand, trace fine subrounded gravel (up to 0.75" in size).	
20		10 10 10			
21					
22		10 8 9			
23		8 8 8			
24	BN-SB04-24.5-102113				
24.5				Bottom of Boring @ 24.5 FT. Abandoned with bentonite to surface.	
25					
26					
27					
28					
29					
30					
31					
32					
33					

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. BN-SB06**
BORING LOCATION: BNSF Property	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/21/13 — DATE FINISHED: 10/21/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 24.5 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA — COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb — DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
					WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), moist, 85% fine to medium sand, 10% fines, 5% fine subrounded gravel (up to 0.75" in size).	
1						Cleared to 5 feet bgs with vacuum truck.
2						BN-SB06-102113 is collected from interval 0 to 5 FT.
3						
4	BN-SB06-4-10213			0.2	Wet @ 4 FT.	No sheen.
5				0.0		
6			4 6 7	0.0	SILTY SAND (SM): dark yellowish brown (10YR 3/4), wet, medium dense, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 0.75" in size), mottled.	No sheen.
7			10 21 28			No sheen.
8				0.0		No sheen.
9			12 14 16	0.0		No sheen.
10			13 15 18		WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), wet, medium dense, 90% fine to coarse sand, 10% fines.	No sheen.
11				0.0		No sheen.
12			16 20 20	0.0		No sheen.
13			19 21 21			No sheen.
14				0.0	SILTY SAND (SM): dark yellowish brown (10YR 3/4), wet, medium dense, 80% fine to medium sand, 20% fines.	No sheen.
15			14			

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. BN-SB06 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
		☒	24 21	0.0	WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), wet, medium dense, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75" in size).	No sheen.
16		☒	28 31 30	0.0		No sheen.
17		☒	26 27 29	0.0	Heaving Sand.	No sheen.
18						No sheen.
19		☒	21 25 31	0.0		No sheen.
20		☒	10 10 20	0.0	▽ brown (10YR 5/3),	
21						
22		☒	10 20 20		SILTY SAND (SM): dark yellowish brown (10YR 4/4), moist, medium dense, 80% fine to coarse sand, 20% fines.	
23		☒			WELL-GRADED SAND with SILT (SW-SM): brown (10YR 5/3), wet, dense sand, 90% fine to coarse sand, 10% fines.	
24	BN-SB06-24-102113	■	31 33 36	0.0		
25					Bottom of Boring @ 24.5 FT. Abandoned with bentonite to surface.	
26						
27						
28						
29						
30						
31						
32						
33						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. BN-SB07**		
BORING LOCATION: BNSF Property	ELEVATION AND DATUM: NA		
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/18/13	DATE FINISHED: 10/18/13	
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 25.0	MEASURING POINT: Ground Surface	
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.)	FIRST NA	COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG		
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long	REG. NO. L.Hg. 1354	

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
				0.5	WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), moist, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel, trace cobbles.	
1						Cleared to 10 feet bgs with vacuum truck.
2						BN-SB07-102113 is a composite sample from 0 to 10 FT.
3					Wet @ 3 FT.	No Sheen.
4	BN-SB07-4-101813					
5						
6						
7						
8						
9						
10				0.0 0.0	WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), wet, medium dense, 90% fine to coarse sand, 10% fines.	No Sheen.
11			12 13 15	0.0 0.0		No Sheen.
12			9 12 15	0.0		No Sheen.
13						No Sheen.
14			8 8 6	0.0 0.0		No Sheen.
15						

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. BN-SB07 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			6 12 13			No Sheen.
16				0.0	WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), wet, medium dense, 90% fine to coarse sand, 10% fines.	No Sheen.
17			13 16 15	0.0 0.0	WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), wet, medium dense, 90% fine to coarse sand, 10% fines.	No Sheen.
18			8 9 9		Heaving Sand.	No Sheen.
19				0.0		No Sheen.
20			14 19 25	0.1 0.0		No Sheen.
21			20 22 25		very dark gray (10YR 3/1),	No Sheen.
22				0.0		No Sheen.
23			22 27 26	0.2 0.1		No Sheen.
24	BN-SB07-24-101813	■	23 18 19			No Sheen.
25					Bottom of Boring @ 25 FT. Abandoned with bentonite to surface.	
26						
27						
28						
29						
30						
31						
32						
33						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. CE-SB01**		
BORING LOCATION: City of Everett Right of Way	ELEVATION AND DATUM: NA		
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/23/13	DATE FINISHED: 10/23/13	
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0	MEASURING POINT: Ground Surface	
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.)	FIRST NA	COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG		
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long	REG. NO. L.Hg. 1354	

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					SILTY SAND (SM): very dark gray (10YR 3/1), moist, 65% fine to medium sand, 30% fines, 5% fine subrounded gravel (up to 0.75"). FILL.	
1						Cleared to 5 feet bgs with vacuum truck.
2						CE-SB01-4-102313 is collected from interval 0 to 5 FT.
3						
4	CE-SB01-4-102313	■		11.6		
5		☒		26	Wet @ 5 FT.	No sheen.
6		☒	4 3 3			Sheen
		☒		142 134	Pieces of wood, brick fragments, glass, ceramic tile fragments, rock pieces (up to 1"). FILL.	
7		☒	5 15 20			Sheen, visible product, petroleum hydrocarbon-like odor.
8		☒		96.8		Sheen, visible product, petroleum hydrocarbon-like odor.
9		☒	4 3 2			Sheen, visible product, petroleum hydrocarbon-like odor.
	CE-SB01-9.5-102313	■		64.6 76.1	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, mixed with SANDY SILT (ML). FILL.	
10		■	3 4 4			Sheen, visible product, petroleum hydrocarbon-like odor.
11		☒		35		Sheen, visible product, petroleum hydrocarbon-like odor.
12		☒	4 4 4			Sheen, petroleum hydrocarbon-like odor.
		☒		64.9 71.5	SILTY SAND (SM): very dark gray (10YR 3/1), moist, loose, 65% fine to medium sand, 30% fines, 5% fine subrounded gravel (up to 0.75").	
13		☒	2 3 3			Sheen, petroleum hydrocarbon-like odor.
14		☒	4	44.9	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, mixed with SANDY SILT (ML).	Sheen, visible product, petroleum hydrocarbon-like odor.
15						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. CE-SB01 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
15			2 2	29		Sheen, visible product, petroleum hydrocarbon-like odor.
16			1 2 1		PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, mixed with SANDY SILT (ML).	Sheen, visible product, petroleum hydrocarbon-like odor.
17			3 2 4			
18						
19			4 4 3			
20				7.5 3.4	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, 100% organic matter.	Sheen.
21			4 3 2		SANDY SILT (ML): very dark gray (10YR 3/1), wet, no plasticity, soft, 60% fines, 40% fine to medium sand.	No sheen.
21.5				5.9 2.6	ORGANIC SOIL (PT): reddish brown (2.5YR 2.5/3), wet, stiff, 100% organic matter. Piece of rock from 22 FT to 22.5 FT.	
22			12 20 20			Sheen.
22.5					SILTY SAND (SM): very dark gray (10YR 3/1), moist, medium dense, 65% fine to medium sand, 30% fines, 5% fine subrounded gravel (up to 0.75"), wood debris.	Sheen.
23.5			20 21 22			
24	CE-SB01-24-102313	■		1.2		No sheen.
24.5					Bottom of Boring @ 24.5 FT. Abandoned with bentonite to surface.	
25–33						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. CE-SB02**
BORING LOCATION: City of Everett Right of Way	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/23/13 — DATE FINISHED: 10/23/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA — COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb — DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0				SILTY SAND (SP-SM): dark brown (10YR 3/3), moist, 65% fine to medium sand, 30% fines, 5% fine subrounded gravel (up to 0.75"), wood debris, ceramic tile debris. FILL.	
1					Cleared to 5 feet bgs with vacuum truck.
2					
3					
4	CE-SB02-4-101413		1096		
5		3 4 4	162	Wet @ 5 FT.	Sheen, visible product, petroleum hydrocarbon-like odor.
6					Sheen, petroleum hydrocarbon-like odor.
			232 76.9		
7		2 2 2			Sheen, petroleum hydrocarbon-like odor.
8		3 2 2	108	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, mixed with SILTY SAND (SM), nails, glass fragments, copper wire (< 1cm in size). FILL.	Sheen, petroleum hydrocarbon-like odor.
9					Sheen, petroleum hydrocarbon-like odor.
			79.4 87.5		
10		4 4 5			Sheen, petroleum hydrocarbon-like odor.
11			20.9		Sheen, petroleum hydrocarbon-like odor.
12		2 2 2			Sheen, petroleum hydrocarbon-like odor.
			34 23		
13		7 8 7			Sheen, petroleum hydrocarbon-like odor.
14		5 5 6			Sheen, petroleum hydrocarbon-like odor.
15					

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. CE-SB02 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	 Sample	 Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
				6.5 4.6	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, 100% organic matter, nails, glass fragments, hydrogen sulfide-like odor. FILL.	Sheen, petroleum hydrocarbon-like odor.
16			3 3 3			Sheen.
17			4 4 6			No sheen.
18				3.2 0.8	SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 70% fine to medium sand, 25% fines, 5% fine subrounded gravel.	No sheen.
19			7		PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, 100% organic matter, nails, hydrogen sulfide-like odor.	Sheen.
20	CE-SB02-20-102313	■	10 10		SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 70% fine to medium sand, 25% fines, 5% fine subrounded gravel. Bottom of Boring @ 20 FT. Abandoned with bentonite to surface.	No sheen.
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PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. EA-SB01**		
BORING LOCATION: ExxonMobil/ADC	ELEVATION AND DATUM: NA		
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/28/13	DATE FINISHED: 10/28/13	
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0	MEASURING POINT: Ground Surface	
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.)	FIRST NA	COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG		
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long		REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0				Asphalt (0.5 inches), road base (13 inches), CAP fabric at 18 inches.	Cleared to 5 feet bgs with vacuum truck.
1.5				SILTY SAND (SM): very dark gray (10YR 3/1), moist, 55% fine to medium sand, 40% fines, 5% fine subrounded gravel (up to 0.75"), wood debris, cobbles, ceramic pieces. FILL.	
4.5	EA-SB01-101413		161		
5			139		Sheen, visible product, petroleum hydrocarbon-like odor.
5.5		1 1 1		Wet @ 5.5 FT.	
6.5			134 135		Sheen, visible product, petroleum hydrocarbon-like odor.
7		1 1 2		PEAT (PT): reddish brown (2.5YR 2.5/3), wet, very soft, mixed with SILTY SAND (SM), rootlets. FILL.	Sheen, visible product, petroleum hydrocarbon-like odor.
8			53.6	SILTY SAND (SM): very dark gray (10YR 3/1), moist, very loose, 55% fine to medium sand, 40% fines, 5% fine subrounded gravel (up to 0.75"), wood debris, nails, glass fragments. FILL.	Sheen, petroleum hydrocarbon-like odor.
9		1 2 3	75.8 120	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, very soft, mixed with SILTY SAND (SM), rootlets. FILL.	Sheen, visible product, petroleuym hydrocarbon-like odor.
9.8		10 14 15		SILTY SAND (SM): very dark gray (10YR 3/1), wet, medium dense, 55% fine to medium sand, 40% fines, 5% fine subrounded gravel (up to 0.75"), wood debris, nails, glass fragments. FILL.	Sheen, petroleum hydrocarbon-like odor.
10.9				Wood pieces.	
11.2		5 6 9	34.7 5.6	SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 55% fine to medium sand, 40% fines, 5% fine subrounded gravel (up to 0.75"), wood debris, nails, glass fragments. FILL.	Sheen, visible product, petroleum hydrocarbon-like odor.
12.8		12 13 15	20.3	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, medium dense, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75"), wood debris.	No sheen, petroleum hydrocarbon-like odor.
14		10			No sheen, petroleum hydrocarbon-like odor.
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PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. EA-SB01 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
15			7 5	60 20.3		Sheen, petroleum hydrocarbon-like odor.
16			8 5 6	26.3	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 90% fine to coarse sand, 10% fines, wood debris.	Sheen, petroleum hydrocarbon-like odor.
17			8 6 9	43.5 10	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 90% fine to coarse sand, 10% fines, wood debris, mixed with PEAT, reddish brown (2.5YR 2.5/3), hydrogen sulfide-like odor.	Sheen, petroleum hydrocarbon-like odor. No sheen.
19	EA-SB01-102813	■	5 5 6	10		Sheen. No sheen.
20					Bottom of Boring @ 20 FT. Abandoned with bentonite to 1 FT bgs and cement to surface.	
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. EA-SB02**
BORING LOCATION: ExxonMobil/ADC	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/28/13 DATE FINISHED: 10/28/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					Asphalt (5 inches), road base (10 inches), CAP fabric at 15 inches.	
1					SILTY SAND (SM): very dark gray (10YR 3/1), moist, 65% fine to mediums and, 30% fines, 5% fine subrounded gravel (up to 0.75"), cobbles. FILL	Cleared to 5 feet bgs with vacuum truck.
4	EA-SB02-4-101413			421		
5				33.3		Sheen, visible product, petroleum hydrocarbon-like odor.
5.5			4 3 2		Wet @ 5.5 ft with wire and wood debris.	Sheen, visible product, petroleum hydrocarbon-like odor.
6.5				18.3 30.4		
7			3 2 3			Sheen, visible product, petroleum hydrocarbon-like odor.
8			3 9 4	64		Sheen, visible product, petroleum hydrocarbon-like odor.
9				61.6	Mixed with PEAT, reddish brown (2.5YR 2.5/3)	Sheen, visible product, petroleum hydrocarbon-like odor.
9.5			5 6 6	8.6	SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 65% fine to mediums and, 30% fines, 5% fine subrounded gravel (up to 0.75"), glass pieces. FILL.	Sheen, visible product, petroleum hydrocarbon-like odor.
10.5					Mixed with PEAT, reddish brown (2.5YR 2.5/3)	
11				42.8		Sheen.
12			3 3 4	16.1		Sheen, petroleum hydrocarbon-like odor.
13			2 3 6		PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, mixed with wood pieces and SILTY SAND (SM).	
14			4	9.8	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 90% fine to medium sand, 10% fines.	No sheen.
15						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. EA-SB02 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
		5 4	21.6 19.6	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, medium stiff, mixed with POORLY-GRADED SAND with SILT (SP-SM), hydrogen sulfide-like odor.	Sheen.
16		5 5 5			Sheen.
17		6 5 4	8.6		Sheen.
18			12 3.2		Sheen.
19		6 5 4			No sheen.
20				PEAT (PT): reddish brown (2.5YR 2.5/3), wet, medium stiff, 100% organic, trace fine subrounded gravel (up to 0.75"), wood pieces, hydrogen sulfide-like odor.	No sheen.
21	EA-SB02-21-102813	4 4 4	7.1		
				Bottom of Boring @ 21.5 FT. Abandoned with bentonite to 1 FT bgs and cement to surface.	
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OAKBOREV (REV. 8/2011)

Log of Boring No. EA-SB03

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	
BORING LOCATION: ExxonMobil/ADC	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/30/13 | DATE FINISHED: 10/30/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 | MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA | COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb | DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long | REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0				Asphalt (7 inches), road base (8 inches).	
1				WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), moist, 70% fine to coarse sand, 20% fine subrounded gravel (up to 0.75"), 10% fines, cobbles, wood debris. FILL.	Cleared to 5 feet bgs with vacuum truck.
2					EA-SB03-5-103013 is collected from interval 0 to 5 FT.
3					
4	EA-SB03-5-103013		155		
5			29.6	Wet @ 5 FT.	Petroelum hydrocarbon-like odor.
5.5		7		Wood pieces	
6		3 3	3.2 10.5	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), moist, 70% fine to coarse sand, 20% fine subrounded gravel (up to 0.75"), 10% fines, cobbles, wood debris. FILL.	Sheen, petroleum hydrocarbon-like odor.
7		2 3 3		SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel, wood debris, rootlets.	Sheen.
8			0.7	SILTY SAND (SM): dark gray (10YR 4/1), wet, loose, 80% fine to medium sand, 15% fines, 5% fine subrounded gravel, wood debris, rootlets.	Sheen.
9		1 2 2	10.7 5.7		No sheen.
10		2 2 3		PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, 100% organic matter, hydrogen sulfide-like odor.	Sheen.
11			1.7		Sheen.
12	EA-SB03-12-103013	3 3 4	0.7 0.5		No sheen.
13		4 5 16		WELL-GRADED SAND with SILT (SW-SM): dark gray (10YR 4/1), wet, loose, 90% fine to medium sand, 10% fines.	No sheen.
14			0.2		No sheen.
15		5			

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. EA-SB03 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
	EA-SB03-20-103013	☒	6 7	0.8		No sheen.
16		☒	3 4 6	0.5 4.9	WELL-GRADED SAND with SILT (SW-SM): dark gray (10YR 4/1), wet, loose, 90% fine to medium sand, 10% fines, hydrogen sulfide-like odor.	No sheen. No sheen.
18		☒	8 7 5	0.6	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, 100% organic matter, with pieces of wood, hydrogen sulfide-like odor.	No sheen.
19		☒ ■	3 4 4	0.3	POORLY-GRADED SAND with SILT (SP-SM): dark gray (10YR 4/1), wet, loose, 90% fine to medium sand, 10% fines, hydrogen sulfide-like odor, mixed with PEAT.	No sheen.
20					Bottom of Boring @ 20 Ft. Abandoned with bentonite to 1 FT bgs and cement to surface.	
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. EA-SB04**
BORING LOCATION: ExxonMobil/ADC	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/23/13 DATE FINISHED: 10/23/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
					Asphalt (7 inches), road base (6 inches), CAP fabric at 15.6 inches.	
1					WELL-GRADED SAND with SILT and GRAVEL (SW-SM): very dark gray (10YR 3/1), moist, 70% fine to coarse sand, 20% fine subrounded gravel (up to 0.75"), 10% fines, wood debris. FILL.	Cleared to 5 feet bgs with vacuum truck.
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3						
4	EA-SB04-5-101713			541		
5				327	Wet @ 5 FT.	Sheen, visible product, petroleum hydrocarbon-like odor.
6			4 5 3	333		Sheen, petroleum hydrocarbon-like odor.
7			10 10 12		Wood pieces.	Sheen, petroleum hydrocarbon-like odor.
8			7 15 15	99.9	WELL-GRADED SAND with SILT and GRAVEL (SW-SM): very dark gray (10YR 3/1), moist, 70% fine to coarse sand, 20% fine subrounded gravel (up to 0.75"), 10% fines, wood debris. FILL.	Sheen, petroleum hydrocarbon-like odor.
9				6.1	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, stiff, 100% organic matter, pieces of wood.	Sheen, petroleum hydrocarbon-like odor.
10			8 10 10			Sheen, petroleum hydrocarbon-like odor.
11			4 4 6	14.8 7.5		Sheen, petroleum hydrocarbon-like odor.
12				14.7	SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 0.75") mixed with PEAT, reddish brown (2.5YR 2/5/3), wood.	No sheen.
13			2 23			Sheen, petroleum hydrocarbon-like odor.
14			6	4.6		Sheen, petroleum hydrocarbon-like odor.
15						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. EA-SB04 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
	EA-SB04-20102313	7 10	2.2 1.2		No sheen, petroleum hydrocarbon-like odor.
16		12 11 18	2.8	SILTY SAND (SM): very dark gray (10YR 3/1), wet, medium dense, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 0.75").	No sheen.
17		13 16 22			No sheen.
18				Poor recovery, pieces of rock wedged in sampler shoe.	No sheen.
19		16 20 20	1.6	POORLY-GRADED SAND with SILT (SP-SM): very dark gray (10YR 3/1), wet, medium dense, 80% fine to coarse sand, 10% fine sand, 10% fine subrounded gravel (up to 0.75"), wood debris.	No sheen.
20				Bottom of Boring @ 20 FT. Abandoned with bentonite to 1 FT bgs and cement to surface.	
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. EA-SB05**
BORING LOCATION: ExxonMobil/ADC	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/29/13 — DATE FINISHED: 10/29/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA — COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb — DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
					Asphalt (7 inches), No CAP fabric.	
					SILTY SAND with GRAVEL (SM): very dark brown (10YR 2/2), moist, 60% fine to medium sand, 25% fines, 15% fine subrounded gravel (up to 0.75"), wood debris, cobbles, nails, pieces of glass. FILL.	
1						Cleared to 5 feet bgs with vacuum truck.
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3						
4						
	EA-SB05-5-101913	■		122		
5				4.0	Wet @ 5 FT.	No sheen.
6			3 3 4			No sheen.
			1 1 1	3.6 0.9		
7						Sheen.
8				1.4		No sheen.
9			2 2 1			No sheen.
				0.8		
10			1 1 2			No sheen.
					PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, 100% organic matter, hydrogen sulfide-like odor.	
11			8 9 8	0.7	Poor recover, due to wood pieces in shoe of split-spoon sampler.	No sheen.
12						No sheen.
				0.8	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, organic matter mixed with wood pieces and SILTY SAND (SM), hydrogen sulfide-like odor.	
13			20 21 20			No sheen.
14				4.9		No sheen.
			4			
15						

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. EA-SB05 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
15	EA-SB05-20-102913	4 5	1.63	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, organic matter mixed with wood pieces, hydrogen sulfide-like odor.	No sheen.
16 17		8 10 14 8 8 5	20.3 3.0 17	WELL-GRADED SAND with SILT (SW-SM): dark brown (10YR 3/2), wet, medium dense, 90% fine to coarse sand, 10% fines mixed with 10% PEAT, hydrogen sulfide-like odor.	No sheen. No sheen.
18			17	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, organic matter mixed with wood pieces, hydrogen sulfide-like odor.	No sheen.
19		6 6 8	27.3	WELL-GRADED SAND with SILT (SW-SM): dark brown (10YR 3/2), wet, medium dense, 90% fine to coarse sand, 10% fines mixed with 10% PEAT and pieces of wood, hydrogen sulfide-like odor.	No sheen.
20				PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, organic matter mixed with wood pieces, hydrogen sulfide-like odor.	
21				Bottom of Boring @ 20 FT. Abandoned with bentonite to 1 FT bgs and cement to surface.	
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. EA-SB06**
BORING LOCATION: ExxonMobil/ADC	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/28/13 · DATE FINISHED: 10/28/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 · MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA · COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb · DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long · REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
				Asphalt (6 inches). SILTY SAND (SM): gray (10YR 5/1), moist, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 0.75").	
1					Cleared to 5 feet bgs with vacuum truck.
2					EA-SB06-5-101413 is collected from interval 0 to 5 FT.
3	EA-SB06-5-101413		417		
4					
5	EA-SB06-6-102813	3			Sheen, petroleum hydrocarbon-like odor.
6		3 4	868 671 7.6	Wet @ 6 FT.	No sheen, petroleum hydrocarbon-like odor.
7		1 1 1		SILTY SAND (SM): gray (10YR 5/1), wet, loose, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 0.75"), mixed with PEAT, reddish brown (2.5YR 2.5/3) and wood pieces.	No sheen, petroleum hydrocarbon-like odor.
8			4.2		No sheen, petroleum hydrocarbon-like odor.
9		2 2 1	78.2	SILTY SAND (SM): very dark gray (10YR 3/1), wet, very loose, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 0.75").	No sheen, petroleum hydrocarbon-like odor.
10		1 1 2		SILTY SAND (SM): very dark gray (10YR 3/1), wet, very loose, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 0.75"), mixed with PEAT, reddish brown (2.5YR 2.5/3) and wood pieces.	Sheen, petroleum hydrocarbon-like odor.
11	EA-SB06-12-102813	8	8	ORGANIC SOIL (PT): reddish brown (2.5YR 2.5/3), wet, medium stiff, organic matter, pieces of wood, hydrogen sulfide-like odor.	No sheen.
12		8 9	9.3 3.2 2.6	ORGANIC SOIL (PT): reddish brown (2.5YR 2.5/3), wet, medium stiff, organic matter, pieces of wood, metal debris, mixed with brown, SANDY SILT (ML), hydrogen sulfide-like odor.	No sheen.
13		20 21 20			No sheen.
14		4	2.4		No sheen.
15					

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. EA-SB06 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
		☒	4 5	1.5 1.3		No sheen.
16		☒	8 10 14	1.2	SILTY SAND (SM): brown (10YR 5/3), wet, medium dense, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 0.75")	No sheen. No sheen.
17						
18		☒	8 8 5	1.3	WELL-GRADED SAND with SILT (SW-SM): dark gray (10YR 4/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel, wood pieces.	No sheen.
19	EA-SB06-20-102813	☒ ■	6 6 8	1.2	2 inch piece of gravel.	No sheen.
20					Bottom of Boring @ 20 FT. Abandoned with bentonite to 1 FT bgs and cement to surface.	
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PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. FA-SB01**
BORING LOCATION: Federal Ave (West Right-of-Way)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/25/13 DATE FINISHED: 10/25/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
					SILTY SAND (SM): dark yellowish brown (10YR 3/4), moist, 60% fine to medium sand, 30% fines, 10% fine subrounded gravel (up to 0.75"), wood debris, bricks, and cobbles present. FILL.	
1						Cleared to 5 feet bgs with vacuum truck.
2						
3						
4						
5	FA-SB01-5.5-101513			76		Sheen, visible product, petroleum hydrocarbon-like odor.
					Wet @ 5.5 FT.	
6						Sheen, petroleum hydrocarbon-like odor.
				60 34.7		
7			5 5 3			Sheen, visible product, petroleum hydrocarbon-like odor.
					WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75").	
8				19.2		Sheen, visible product, petroleum hydrocarbon-like odor.
9			3 1 5			Sheen, petroleum hydrocarbon-like odor.
				10.7 14.7	Pieces of wood.	
10					WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75").	Sheen, petroleum hydrocarbon-like odor.
			8 8 8			
11				20.7	SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 75% fine to coarse sand, 20% fines, 5% fine subrounded gravel (up to 0.75").	Sheen, petroleum hydrocarbon-like odor.
12			5 4 5			Sheen, petroleum hydrocarbon-like odor.
				6.1 11.8		
13					WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75").	No sheen, petroleum hydrocarbon-like odor.
			5 5 7			
14				7.5	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, medium stiff, mixed with SILTY SAND with GRAVEL and wood debris.	Sheen, petroleum hydrocarbon-like odor.
			9			
15						

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. FA-SB01 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	 Sample	 Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			8 10	2.2		Sheen, petroleum hydrocarbon-like odor.
				7.6	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75").	
16			3 4 4		mixed with PEAT, reddish brown (2.5YR 2.5/3), hydrogen sulfide-like odor.	Sheen.
17				2.2		Sheen.
18			15 17 23			No sheen.
				2.2	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, medium dense, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75") mixed with dark brown, SILT (ML).	
19	FA-SB01-20-102513		10 13 13	1		No sheen.
20					Bottom of Boring @ 20 FT. Abandoned with bentonite to surface.	No sheen.
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PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. FA-SB02**
BORING LOCATION: Federal Ave (West Right-of-Way)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/24/13 ; DATE FINISHED: 10/24/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 ; MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA ; COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb ; DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long ; REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					WELL-GRADED SAND (SW): very dark gray (10YR 3/1), moist, 100% fine to medium sand.	
1						Cleared to 8 feet bgs with vacuum truck.
2						
3						
4						
5	FA-SB02-5-101513	■		150		Sheen, trace free product, petroluem hydrocarbon odor.
6					Wet @ 6 FT.	Sheen, petroluem hydrocarbon odor.
7						Sheen, petroluem hydrocarbon odor.
8		☒	10 6 3	44.8 5.6	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 90% fine to medium sand, 10% fines.	Sheen, petroluem hydrocarbon odor.
9						Sheen, petroluem hydrocarbon odor.
9.5		☒	5 5 5	38.9 1.6		
10						Sheen, petroluem hydrocarbon odor.
11		☒	6 7 9	20.5	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 80% fine to medium sand, 10% fines, 10% fine subrounded gravel, wood debris (roots).	No sheen.
12						Sheen.
12.5		☒	4 4 3	7.4 5.6		
13						Sheen.
14		☒	3	3.2		No sheen.
15						

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. FA-SB02 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
15			5 5	2.2 3.2	SANDY SILT (ML): very dark brown (10YR 2/2), wet, no plasticity, medium stiff, 65% fines, 35% fine to medium sand, wood debris, hydrogen sulfide-like odor.	No sheen.
16			4 5 9	1.2	SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose to medium dense, 65% fine to coarse sand, 30% fines, 5% fine subrounded gravel (up to 0.75" in size), hydrogen sulfide odor.	No sheen.
17					SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose to medium dense, 80% fine to coarse sand, 15% fines, 5% fine subrounded gravel (up to 0.75" in size), wood debris, hydrogen sulfide odor.	No sheen.
18			13 14 14	0.8		No sheen.
19	FA-SB02-20-102413		7 8 11	0.6	Mixed with reddish brown (2.5 YR 3.5/3) PEAT.	No sheen.
20					Bottom of Boring @ 20 FT. Abandoned with bentonite to surface.	
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OAKBOREV (REV. 8/2011)

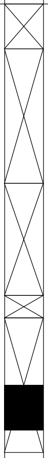
Log of Boring No. FA-SB03

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	
BORING LOCATION: Federal Ave (West Right-of-Way)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/24/13 — DATE FINISHED: 10/24/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA — COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb — DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					POORLY-GRADED SAND with SILT (SP-SM): very dark grayish brown (10YR 3/2), moist, 85% fine to medium sand, 10% fines, 5% fine subrounded gravel (up to 0.75"), wood debris (roots).	
1						Cleared to 5 feet bgs with vacuum truck.
2						FA-SB03-4-102413 is collected from interval 0 to 5 FT.
3						
4	FA-SB03-4-102413	■		9.4		
5		☒		9.5	Wet @ 5 FT.	No sheen.
6			4 4 4			Sheen, petroleum hydrocarbon-like odor.
6.5	FA-SB03-6.5-102413	■		23.4 7.4		
7		☒	5 7 9		SILTY SAND (SM): dark brown (10YR 3/3), wet, loose, 60% fine to medium sand, 30% fines, 10% fine subrounded gravel (up to 0.75") mixed with SANDY SILT (ML) dark greenish gray (10GY 4/1).	Sheen, petroleum hydrocarbon-like odor.
8		☒		2.6	SILTY SAND (SM): very dark gray (10YR 3/1), wet, 65% fine to coarse sand, 30% fines 5% fine subrounded gravel (up to 0.75").	No sheen.
9			6 7 8	0.5 0.5	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75").	Sheen.
10		☒	8 9 9			No sheen.
11		☒		0.8		No sheen.
12			5 7 7	0.6 0.6	SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 80% fine to medium sand, 20% fines.	No sheen.
13		☒	7 8 8			No sheen.
14		☒	13	2.1	mixed with PEAT, reddish brown (2.5YR 2.5/3).	No sheen.
15						

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. FA-SB03 (cont'd)



DEPTH (feet)	SAMPLES Sample No.	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
	FA-SB03-20-102413	15 19	0.4 0.2	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, medium dense, 75% fine to coarse sand, 10% fines, 5% fine subrounded gravel, rootlets.	No sheen.
16		15 17 22			No sheen.
17			0.2		No sheen.
18		10 11 14	0.2 0.2		No sheen.
19		16 17 22		mixed with PEAT, reddish brown (2.5YR 2.5/3).	No sheen.
20				Bottom of Boring @ 20 FT. Abandoned with bentonite to surface.	
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. FA-SB04**
BORING LOCATION: Federal Ave (West Right-of-Way)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/24/13 | DATE FINISHED: 10/24/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 | MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA | COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb | DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long | REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					POORLY-GRADED SAND with SILT (SP-SM): very dark grayish brown (10YR 3/2), moist, 85% fine to medium sand, 10% fines, 5% fine subrounded gravel (up to 0.75").	
1						Cleared to 5 feet bgs with vacuum truck.
2						FA-SB04-4-102413 is collected from interval 0 to 5 FT.
3						
4	FA-SB04-4-102413	■		2.3		
5		☒		0.1	Wet @ 5 FT.	No sheen, petroleum hydrocarbon-like odor.
5.5		☒	2 2 3	0.8	SANDY SILT (ML): dark greenish gray (5GY 4/1), wet, soft, non plasticity, 70% fines, 30% fine sand.	
6						No sheen.
6.5		☒		0.1	SILTY SAND (SM): dark greenish gray (5GY 4/1), wet, loose, 65% fine to medium sand, 30% fines, 5% fine subrounded gravel (up to 0.75").	
7			1 1 2			No sheen.
7.5					Mixed with PEAT, reddish brown (2.5yr 2.5/3), burnt wood debris.	
8		☒		0.1		No sheen.
9			1 5 11			No sheen.
9.5		☒		0.1 0.2		
10			10 11 9			No sheen.
10.5					WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75").	
11		☒		0.1		No sheen.
12			11 12 14			No sheen.
12.5		☒		0.1 0.2		
13			10 10 7			No sheen.
14		☒		0.2	hydrogen sulfide-like odor.	No sheen.
15			5			

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. FA-SB04 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
16			5 5 5	2.8 21.6	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75"), mixed with PEAT, reddish brown (2.5yr 2.5/3).	No sheen. No sheen.
17			6 7	9.9	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75"), hydrogen sulfide-like odor.	No sheen.
18			6 8 10	1.9	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75"), mixed with PEAT, reddish brown (2.5yr 2.5/3).	No sheen.
19 20	FA-SB04-20-102413		6 5 8	0.3	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75"), hydrogen sulfide-like odor.	No sheen.
21					Bottom of Boring @ 20 FT. Abandoned with bentonite to surface.	
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. FA-SB05**
BORING LOCATION: Federal Ave (West Right-of-Way)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/24/13 DATE FINISHED: 10/24/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST NA COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					SILTY SAND (SM): dark gray (10YR 4/1), moist, 65% fine to medium sand, 30% fines, 5% fine subrounded gravel (up to 0.75").	
1						Cleared to 8 feet bgs with vacuum truck. FA-SB05-4-102413 is collected from interval 0 to 8 FT.
4.5	FA-SB05-4-102413			0.0		
5.5					Wet @ 5.5 FT.	
8				1.0	SILTY SAND (SM): dark gray (10YR 4/1), moist, loose, 65% fine to medium sand, 30% fines, 5% fine subrounded gravel (up to 0.75"), mixed with PEAT reddish brown (2.5YR 2.5/3).	No sheen.
9			5 8 12			No sheen.
9.5				0.3 0.3	WELL-GRADED SAND with SILT (SW-SM): dark gray (10YR 4/1), wet, loose, 85% fine to medium sand, 10% fines, 5% fine subrounded gravel.	
10						No sheen.
11			8 9 9	0.5		No sheen.
12			8 7 9	0.3 0.3		No sheen.
13						No sheen.
14			6 7 9	27.9	wet, loose, 75% fine to medium sand, 10% fines, 15% fine subrounded gravel.	No sheen.
15			5			

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. FA-SB05 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			7 9	0.3		No sheen.
16			6 6 9	8.9 10.1	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to medium sand, 10% fines, 5% fine subrounded gravel, hydrogen sulfide-like odor.	No sheen. No sheen.
17						
18			7 5 6	1.6	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, medium stiff, 100% organics, with pieces of wood.	No sheen.
19	FA-SB05-20-102413		11 14 16	5.9	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, medium dense, 90% fine to medium sand, 10% fines, plant debris, hydrogen sulfide-like odor.	No sheen.
20					Bottom of Boring @ 20 FT. Abandoned with bentonite to surface.	
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PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. FA-SB06**
BORING LOCATION: Federal Ave (West Right-of-Way)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/25/13 DATE FINISHED: 10/25/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST NA COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					Asphalt (0.5 inches).	
0.5					SILTY SAND (SM): dark yellowish brown (10YR 3/4), moist, 55% fine to medium sand, 30% fines, 10% fine subrounded gravel (up to 0.75"), cobbles present.	
1						Cleared to 5 feet bgs with vacuum truck.
2						FA-SB06-4-102513 is collected from interval 0 to 5 FT.
4	FA-SB06-4-102513	■		0.4		
5				0.8	Wet @ 5 FT.	No sheen.
6		☒	3 2 4			Sheen, petroleum hydrocarbon-like odor.
6.5				31.2	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75").	
7.5	FA-SB06-7.5-102513	■	4 6 5	55		Sheen, petroleum hydrocarbon-like odor.
8		☒		42		Sheen, petroleum hydrocarbon-like odor.
9		☒	7 6 6	35 33.9		Sheen, petroleum hydrocarbon-like odor.
10		☒	9 10 10			No sheen, petroleum hydrocarbon-like odor.
11		☒		2.6		Sheen, petroleum hydrocarbon-like odor.
12		☒	5 6 6	20.9 20.7		No sheen, petroleum hydrocarbon-like odor.
13		☒	10 11 12			Sheen, petroleum hydrocarbon-like odor.
14		☒		2.6		Sheen, petroleum hydrocarbon-like odor.
15		☒	9			

OAKBOREV (REV. 8/2011)

Log of Boring No. FA-SB06 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
15			12 15	8.5		No sheen, petroleum hydrocarbon-like odor.
16			9 10 13	11.6	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, medium dense, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75"). Heaving sand.	Sheen, petroleum hydrocarbon-like odor.
17			4 4 4	3.2		Sheen, petroleum hydrocarbon-like odor.
18				7.9	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 60% fine to coarse sand, 30% fine subrounded gravel (up to 0.75"), 10% fines, with wood debris.	No sheen, petroleum hydrocarbon-like odor.
19	FA-SB06-20-102513		8 6 5	5.1	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, medium dense, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel (up to 0.75").	Sheen.
20					Bottom of Boring @ 20 Ft. Abandoned with bentonite to 1 FT bgs and cement to surface.	No sheen.
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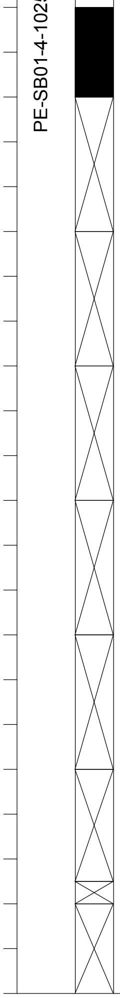
PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. FA-SB07**

BORING LOCATION: Federal Ave (West Right-of-Way)	ELEVATION AND DATUM: NA			
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/25/13	DATE FINISHED: 10/25/13		
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0	MEASURING POINT: Ground Surface		
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.)	FIRST NA	COMPL. NA	
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG			
HAMMER WEIGHT: 300 lb	DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long	REG. NO. L.Hg. 1354	



DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Blows/Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0				SILTY SAND (SM): dark yellowish brown (10YR 3/4), moist, 60% fine to medium sand, 30% fines, 10% fine subrounded gravel (up to 0.75").	
1					Cleared to 5 feet bgs with vacuum truck.
2					FA-SB07-4-102513 is collected from interval 0 to 5 FT.
4	PE-SB01-4-102513		0.1		
5			0.0	gray (10YR 5/1), Wet @ 5 FT.	No sheen.
6		4 4 5		mixed with pieces of wood.	No sheen.
6.5			2.1 15	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel, rootlets.	
7		5 7 6			No sheen, petroleum hydrocarbon-like odor.
8			0.5		No sheen.
9		6 9 15			No sheen.
9.5			0.4 0.2		
10		8 16 16			No sheen.
11			0.3		No sheen.
12		7 8 9			No sheen.
12.5			0.1 0.2		
13		8 9 9			No sheen.
14			0.3		No sheen.
15		9			

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. FA-SB07 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			9 11	0.1 1.8	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded gravel, rootlets, mixed with PEAT reddish brown (2.5YR 2.5/3).	No sheen.
16			10 10 11	0.1	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, stiff, mixed with POORLY-GRADED SAND with SILT, hydrogen sulfide odor.	No sheen.
17					WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, medium dense, 85% fine to medium sand, 10% fines, 5% fine subrounded gravel, rootlets.	No sheen.
18			10 14 16	0.3	Pieces of wood.	No sheen.
					WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 85% fine to medium sand, 10% fines, 5% fine subrounded gravel, rootlets.	
19	PE-SB01-20-102513	■	15 15 18	0.1		No sheen.
20					Bottom of Boring @ 20 FT. Abandoned with bentonite to surface.	
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. KC-SB01**
BORING LOCATION: Kimberly Clark	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/30/13 DATE FINISHED: 10/30/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 25.0 MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST NA COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					WELL-GRADED SAND with SILT and GRAVEL (SW-SM): dark brown (10YR 3/3), wet, 70% fine to coarse sand, 20% fine subrounded to rounded gravel (up to 0.75"), 10% fines, cobbles.	
1						Cleared to 5 feet bgs with vacuum truck.
2						KC-SB01-103013 is collected from interval 0 to 5 FT.
3						
4	KC-SB01-5-103013					
4.5		■		0.1		
5		☒		0.2	WELL-GRADED SAND with SILT (SW-SM): dark brown (10YR 3/3), wet, loose, 85% fine to coarse sand, 10% fines, 5% fine subrounded to rounded gravel (up to 0.75").	No sheen.
6			8 5 5			No sheen.
6.5		☒		0.3 0.3		
7			3 2 2			No sheen.
8		☒		0.1		No sheen.
8.5					WELL-GRADED SAND with SILT (SW-SM): dark brown (10YR 3/3), wet, medium dense, 85% fine to coarse sand, 10% fines, 5% fine subrounded to rounded gravel (up to 0.75"), wood pieces.	
9			4 5 5			No sheen.
9.5		☒		0.1 0.2		
10			12 13 16		dark gray (10Y 4/1), no wood pieces.	No sheen.
11		☒		0.1		No sheen.
12			5 15 21			No sheen.
12.5		☒		0.1 0.1		
13			15 17 21			No sheen.
14		☒		0.1		No sheen.
15			11			

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. KC-SB01 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
15		16 21	0.1 0.2	WELL-GRADED SAND with SILT (SW-SM): very dark grayish brown (10YR 3/2), wet, medium dense, 90% fine to coarse sand, 10% fines. Heaving sand.	No sheen.
16		19 20 21			No sheen.
17		18	0.2		No sheen.
18		22 21	0.1 0.2		No sheen.
19		15 17 19			No sheen.
20		18	0.1	WELL-GRADED SAND with SILT (SW-SM): very dark grayish brown (10YR 3/2), wet, medium dense, 85% fine to coarse sand, 10% fines, 5% fine subrounded to rounded gravel (up to 0.75").	No sheen.
21		22 24	0.2 0.2		No sheen.
22		14 18 19		4 inch cobble stuck in shoe of split-spoon sampler.	No sheen.
23			0.3		No sheen.
24	KC-SB01-25-103013	20 20 24	0.2	SILTY SAND (SM): dark gray (10YR 5/3), wet, medium dense, 75% fine to medium sand, 25% fines.	No sheen.
25				Bottom of Boring @ 25 FT. Abandoned with bentonite to surface.	
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OAKBOREV (REV. 8/2011)

Log of Boring No. PE-SB02

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	
BORING LOCATION: Vigor Marine (Port of Everett Leasehold Property)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/22/13 DATE FINISHED: 10/22/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0–1					Asphalt (8 inches), base gravel (10 inches).	
1–2					WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), moist, 85% fine to medium sand, 10% fines, 5% fine subrounded gravel (up to 0.75" in size), brick debris. FILL.	Cleared to 5 feet bgs with vacuum truck.
2–3						
3–4						
4–5						
5–6		☒	8	40 90.8		No sheen.
6–7	PE-SB02-7-102213	☒ ■	6 7	88 4.1	Wet @ 6 FT.	Sheen, free product, petroleum hydrocarbon-like odor
7–8		☒	10 10 12			Sheen, free product, petroleum hydrocarbon-like odor
8–9		☒	5	2.2		Sheen.
9–10		☒	5 5	4.7 2.2		No sheen.
10–11		☒	10 9 10			Sheen.
11–12		☒	7	0.8		No sheen.
12–13		☒	9 15	3.2 4.1	SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 0.75" in size).	No sheen.
13–14		☒	10 9 10			Sheen.
14–15		☒	15	1.3		No sheen.

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. PE-SB02 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
		☒	14 15	1.3 1.1	SILTY SAND (SM): very dark gray (10YR 3/1), wet, medium dense, 65% fine to medium sand, 30% fines, 5% fine subrounded gravel (up to 0.75" in size), no sheen, hydrogen sulfide-like odor.	No sheen.
16		☒	9 10 12			No sheen.
17		☒		4		No sheen.
18		☒	12 13 14	0.5		No sheen.
19	PE-SB02-20-102213	☒ ■	11 10 14	0.6		No sheen.
20					Bottom of Boring @ 20 FT. Abandoned with bentonite to 1 FT bgs and cement to surface.	
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PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. PE-SB03**
BORING LOCATION: Vigor Marine (Port of Everett Leasehold Property)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/22/13 — DATE FINISHED: 10/22/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) — FIRST: NA — COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb — DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					Asphalt (5 inches), base gravel (18 inches).	
1						Cleared to 5 feet bgs with vacuum truck.
1.5					WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), moist, 95% fine to medium sand, 5% fines.	
2						
3						
4	PE-SB03-5-101613	■		46		
5		☒		44	Wet @ 5.25 FT.	Sheen, free product, petroleum hydrocarbon-like odor
6			8 20 12			Sheen, free product, petroleum hydrocarbon-like odor
6.5		☒		13.1 18		
7			8 7 6			Sheen, petroleum hydrocarbon-like odor
8		☒		3.8		Sheen, petroleum hydrocarbon-like odor
9			6 10 10	22 2.4		Sheen, petroleum hydrocarbon-like odor
9.5		☒				
10			3 4 6			Sheen, petroleum hydrocarbon-like odor
10.5		☒				
11		☒		1.6	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 95% fine to medium sand, 5% fines, trace wood debris.	No sheen
12			8 9 12	1.1 1.0		No sheen
12.5		☒				
13			6 8 8			No sheen
14		☒		5.6		No sheen
15			10			

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. PE-SB03 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			10 10	3.1 1.0	SANDY SILT (ML): very dark brown (10YR 2/2), wet, no plasticity, medium stiff, 65% fines, 35% fine sand, trace wood debris, hydrogen sulfide-like odor.	No sheen
16			7 9 9	2.4		No sheen
17			8 7 8		SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 80% fine to medium sand, 20% fines, hydrogen sulfide-like odor.	No sheen
18				0.6 1.5	SANDY SILT (ML): dark brown (10YR 3/3), wet, no plasticity, loose, 70% fines, 30% fine to medium sand, hydrogen sulfide-like odor.	No sheen
19	PE-SB03-20-102213	■	9 10 10	1.5		No sheen
20					Bottom of Boring @ 20 FT. Abandoned with bentonite to 1 FT bgs and cement to surface.	
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. PE-SB04**
BORING LOCATION: Port of Everett	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/22/13 — DATE FINISHED: 10/22/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA — COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb — DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
					Asphalt (6 inches), base gravel (12 inches).	
1						Cleared to 5 feet bgs with vacuum truck.
2					SILTY SAND (SM): very dark gray (10YR 3/1), moist, loose, 65% fine to coarse sand, 25% fines, 10% fine subrounded gravel (up to 0.75" in size), wood debris.	PE-SB04-102213 is collected from interval 0 to 5 FT.
3						
4	PE-SB04-102213	■		0.0		
5				4.6		No sheen.
6			4 4 5	0.2 3.4		No sheen.
7			2 2 3		Wet @ 7.0 FT. WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 90% fine to medium sand, 10% fines.	No sheen.
8				0.3	SANDY SILT (ML): dark brown (10YR 3/3), wet, no plasticity, medium stiff, 60% fines, 40% fine to medium sand, wood debris (possible railroad tie).	Sheen.
9			6 8 10	0.0 0.0	WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 90% fine to medium sand, 10% fines.	No sheen.
10			4 4 5		Pieces of wood. WELL-GRADED SAND with SILT (SW-SM): very dark gray (10YR 3/1), wet, loose, 90% fine to medium sand, 10% fines.	No sheen.
11				0.0		No sheen.
12			6 6 6	1.9 0.4		No sheen.
13			4 4 3			No sheen.
14			6	0.9	SANDY SILT (ML): very dark brown (10YR 2/2), wet, no plasticity, medium stiff, 70% fines, 30% fine sand, wood debris, hydrogen sulfide odor.	No sheen.
15						

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. PE-SB04 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			7 7	1.0 9.0	SANDY SILT (ML): very dark brown (10YR 2/2), wet, no plasticity, medium stiff, 70% fines, 30% fine sand, wood debris, hydrogen sulfide odor.	No sheen.
16			7 9 9			No sheen.
17				0.1	SILTY SAND (SM): very dark gray (10YR 3/1), wet, medium dense, 60% fine to coarse sand, 40% fines, hydrogen sulfide odor.	No sheen.
18			17 18 14	0.1	SANDY SILT (ML): dark yellowish brown (10YR 4/4), wet, no plasticity, stiff, 70% fines, 30% fine sand, wood debris, hydrogen sulfide odor.	No sheen.
19	PE-SB04-102213		14 17 21		SILTY SAND (SM): very dark gray (10YR 3/1), wet, medium dense, 60% fine to coarse sand, 40% fines, hydrogen sulfide odor.	No sheen.
20					SANDY SILT (ML): very dark gray (10YR 3/1), wet, no plasticity, stiff, 70% fines, 30% fine sand, wood debris, hydrogen sulfide odor. Bottom of Boring @ 20 FT. Abandoned with bentonite to 1 FT bgs and cement to surface.	
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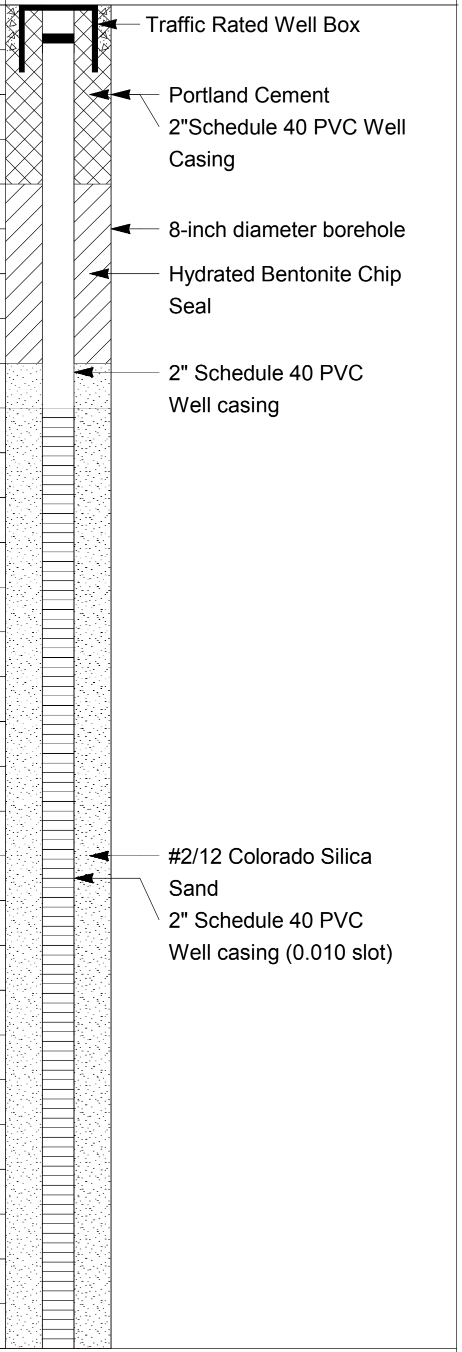
OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Well No. MW-A8**
BORING LOCATION: Dunlap Towing (Port of Everett Leasehold Property)	TOP OF CASING ELEVATION AND DATUM: Ground Surface
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 10/29/13 — DATE FINISHED: 10/28/13
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 15.5 — SCREEN INTERVAL (ft.): 5-15
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.): FIRST 13 — COMPL. 11.75 — CASING:
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 lb — DROP: 30 in	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA
0				Asphalt (6 inches).
0.5–8				WELL-GRADED SAND with SILT (SW-SM): dark brown (10YR 3/3), moist, 80% fine to coarse sand, 10% fines, 10% fine subrounded gravel (up to 0.75"), cobbles, brick, metal pieces. FILL.
5	MW-A8-6-102913	8 6 6	0.1	
6			0.2	
6.5		22 30 30	0.3	
7			0.1	
8		9 8 6	0.1	SILTY SAND (SM): dark brown (10YR 3/3), moist, loose, 75% fine to coarse sand, 25% fines, 5% fine subround gravel. FILL.
9				WELL-GRADED SAND with SILT (SW-SM): dark brown (10YR 3/3), moist, medium dense, 80% fine to coarse sand, 10% fines, 10% fine subrounded gravel (up to 0.75").
9.5		9 20 21	0.0	
10			0.0	
11		18 21 22	0.0	
12.5		22 28 31	0.0	Cobble at 12.5 FT to 13 Ft.
13			0.1	
13.5				brown (10YR 4/3), WET @ 13.5 FT.
14		20 21 24		
14.5			0.1	
15				

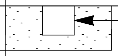
WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



OAKWELLV_TOC (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Well No. MW-A8 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
16	MW-A8-15-102913	■			WELL-GRADED SAND with SILT (SW-SM): dark brown (10YR 3/3), moist, medium dense, 80% fine to coarse sand, 10% fines, 10% fine subrounded gravel (up to 0.75").	 2" Schedule 40 PVC endcap
					Bottom of Boring @ 15.5 FT.	
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PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. BN-SB08**
BORING LOCATION: BNSF Property	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 2/4/14 — DATE FINISHED: 2/10/14
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA — COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 — DROP: 30	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), moist, 75% fine to coarse sand, 15% fines, 10% fine subrounded gravel (up to 0.75" in size). FILL.	Cleared to 5.5 feet bgs with vacuum truck.
5	BN-SB08-5.5-020414	■		0.0		Sheen
5.5					Wet at 5.5'.	
6				0.2 0.1	Trace wood debris.	No Sheen
6–7.5			6 7 8	0.2		No Sheen
7.5–9			5 6 6	0.3		No Sheen
9				0.2	POORLY-GRADED SAND (SP): very dark grayish brown (10YR 3/2), wet, medium dense, 95% fine to medium sand, 5% fines.	No Sheen
9–10.5			10 13 12	0.3	Similar to above but with trace fine subangular gravel (up to 0.75" in size).	No Sheen
10.5–12			15 11 10	0.7 0.2	WELL-GRADED SAND with GRAVEL (SW): very dark grayish brown (10YR 3/2), wet, medium dense, 80% fine to coarse sand, 15% fine subrounded gravel (up to 1" in size), 5% fines.	No Sheen No Sheen
12–13.5			5 11 10	0.1		No Sheen
13.5–15			13 9 10		WELL-GRADED SAND (SW): very dark grayish brown (10YR 3/2), wet, medium dense, 90% fine to coarse sand, 5% fine subrounded gravel (up to 1" in size), 5% fines.	No Sheen

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. BN-SB08 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
				0.3 0.4		No Sheen
16			14 12 15	0.4		No Sheen
17			12 11 12		POORLY-GRADED SAND (SP): dark yellowish brown (10YR 4/4), wet, medium dense, 95% fine to coarse sand, 5% fines, trace subrounded gravel (up to 1" in size).	No Sheen
18				0.4		No Sheen
19			15 16 16	0.3	SILTY SAND (SM): dark yellowish brown (10YR 4/4), wet, medium dense, 75% fine to medium sand, 25% fines.	No Sheen
20			10 12 13			No Sheen
21				0.3 0.5		
22			8 13 14	0.5	SANDY SILT (ML): very dark gray (10YR 3/1), wet, no plasticity, medium stiff, 70% fines, 30% fine sand, trace fine subrounded gravel (up to 1" in size).	
23	BN-SB08-24-021014	■	11 18 11	0.5	SILT (ML): very dark gray (10YR 3/1), wet, no plasticity, stiff, 95% fines, 5% fine sand, trace fine subrounded gravel (up to 0.75" in size), trace shells.	
24					Bottom of Boring @ 24.0 FT. Abandoned with bentonite to surface.	
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PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. BN-SB09**
BORING LOCATION: BNSF Property	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 2/4/14 — DATE FINISHED: 2/10/14
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST NA — COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 — DROP: 30	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					WELL-GRADED GRAVEL with SAND (GW): gray moist, 80% fine to coarse subrounded gravel (up to 3" in size), 15% fine to coarse sand, 5% fines. FILL.	
1						Cleared to 9 feet bgs with vacuum truck.
2					Wet @ 2 FT.	
3					Filter fabric observed at 3 FT.	
4						
5						
6						
7						
7.5					WELL-GRADED SAND with SILT (SW-SM): dark yellowish brown (10YR 3/4), wet, medium dense, 70% fine to coarse sand, 15% fine subrounded gravel (up to 0.75" in size), 15% fines.	
8	BN-SB09-9-020414					
8.5		■		0.1		
9						No Sheen
10				0.3 0.4	Heaving Sand.	No Sheen
11			1 15 21			No Sheen
11.5				0.3		
12						No Sheen
12.5			13 25 20			
13				0.2 0.2		No Sheen
14			19 20 15			No Sheen
14.5				0.2		
15						

OAKBOREV (REV. 8/2011)

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Project No. 610314009

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. BN-SB09 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
15		6 12 12		POORLY-GRADED SAND (SP): dark yellowish brown (10YR 3/4), wet, medium dense, 95% fine to medium sand, 5% fines, trace subrounded gravel (up to 0.75" in size).	No Sheen
16		9 14 10	0.3 0.4	POORLY-GRADED SAND (SP): dark yellowish brown (10YR 3/4), wet, medium dense, 95% fine to medium sand, 5% fines, trace subrounded gravel (up to 0.75" in size).	No Sheen
17			0.3		No Sheen
18		14 17 21			No Sheen
19		10 12 12	0.5 0.5		No Sheen
20			0.2		No Sheen
21		15 15 15			
22		17 22 20	0.3 0.3		
23	BN-SB09-24-021014		0.3		
24		20 20 20			
25				Bottom of Boring @ 25.0 FT. Abandoned with bentonite to surface.	
26					
27					
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PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. KC-SB02**
BORING LOCATION: Kimberly Clark	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 2/4/14 — DATE FINISHED: 2/10/14
DRILLING METHOD: Limited Access Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 55 modified	DEPTH TO WATER (ft.) FIRST: NA — COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 150 — DROP: 30	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					Asphalt (4 Inches)	
0.5					POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), moist, 95% fine to medium sand, 5% fines, trace coarse sand and trace fine subrounded gravel (up to 0.75" in size). FILL.	
1						Cleared to 5 feet bgs with vacuum truck.
2						
3						
4	KC-SB02-5-020414					
4.5		■		6.3		
5				0.2	Wet @ 5 FT.	Trace Sheen
5.5			8 6 8			
6	KC-SB02-7-021014				SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 75% fine to medium sand, 20% fines, 5% fine subrounded gravel (up to 1" in size).	No Sheen
6.5		■		0.0		
7			6 6 9		PEAT (PT): reddish brown (2.5YR 2.5/3), wet, medium stiff, mixed with SANDY SILT (SM).	No Sheen
8				0.7 0.0	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, loose, 95% fine to medium sand, 5% fines, mottled.	No Sheen
9			8 10 10	0.1		No Sheen
10			14 28 30			No Sheen
11				0.4 0.2		No Sheen
12			20 20 20	0.4		No Sheen
12.5					POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, medium dense, 95% fine to coarse sand, 5% fines, trace subrounded gravel (up to 0.75" in size).	
13			15 19 21			No Sheen
14			16	0.2 0.3		No Sheen
15						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. KC-SB02 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
		15 15	0.2		No Sheen
16		16 17 17	0.0		No Sheen
17			0.5	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, medium dense, 95% fine to coarse sand, 5% fines, trace subrounded gravel (up to 0.75" in size) mixed with PEAT (PT), hydrogen sulfide odor.	No Sheen
18		15 18 23	0.0		No Sheen
19	KC-SB02-20-021014	7 9 12	11.0	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, medium stiff.	No Sheen
20				Bottom of Boring @ 20.0 FT. Abandoned with bentonite to 2 FT bgs and cement to surface.	No Sheen
21					
22					
23					
24					
25					
26					
27					
28					
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. PE-SB05**	
BORING LOCATION: Dunlap Towing (Port of Everett Leasehold Property)	ELEVATION AND DATUM: NA	
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 2/4/14	DATE FINISHED: 2/7/14
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0	MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.)	FIRST NA / COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG	
HAMMER WEIGHT: 300 / DROP: 30	RESPONSIBLE PROFESSIONAL: John Long	REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
					Asphalt (5 inches)	
1					SILTY SAND with GRAVEL (SM): dark yellowish brown (10YR 3/4), moist, 65% fine to coarse sand, 20% fine subrounded gravel (up to 0.75" in size), 15% fines. FILL.	Cleared to 5 feet bgs with vacuum truck.
2						
3						
4						
5			5 5 5	4 0.6	WELL-GRADED SAND (SW): dark yellowish brown (10YR 3/4), moist, loose, 95% fine to coarse sand, 5% fines. FILL.	No Sheen
6			50/6			No Sheen
7					WELL-GRADED SAND (SW): dark yellowish brown (10YR 3/4), moist, loose, 90% fine to coarse sand, 5% fines, 5% fine subrounded gravel (up to 0.75" in size), wood debris. FILL.	No Sheen
8	PE-SB05-9-021014	■	5	0.4 0.4		No Sheen
9			5 7	0.3	SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 80% fine to medium sand, 20% fines.	No Sheen
10			4 5 11		SANDY SILT (ML): very dark gray (10YR 3/1), wet, medium stiff, 80% nonplastic fines, 20% fine to medium sand, trace subrounded gravel (up to 2" in size), wood debris (twigs), hydrogen sulifde odor.	No Sheen
11			12 14 19	0.5 0.3	SILTY SAND (SM): very dark gray (10YR 3/1), wet, medium dense, 80% fine to medium sand, 20% fines, trace fine gravel, trace peat, cemented.	No Sheen
12				0.3		No Sheen
13			21 20 20			No Sheen
14			16	0.3 0.2	POORLY-GRADED SAND (SP): black (10YR 2/1), wet, medium dense, 95% fine to medium sand, 5% fines, trace fine subrounded gravel, trace peat, yellow specks.	No Sheen
15						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. PE-SB05 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			13 14	0.4	POORLY-GRADED SAND (SP): black (10YR 2/1), wet, medium dense, 90% fine to medium sand, 5% nonplastic fines, 5% fine subrounded gravel (up to 0.75" in size).	No Sheen
16			5 5 8	0.4	SILTY SAND (SM): very dark gray (10YR 3/1), wet, loose, 70% fine to medium sand, 30% nonplastic fines, trace subrounded gravel (up to 0.75" in size).	No Sheen
17				0.3	SANDY SILT (ML): very dark gray (10YR 3/1), wet, medium stiff, 70% nonplastic fines, 30% fine to medium sand.	No Sheen
18			6 7 9	0.3	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, loose, 95% fine to medium sand, 5% nonplastic fines, trace fine subrounded gravel.	No Sheen
19	PE-SB05-20-020714		6 9 12	0.4	▽ Trace wood debris mixed in POORLY-GRADED SAND (SP).	No Sheen
20					Bottom of Boring @ 20.0 FT. Abandoned with bentonite to 2 FT bgs and cement to surface.	No Sheen
21						
22						
23						
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32						
33						

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. PE-SB06**
BORING LOCATION: Vigor Marine (Port of Everett Leasehold Property)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 2/4/14 ; DATE FINISHED: 2/7/14
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 ; MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST NA ; COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 ; DROP: 30	RESPONSIBLE PROFESSIONAL: John Long ; REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
					Asphalt (5""	
1 2					WELL-GRADED SAND with GRAVEL (SW): dark yellowish brown (10YR 3/4), moist, 75% fine to coarse sand, 15% fine subrounded gravel (up to 1" in size), FILL.	Cleared to 5 feet bgs with vacuum truck.
3 4					Concrete rubble, filter fabric at 5'.	
5 6			5 7 7	2.4 3.6	WELL-GRADED SAND (SW): dark yellowish brown (10YR 3/4), moist, loose, 90% fine to coarse sand, 10% nonplastic fines, FILL.	No Sheen No Sheen
7 8	PE-SB06-7.5-020714		8 8 11	1.6 2.0 13.3	SILTY SAND (SM): dark yellowish brown (10YR 3/4), moist, loose, 75% fine to coarse sand, 20% nonplastic fines, 5% fine subrounded gravel (up to 2" in size), wood debris, FILL. Wet @ 7 FT.	Sheen, trace product, petroleum hydrocarbon-like Sheen
9 10			8 10 15 10 12 15	11.6	WELL-GRADED SAND with GRAVEL (SW): very dark gray (10YR 3/1), wet, medium dense, 80% fine to coarse sand, 15% fine subrounded gravel (up to 1" in size), 5% nonplastic fines.	Sheen Sheen, trace product, petroleum hydrocarbon-like
11 12	PE-SB06-11.5-020714		10 10 11	12	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, medium dense, 95% fine to medium sand, 5% nonplastic fines.	No Sheen No Sheen
13					No recovery.	No Sheen
14 15			12	10 13.8	WELL-GRADED SAND with GRAVEL (SW): very dark gray (10YR 3/1), wet, medium dense, 85% fine to coarse sand, 15% nonplastic fines, trace subrounded gravel (up to 0.75" in size).	No Sheen

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. PE-SB06 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			11 14	1.8		No Sheen
16			11 11 9	3.9 8.3	WELL-GRADED SAND with GRAVEL (SW): very dark gray (10YR 3/1), wet, medium dense, 85% fine to coarse sand, 15% nonplastic fines, trace subrounded gravel (up to 0.75" in size).	No Sheen
17						No Sheen
18			7 7 9	5	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, loose, 95% fine to medium sand, 5% nonplastic fines, with trace PEAT (PT), hydrogen sulfide-like odor.	No Sheen
19	PE-SB06-20-020714	■	13 15 20			No Sheen
20					Bottom of Boring @ 20.0 FT. Abandoned with bentonite to 2 FT bgs and cement to surface.	No Sheen
21						
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. PE-SB07**
BORING LOCATION: Vigor Marine (Port of Everett Leasehold Property)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 2/4/14 — DATE FINISHED: 2/7/14
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST NA — COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 — DROP: 30	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
				Asphalt.	
1				POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), moist, 90% fine to coarse sand, 5% nonplastic fines, 5% fine subrounded gravel (up to 1" in size). FILL.	Cleared to 5 feet bgs with vacuum truck.
2					
3				Wood debris mixed in the POORLY-GRADED SAND.	
4	PE-SB07-5-020314		100 71.6	WELL-GRADED SAND (SW): very dark gray (10YR 3/1), moist, 95% fine to coarse sand, 5% nonplastic fines. FILL. Wet @ 4.5 FT.	
5		4 5 9		WELL-GRADED SAND (SW): very dark gray (10YR 3/1), wet, loose, 95% fine to coarse sand, 5% nonplastic fines, trace subrounded gravel (up to 0.75" in size).	Sheen, visible product, petroleum hydrocarbon-like odor.
6	PE-SB07-7-020714		60		Sheen, visible product, petroleum hydrocarbon-like odor.
7		16 19 18			Sheen, visible product, petroleum hydrocarbon-like odor.
8	PE-SB07-9-020714	8 5 8	33 71 43	Similar as above but with trace wood debris.	Sheen, visible product, petroleum hydrocarbon-like odor.
9					Sheen, visible product, petroleum hydrocarbon-like odor.
10	PE-SB07-11-020714	18 18 18	4.0		Sheen, visible product, petroleum hydrocarbon-like odor.
11		16 15 18			No Sheen
12	PE-SB07-13-020714		4.0 11.4		No Sheen
13		15 18 21			Trace Sheen
14	PE-SB07-15-020714	14	12.2 4.5		No Sheen
15					

OAKBOREV (REV. 8/2011)

Project No. 610314009

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. PE-SB07 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			15 19	9.9	SILTY SAND (SM): very dark gray (10YR 3/1), wet, medium dense, 80% fine to medium sand, 20% nonplastic fines, trace fine subrounded gravel (up to 0.75" in size), trace PEAT.	No Sheen
16	PE-SB07-17-020714		13 20	14.5		No Sheen
17		■	15	12.2		No Sheen
18			10 10 12	8.4		Sheen
19	PE-SB07-20-020714	■	6 8 8	4.8		No Sheen
20					PEAT (PT): reddish brown (2.5YR 2.5/3), wet, medium stiff, 100% organic, hydrogen sulfide-like odor.	No Sheen
					Bottom of Boring @ 20.0 FT. Abandoned with bentonite to 2 FT bgs and cement to surface.	
21						
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OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. PE-SB08**
BORING LOCATION: Vigor Marine (Port of Everett Leasehold Property)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 2/4/14 — DATE FINISHED: 2/6/14
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST NA COMPL. NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 DROP: 30	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					Asphalt.	
1					WELL-GRADED SAND (SW): very dark gray (10YR 3/1), moist, 85% fine to coarse sand, 10% fines, 5% nonplastic fines. FILL.	Cleared to 5 feet bgs with vacuum truck.
5				0.8 0		No Sheen
6			6 6 7		SILTY SAND (SM): very dark gray (10YR 3/1), moist, loose, 65% fine to coarse sand, 35% nonplastic fines, trace fine subrounded gravel (up to 0.75" in size), wood debris.	No Sheen
7	PE-SB08-7.5-020614		3 5 8	0.0	SANDY SILT (ML): very dark gray (10YR 3/1), wet, soft, 65% nonplastic fines, 35% fine to medium sand.	No Sheen
8				0 0.0	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, loose, 95% fine to medium sand, 5% nonplastic fines, trace fine subrounded gravel (up to 0.75" in size).	No Sheen
9			3 5 8	2.0		No Sheen
10			4 4 5			No Sheen
11	PE-SB08-11.5-020614			2.2	WELL-GRADED SAND (SW): very dark gray (10YR 3/1), wet, loose, 85% fine to coarse sand, 10% nonplastic fines, 5% fine subrounded gravel (up to 2" in size).	Sheen, petroleum hydrocarbon-like odor
12			5 5 8	2.1 3.2		Sheen, petroleum hydrocarbon-like odor
13			4 5 7			Sheen, petroleum hydrocarbon-like odor
14			6	2.9 6.6		Sheen, petroleum hydrocarbon-like odor
15						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. PE-SB08 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			7 9	21.2		Sheen, petroleum hydrocarbon-like odor
16			14 15 18		WELL-GRADED SAND with GRAVEL (SW): very dark gray (10YR 3/1), wet, medium dense, 65% fine to coarse sand, 30% fine rounded to subrounded gravel (up to 3" in size), 5% nonplastic fines, glass fragments.	Sheen, petroleum hydrocarbon-like odor
17				30.8 11.3		Sheen, petroleum hydrocarbon-like odor
18			16 18 18	16.6	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, medium dense, 90% fine to coarse sand, 5% nonplastic fines, 5% fine subrounded gravel.	Sheen, petroleum hydrocarbon-like odor
19			5 5 4			Sheen, petroleum hydrocarbon-like odor
20	PE-SB08-21-020614		6 7 7	7.9	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, loose, 95% fine to medium sand, 5% nonplastic fines, trace subrounded gravel (up to 0.75" in size).	
21				0	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, medium dense, 95% fine to medium sand, 5% nonplastic fines, trace subrounded gravel (up to 0.75" in size) mixed with trace PEAT (PT), hydrogen sulfide odor.	Sheen, petroleum hydrocarbon-like odor
22	PE-SB08-23-020614		21 24 27	0		No Sheen
23					Bottom of Boring @ 23.0 FT. Abandoned with bentonite to 2 FT bgs and cement to surface.	No Sheen
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. PE-SB09**
BORING LOCATION: Port of Everett	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 2/4/14 — DATE FINISHED: 2/10/14
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA — COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 — DROP: 30	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
					Asphalt.	
1					WELL-GRADED SAND (SW): dark yellowish brown (10YR 3/4), moist, loose, 85% fine to coarse sand, 10% nonplastic fines, 5% fine subrounded gravel (up to 0.75" in size). FILL.	Cleared to 5 feet bgs with vacuum truck.
2						
3						
4						
5	PE-SB09-5.5-021014			1.0	Wet @ 5 FT.	Sheen
6			6 7 18	0.2 0.0		Sheen
7			5 10 9	0.5 0.3	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, loose, 95% fine to medium sand, 5% nonplastic fines, trace subrounded gravel (up to 0.75" in size).	No Sheen
8						Trace Sheen
9			2 3 3	0.0	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, 100% organic matter, hydrogen sulfide-like odor.	No Sheen
					PEAT (PT): reddish brown (2.5YR 2.5/3), wet, soft, mixed with POORLY GRADED SAND (SP).	
10			6 5 6	0.0 0.1		No Sheen
11						No Sheen
12			6 6 8	0.2	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, loose, 95% fine to medium sand, 5% nonplastic fines, trace PEAT (PT)	No Sheen
13			9 8 6	0.2 0.9		No Sheen
14			10			No Sheen
15						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

Log of Boring No. PE-SB09 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
			10 10	2.0	POORLY-GRADED SAND (SP): very dark gray (10YR 3/1), wet, loose, 95% fine to medium sand, 5% nonplastic fines, mixed with PEAT (PT), hydrogen sulfide-like odor.	No Sheen
16			5 5 4			No Sheen
17				8.6 0.6		No Sheen
18			9 14 15	2.6		No Sheen
19			8 8 9	7.0	PEAT (PT): reddish brown (2.5YR 2.5/3), wet, medium stiff, 100% organic, hydrogen sulfide-like odor.	No Sheen
20	PE-SB09-5.5-021014	■			Bottom of Boring @ 20.0 FT. Abandoned with bentonite to 2 FT bgs and cement to surface.	No Sheen
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation 2717/2731 Federal Ave. Everett, WA	**Log of Boring No. PE-SB10**
BORING LOCATION: Vigor Marine (Port of Everett Leasehold Property)	ELEVATION AND DATUM: NA
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 2/4/14 — DATE FINISHED: 2/6/14
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 20.0 — MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER (ft.) FIRST: NA — COMPL.: NA
SAMPLING METHOD: Modified California drive sampler [18" x 2.5"]	LOGGED BY: J. Bellamy, LG
HAMMER WEIGHT: 300 — DROP: 30	RESPONSIBLE PROFESSIONAL: John Long — REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	REMARKS
0					Asphalt (6")	
0.5					WELL-GRADED SAND (SW): very dark gray (10YR 3/1), moist, 80% fine to coarse sand, 15% nonplastic fines, 5% fine subrounded gravel, Fill.	Cleared to 5 feet bgs with vacuum truck.
5				1.5 0.2	WELL-GRADED SAND (SW): very dark gray (10YR 3/1), moist, medium dense, 80% fine to coarse sand, 15% nonplastic fines, 5% fine subrounded gravel, Fill.	No Sheen
6			10 22 16			No Sheen
6.5				0.2		
7			21 21 20			No Sheen
8				0.0		No Sheen
8.5	PE-SB10-8.5-021014	■		0.0	Wet @ 8.5 FT.	
9			16 15 16			No Sheen
9.5				0.0		
10			9 7 7			No Sheen
11				0.0 0.0		No Sheen
12			8 7 5			No Sheen
12.5				5.8		
13			5 5 4			No Sheen
13.5					SANDY SILT (ML): very dark gray (10YR 3/1), wet, medium stiff, 83% nonplastic fines, 17% fine to coarse sand, trace fine subrounded gravel (up to 0.75" in size), trace PEAT (PT), hydrogen sulfide-like odor.	
14			7	0.4 0.1		No Sheen
15						

OAKBOREV (REV. 8/2011)

PROJECT: ExxonMobil/ADC Final Data Investigation
2717/2731 Federal Ave. Everett, WA

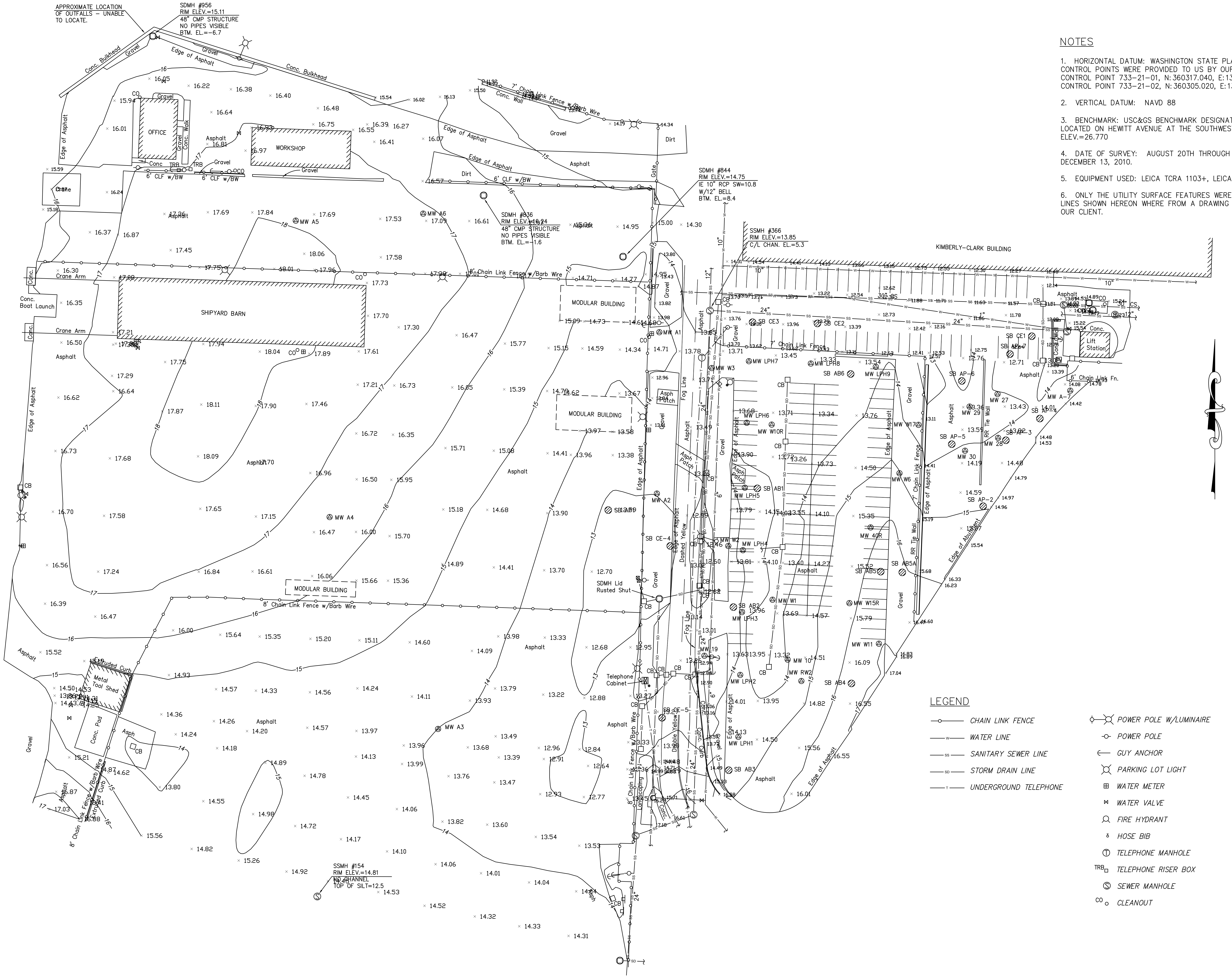
Log of Boring No. PE-SB10 (cont'd)

DEPTH (feet)	SAMPLES			OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
	Sample No.	Sample	Blows/ Foot			
	PE-SB10-20-021014		6 7	0.2	WELL-GRADED SAND (SW): very dark gray (10YR 3/1), wet, loose, 90% fine to coarse sand, 5% nonplastic fines, 5% fine subrounded gravel (up to 0.75" in size), mixed with trace PEAT (PT).	No Sheen
16			5 4 5		SANDY SILT (ML): very dark gray (10YR 3/1), wet, medium stiff, 83% nonplastic fines, 17% fine to coarse sand, trace fine subrounded gravel (up to 0.75" in size), trace PEAT (PT), wood debris, hydrogen sulfide-like odor.	No Sheen
17				0.0 0.0		No Sheen
18			8 10 10	0.0	WELL-GRADED SAND (SW): very dark gray (10YR 3/1), wet, loose, 90% fine to coarse sand, 5% nonplastic fines, 5% fine subrounded gravel (up to 1" in size).	No Sheen
19			12 15	0.0	SILT (ML): very dark gray (10YR 3/1), wet, stiff, 90% nonplastic fines, 10% fine to medium sand, wood debris.	No Sheen
20			20		WELL-GRADED SAND (SW): very dark gray (10YR 3/1), wet, medium dense, 90% fine to coarse sand, 5% nonplastic fines, 5% fine subrounded gravel (up to 1" in size).	No Sheen
21					Bottom of Boring @ 20.0 FT. Abandoned with bentonite to 2 FT bgs and cement to surface.	
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

OAKBOREV (REV. 8/2011)

APPENDIX C

TOPOGRAPHIC SURVEY BY TRUENORTH



NOTES

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83/91. THE FOLLOWING CONTROL POINTS WERE PROVIDED TO US BY OUR CLIENT AND WERE LOCATED USING GPS RTK:
CONTROL POINT 733–21–01, N:360317.040, E:1301542.320 AND
CONTROL POINT 733–21–02, N:360305.020, E:1301886.200

2. VERTICAL DATUM: NAVD 88

3. BENCHMARK: USC&GS BENCHMARK DESIGNATED AS "J–7" DESCRIBED AS A 3 1/2" BRASS CAP LOCATED ON HEWITT AVENUE AT THE SOUTHWEST END OF THE RAILROAD BRIDGE #1783.8. ELEV.=26.770

4. DATE OF SURVEY: AUGUST 20TH THROUGH 25TH, 2010. SUPPLEMENTAL SURVEYING ON DECEMBER 13, 2010.

5. EQUIPMENT USED: LEICA TCRA 1103+, LEICA DNA10 DIGITAL LEVEL, AND LEICA GPS RTK..

6. ONLY THE UTILITY SURFACE FEATURES WERE LOCATED DURING THIS SURVEY. THE UTILITY LINES SHOWN HEREON WHERE FROM A DRAWING PREPARED BY OTHERS AND PROVIDED TO US BY OUR CLIENT.

LEGEND

—o—	CHAIN LINK FENCE	—X—	POWER POLE W/LUMINAIRE	CB	CATCH BASIN/INLET
—W—	WATER LINE	—o—	POWER POLE	○	STORM DRAIN MANHOLE
—SS—	SANITARY SEWER LINE	←	GUY ANCHOR	MW	MONITORING WELL
—SD—	STORM DRAIN LINE	X	PARKING LOT LIGHT	SB	SOIL BORING
—T—	UNDERGROUND TELEPHONE	⊞	WATER METER	⊥	SIGN
		⋈	WATER VALVE	⊠	JUNCTION BOX
			FIRE HYDRANT	• •	BOLLARDS
			HOSE BIB		
		T	TELEPHONE MANHOLE		
		TRB	TELEPHONE RISER BOX		
		⊘	SEWER MANHOLE		
		CO	CLEANOUT		

GRAPHIC SCALE
40 0 20 40 80
(IN FEET)

SURVEYED: JM/CP
DRAWN: EF
CHECKED: FM

REV	REVISION	DATE	BY	APP'D

True NORTH
LAND SURVEYING, INC.
815 S. Weller Street
Suite 200
Seattle, WA 98104-3023
206.332.0800

EILEEN M. FORRESTER
31453

Date: 12-17-10
Scale: 1" = 40'
Book: J1055.02.dwg

Exxon Mobil / American Distribution Co.
Topographic Survey
For AMEC

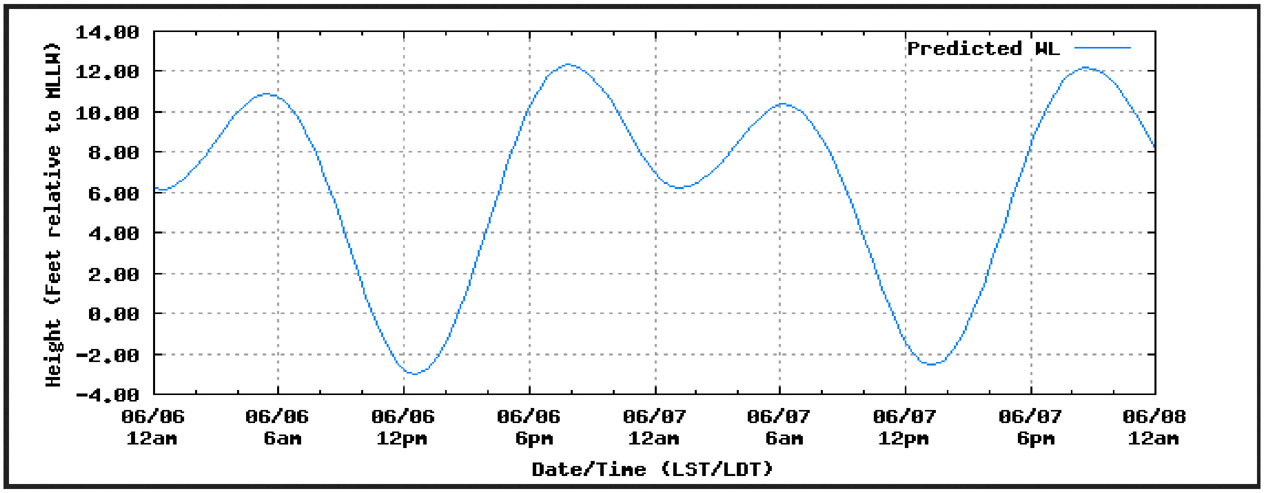
Job Number: J10-55.02
Sheet: 1 of 1

APPENDIX D

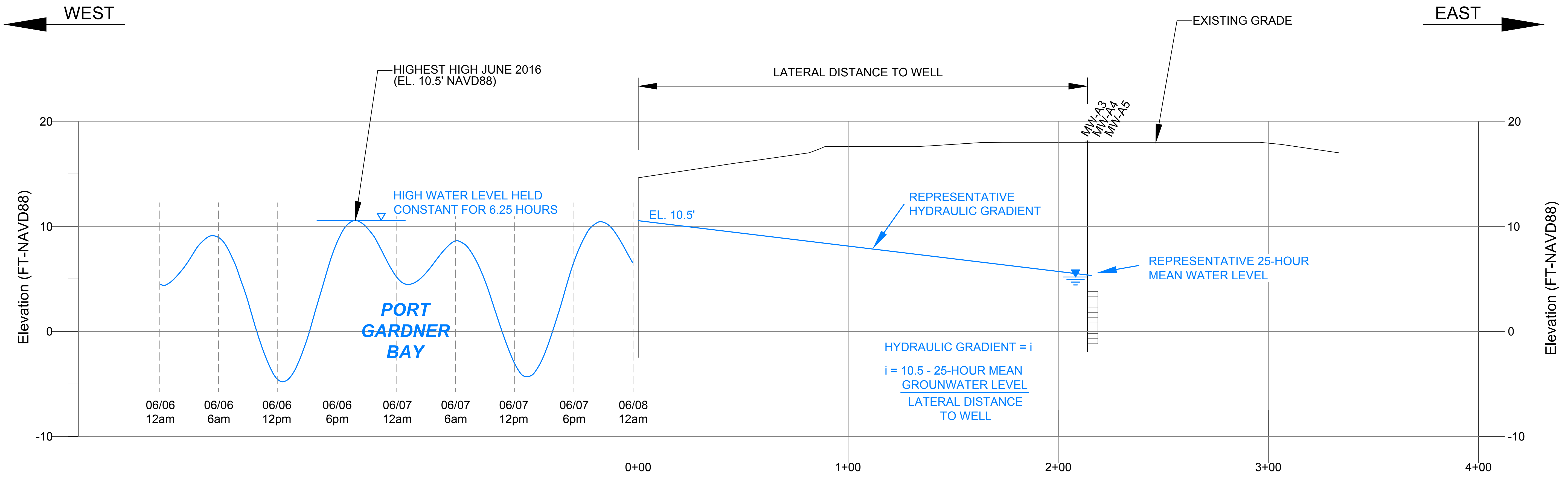
TIDAL FLUX CALCULATIONS

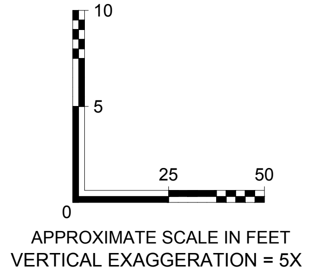
Calculated Maximum Tide Flux Travel Distance
ExxonMobil/ADC Property Ecology Site ID 2728
Everett, Washington

June 6, 2016 Tide Predictions at Everett, Washington



MW-A5 hydraulic conductivity							
Well	**Mean Water Level 25 hour (NGVD88)**	**units**	**Datum**	**Distance from Port Gardner Bay (feet)**	**K (cm/sec)**	**K based on**	**K (inch/hour)**
MW-A3	6.413	feet	NGVD88	368	6.35E-03	MW-A5	9.0
MW-A4	4.747	feet	NGVD88	234	6.35E-03		9.0
MW-A5	5.605	feet	NGVD88	230	6.35E-03		9.0
Everett Tide	12.3	feet	MLLW	Effective Porosity	0.3	% of voids for sand	
(June 6,2016)	10.5	feet	NGVD88				
Seepage veolocity		S_v =	Ki/n_e				
	K	i	n_e	S_v (inch/hour)	6.25 hour travel distance (feet)		
	9.0	0.011	0.3	0.33	0.17		
	9.0	0.025	0.3	0.74	0.38		
	9.0	0.021	0.3	0.64	0.33		
MW-A6 hydraulic conductivity							
Well	**Mean Water Level 25 hour (NGVD88)**	**units**	**Datum**	**Distance from Port Gardner Bay (feet)**	**K (cm/sec)**	**K based on**	**K (inch/hour)**
MW-A3	6.413	feet	NGVD88	368	9.28E-03	MW-A6	13.2
MW-A4	4.747	feet	NGVD88	234	9.28E-03		13.2
MW-A5	5.605	feet	NGVD88	230	9.28E-03		13.2
Everett Tide	12.3	feet	MLLW	Effective Porosity	0.3	% of voids for sand	
(June 6,2016)	10.5	feet	NGVD88				
Seepage veolocity		S_v =	Ki/n_e				
	K	i	n_e	S_v (inch/hour)	6.25 hour travel distance (feet)		
	13.2	0.011	0.3	0.49	0.25		
	13.2	0.025	0.3	1.08	0.56		
	13.2	0.021	0.3	0.93	0.49		





APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

wood.

CLIENT:

EXXONMOBIL
AMERICAN DISTRIBUTING CO.

Wood Environment &
Infrastructure Solutions, Inc.
600 University Street, Suite 600
Seattle, WA, U.S.A. 98101

DWN BY: APS
CHK'D BY: LV
DATUM: NAVD88 FT
PROJECTION: WASP
SCALE: AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
TIDAL MIXING CALCULATION
SCHEMATIC CROSS SECTION

DATE: SEPTEMBER 2018
PROJECT NO: 6103180009
REV. NO.:
FIGURE No. D-1

APPENDIX E

HISTORICAL SITE CHARACTERIZATION DATA

Memo

To:	Leah Vigoren	Project:	6103140009
From:	Crystal Neirby Danille Jorgenson	cc:	Project File
Tel:	(206) 342-1760		
Fax:	(206) 342-1761		
Date:	April 15, 2015		

Subject: ExxonMobil/ADC Site – January 2015 Semiannual Groundwater Sampling Data Quality Review – Work Order Numbers: 15-01-0127, 15-01-0234, 15-01-0235, 15-01-0330, and 15-01-0445

This memorandum presents a summary data quality review for analyses of 31 primary groundwater samples, three groundwater field duplicate samples, and four trip blanks collected between January 5 and 8, 2015. The samples were submitted to Eurofins Calscience, located in Garden Grove, California, a laboratory certified by the Washington State Department of Ecology (Ecology).

The samples were analyzed for the following analytes:

- Selected volatile organic compounds (VOCs) (benzene, toluene, ethylbenzene, total xylenes, and methyl tert-butyl ether) by U.S. Environmental Protection Agency (EPA) Method 8260B;
- Polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270C with select ion monitoring (SIM);
- Total petroleum hydrocarbons (TPH) as gasoline (TPH-G) by Ecology Method NWTPH-Gx; and
- TPH as diesel (TPH-D) and motor oil (TPH-MO) by Ecology Method NWTPH-Dx with silica gel cleanup.

The sample IDs, sample collection dates, laboratory sample IDs, and analyses conducted on the samples are listed in the table below.

Sample Location	Sample ID	Sample Collection Date	Laboratory Sample ID	Requested Analyses
MW-A8	XOM010515-03	1/5/2015	15-01-0127-1	all
MW-A5	XOM010515-01	1/5/2015	15-01-0127-2	all
MW-A6	XOM010515-02	1/5/2015	15-01-0127-3	all
MW-A7	XOM010515-04	1/5/2015	15-01-0127-4	all
MW-A2	XOM010515-06	1/5/2015	15-01-0127-5	all
MW-A2 Field Duplicate	XOM010515-100	1/5/2015	15-01-0127-6	all
MW-19	XOM010515-07	1/5/2015	15-01-0127-7	all
Trip Blank	--	1/5/2015	15-01-0127-8	VOCs
MW-A3	XOM010615-05	1/6/2015	15-01-0234-1	all

Sample Location	Sample ID	Sample Collection Date	Laboratory Sample ID	Requested Analyses
MW-A4	XOM010615-09	1/6/2015	15-01-0234-2	all
MW-A1	XOM010615-10	1/6/2015	15-01-0234-3	all
MW-40R	XOM010615-08	1/6/2015	15-01-0234-4	all
MW-11	XOM010615-11	1/6/2015	15-01-0234-5	all
Trip Blank	--	1/6/2015	15-01-0234-6	VOCs
LPH-1	XOM010615-12	1/6/2015	15-01-0235-1	all
LPH-2	XOM010615-13	1/6/2015	15-01-0235-2	all
RW-2	XOM010615-14	1/6/2015	15-01-0235-3	all
MW-10	XOM010615-15	1/6/2015	15-01-0235-4	all
LPH-3	XOM010715-16	1/7/2015	15-01-0330-1	all
W-1	XOM010715-17	1/7/2015	15-01-0330-2	all
W-2	XOM010715-18	1/7/2015	15-01-0330-3	all
LPH-4	XOM010715-19	1/7/2015	15-01-0330-4	all
LPH-5	XOM010715-20	1/7/2015	15-01-0330-5	all
LPH-6	XOM010715-21	1/7/2015	15-01-0330-6	all
W-10R	XOM010715-22	1/7/2015	15-01-0330-7	all
W-3	XOM010715-23	1/7/2015	15-01-0330-8	all
W-2 Field Duplicate	XOM010715-101	1/7/2015	15-01-0330-9	all
Trip Blank	--	1/7/2015	15-01-0330-10	VOCs
LPH-7	XOM010815-24	1/8/2015	15-01-0445-1	all
Sump 1	XOM010815-25	1/8/2015	15-01-0445-2	all
Sump 2	XOM010815-26	1/8/2015	15-01-0445-3	all
LPH-8	XOM010815-27	1/8/2015	15-01-0445-4	all
LPH-9	XOM010815-28	1/8/2015	15-01-0445-5	all
W-17	XOM010815-29	1/8/2015	15-01-0445-6	all
W-6	XOM010815-30	1/8/2015	15-01-0445-7	all
W-15R	XOM010815-31	1/8/2015	15-01-0445-8	all
W-15R Field Duplicate	XOM010815-102	1/8/2015	15-01-0445-9	all
Trip Blank	--	1/8/2015	15-01-0445-10	VOCs

The analytical results for these samples were reviewed in accordance with the requirements specified in EPA National Functional Guidelines (EPA, 2008), the analytical methods referenced by the laboratory, Amec Foster Wheeler data review procedures, and the laboratory quality control limits. The EPA guidelines referenced above were written specifically for the Contract Laboratory Program, and have been modified for the purposes of this data quality review where they differ from EPA SW-846 method requirements.

All of the certified laboratory reports were reviewed to assess the following: chain-of-custody compliance; holding time compliance; presence or absence of laboratory contamination as demonstrated by method and trip blanks; laboratory control samples (LCS) and LCS duplicates (LCSD); matrix spike (MS) samples; analytical precision as the relative percent (%) difference between replicate sample results (i.e., laboratory and field duplicates) or MS and MS duplicates (MSD); instrument tunes; instrument blanks; interference check samples; and initial and continuing calibrations. This level of data review is equivalent to an EPA Level 2B data review. The work orders subject to the Level 2B data review are 15-01-0127, 15-01-0235, 15-01-0330, and 15-01-0445.

In addition, 10 percent of the results were subjected to an EPA Level 3 data review. The Level 3 data review involves review of all of the criteria noted above for the Level 2B data review and also includes recalculation of instrument and sample results from the laboratory responses, and comparison of the recalculated results to the results reported by the laboratory. The work order subject to the Level 3 data review is 15-01-0234.

Upon receipt by the laboratory, information from the sample jars was compared to the chain-of-custody forms. The temperatures of the coolers were recorded as part of the check-in procedure, and were less than the maximum acceptable temperature of 6 degrees Celsius (°C).

Samples were analyzed using the methods identified in the introduction to this report, and the results were evaluated for the following criteria.

1. **GC/MS Instrument Performance Check (VOCs and PAHs)** – Acceptable
2. **Holding Times** – Acceptable.
3. **Blanks** – Acceptable.

   A trip blank was not submitted with samples included in work order 15-01-0235. These samples were collected on the same day as samples submitted with work order 15-01-0127 and all of the samples analyzed for VOCs were submitted in the same cooler; therefore, the trip blank submitted with work order 15-01-0127 can be used to evaluate samples in work order 15-01-0235. Sample results are not affected and are not qualified.
4. **LCS/LCSD** – Acceptable.
5. **MS/MSD** – Acceptable.
6. **Laboratory Duplicates** – Acceptable.
7. **Field Duplicates** – Acceptable.

   Three field duplicates were collected and the primary and duplicate sample IDs are identified in the table below. The primary and duplicate results, as well as the calculated relative percent differences (RPDs), are summarized in the table below. An RPD is not calculated if both the primary and duplicate results are not greater than five times the value of the reporting limit, as indicated in the table below by “NC.” In these cases, the difference between the primary and duplicate results should not exceed the value of the reporting limit. The field duplicate RPDs are acceptable (i.e., the RPD is less than 30 or the primary and duplicate results do not differ by more than the value of the RL) except for the TPH-G results for

XOM010715-18 and XOM010715-101. The TPH-G results in these two samples are qualified as estimated and flagged with a “J.”

Sample ID/ Field Duplicate ID	Analyte	Primary Result (µg/L)	Duplicate Result (µg/L)	Reporting Limit (µg/L)	RPD (%)
XOM010515-06/ XOM010515-100	TPH-D	320	320	100	0
	TPH-G	110	110	100	0
	1-methylnaphthalene	0.22	0.18	0.096	NC
	acenaphthene	0.68	0.71	0.096	4
	fluorene	1.1	1.0	0.096	10
XOM010715-18/ XOM010715-101	TPH-D	1,300	970	100	29
	TPH-G	490	1,000	100	68
	acenaphthene	2.6	2.3	0.096	12
	fluorene	2.8	2.2	0.096	24
	phenanthrene	2.6	2.5	0.096	4
	anthracene	0.14	0.14	0.096	NC
	pyrene	0.10	ND	0.096	NC
	2-methylnaphthalene	12	11	0.096	9
	1-methylnaphthalene	25	23	0.096	8
XOM010815-31/ XOM010815-102	TPH-D	3,000	3,000	100	0
	TPH-G	2,500	2,900	100	15
	acenaphthylene	0.36	0.53	0.095	NC
	acenaphthene	3.3	4.1	0.095	22
	fluorene	4.1	4.0	0.095	2
	phenanthrene	3.2	3.6	0.095	12
	anthracene	0.28	0.26	0.095	NC
	fluoranthene	0.26	0.19	0.095	NC
	pyrene	0.20	0.13	0.095	NC
	2-methylnaphthalene	120	120	0.095	0
	1-methylnaphthalene	92	93	0.095	1

Notes
µg/L = micrograms per liter
RPD= relative percent difference

8. **Surrogates** – Acceptable except as noted:

NWTPH-Gx
The surrogate was recovered at 139 percent, greater than the control limits of 38 to 134 percent, in sample XOM010815-102. The high recovery equates to a possible high bias in the samples; therefore, the TPH-G result for sample XOM010815-102 is qualified as estimated and flagged with a “J.”

PAHs by EPA 8270C SIM
One of three surrogates, nitrobenzene-d5, was not recovered in the 50X dilutions performed on samples XOM010815-31 and XOM010815-102. The dilutions were performed to overcome high analyte concentrations. The samples are not qualified because the surrogates were not recovered due to the necessary dilutions.

9. **Internal Standards** – Acceptable.

10. **Reporting Limits and Laboratory Flags** – Acceptable.

Work Order 15-01-0127
NWTPH-Dx: The laboratory flagged the TPH-D results in samples XOM010515-01, XOM010515-06, XOM010515-100, and XOM010515-07 with an “HD” to indicate the chromatographic profiles of these samples were inconsistent with the pattern of the reference fuel standard. The chromatograms were not reviewed as part of the Level 2B review; therefore the results are reported and are not qualified.

Work Order 15-01-0234
NWTPH-Dx
The laboratory flagged the TPH-D results from samples XOM010615-05, XOM010615-08, and XOM010615-10 with HD because the chromatogram did not resemble that of the reference standard. These results were subjected to a level 3 data review, and results were calculated using the reference standard. Amec Foster Wheeler agrees that the results should be considered estimated and the identification is tentative. Results for these samples are qualified as estimated and tentatively identified because of the poor spectral match, and the results are flagged NJ.

NWTPH-Gx
The laboratory flagged the TPH-G result from sample XOM010615-08 with HD because the chromatogram did not resemble that of the reference standard. These results were subjected to a level 3 data review, and results were calculated using the reference standard. Amec Foster Wheeler agrees that the results are estimated and the identification is tentative. This result is qualified as estimated and tentatively identified because of the poor spectral match, and the result is flagged NJ.

Work Order 15-01-0235
NWTPH-Dx: The laboratory flagged the TPH-D results in samples XOM010615-13, XOM010615-14, and XOM010615-15 with “HD” to indicate the chromatographic profiles of these samples were inconsistent with the pattern of the reference fuel standard. The chromatograms were not reviewed as part of the Level 2B review; the results are reported and are not qualified.

Work Order 15-01-0330
NWTPH-Dx: The laboratory flagged the TPH-D results in samples XOM010715-16, XOM010715-17, XOM010715-18, XOM010715-19, XOM010715-20, XOM010715-21, XOM010715-22, XOM010715-23, and XOM010715-101 and the TPH-MO results in samples XOM010715-17, XOM010715-19, XOM010715-20, and XOM010715-22 with “HD” to indicate the chromatographic profiles of these samples were inconsistent with the pattern of the

reference fuel standard. The chromatograms were not reviewed as part of the Level 2B review; the results are reported and are not qualified.

NWTPH-Gx: The laboratory flagged the TPH-G results in samples XOM010715-17, XOM010715-18, XOM010715-22, and XOM010715-101 with “HD” to indicate the chromatographic profiles of these samples was inconsistent with the pattern of the reference fuel standard. The chromatograms were not reviewed as part of the Level 2B review; the results are reported and are not qualified.

Work Order 15-01-0445
NWTPH-Dx: The laboratory flagged the TPH-D results in samples XOM010815-24, XOM010815-26, XOM010815-27, XOM010815-28, XOM010815-29, XOM010815-30, XOM010815-31, and XOM010815-102, and the motor oil results in samples XOM010815-26, XOM010815-27, XOM010815-28, and XOM010815-29 with “HD” to indicate the chromatographic profiles of these samples was inconsistent with the pattern of the reference fuel standard. The chromatograms were not reviewed as part of the Level 2B review; the results are reported and are not qualified.

NWTPH-Gx: The laboratory flagged the TPH-G results in samples XOM010815-26, XOM010815-27, XOM010815-28, XOM010815-29, XOM010815-30, XOM010815-31, and XOM010815-102 with “HD” to indicate the chromatographic profiles of these samples was inconsistent with the pattern of the reference fuel standard. The chromatograms were not reviewed as part of the Level 2B review; the results are reported and are not qualified.

11. **Initial Calibrations** – Acceptable.

12. **Continuing Calibrations** – Acceptable.

13. **Calculation Check** – Acceptable.

OVERALL ASSESSMENT OF DATA

The Eurofins Calscience work orders 15-01-0127, 15-01-0234, 15-01-0235, 15-01-0330, and 15-01-0445 are complete and usable. Evaluation of the data usability is based on EPA’s guidance documents. Few problems were identified, and analytical performance was generally within specified limits. There were no rejected results, and all data are acceptable and meet the project’s data quality objectives.

A summary of qualified results is presented in the table below.

Sample Identifications and Qualified Results

Sample ID	Qualified Analyte	Qualified Results	Qualifier Reason
XOM010515-03	none		
XOM010515-01	none		
XOM010515-02	none		
XOM010515-04	none		
XOM010515-06	none		
XOM010515-100	none		

Sample ID	Qualified Analyte	Qualified Results	Qualifier Reason
XOM010515-07	none		
XOM010615-05	TPH as Diesel	110 NJ	Poor Spectral Match
XOM010615-09	none		
XOM010615-10	TPH as Diesel	730 NJ	Poor Spectral match
XOM010615-08	TPH as Diesel TPH as Gasoline	790 NJ 610 NJ	Poor Spectral Match
XOM010615-11	none		
XOM010615-12	none		
XOM010615-13	none		
XOM010615-14	none		
XOM010615-15	none		
XOM010715-16	none		
XOM010715-17	none		
XOM010715-18	TPH-G	490 J	field duplicate RPD
XOM010715-19	none		
XOM010715-20	none		
XOM010715-21	none		
XOM010715-22	none		
XOM010715-23	none		
XOM010715-101	TPH-G	1,000 J	field duplicate RPD
XOM010815-24	none		
XOM010815-25	none		
XOM010815-26	none		
XOM010815-27	none		
XOM010815-28	none		
XOM010815-29	none		
XOM010815-30	none		
XOM010815-31	none		
XOM010815-102	TPH-G	2,900 J	surrogate recovery

REFERENCES

U.S. Environmental Protection Agency (EPA), 2008, U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-08-001, June.

TABLE E-1: GROUNDWATER SAMPLE ANALYTICAL RESULTS [1,2]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Well ID	LPH-1	LPH-2	LPH-3	LPH-4	LPH-5	LPH-6	LPH-7	LPH-8	LPH-9	MW-10	MW-11	MW-19	MW-40R	MW-A1	MW-A2		MW-A3	MW-A4
Date Sampled	**01/06/2015**	**01/06/2015**	**01/07/2015**	**01/07/2015**	**01/07/2015**	**01/07/2015**	**01/08/2015**	**01/08/2015**	**01/08/2015**	**01/06/2015**	**01/06/2015**	**01/05/2015**	**01/06/2015**	**01/06/2015**	**01/05/2015**	**01/05/2015 FD**	**01/06/2015**	**01/06/2015**
TPH (µg/L)																		
TPH as Gasoline	100 U	100 U	100	100 U	100 U	100 U	100 U	140	390	290	100 U	130 NJ	610	100 U	110	110	100 U	100 U
TPH as Diesel	100 U	130	200	8,600	450	240	140	140	970	690	100 U	180 NJ	790	730 NJ	320	320	110 NJ	100 U
TPH as Motor Oil Range	100 U	100 U	100 U	4100	230	100 U	100 U	130	180	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
PAHs (µg/L)																		
1-Methylnaphthalene	0.28	0.095 U	0.45	0.10	1.3	0.32	0.097 U	0.095 U	4.3	3.2	0.095 U	0.096 U	11	1.2	0.22	0.18	0.096 U	1.1
2-Methylnaphthalene	0.096 U	0.095 U	0.095 U	0.095 U	0.15	0.095 U	0.097 U	0.095 U	0.095 U	0.15	0.095 U	0.096 U	0.53	0.68	0.096 U	0.096 U	0.096 U	1.6
Acenaphthene	0.096 U	1.2	0.94	0.65	0.64	0.56	0.15	0.24	0.85	0.83	0.095 U	0.096 U	0.91	0.66	0.68	0.71	0.62	4.4
Acenaphthylene	0.096 U	0.095 U	0.095 U	0.027	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Anthracene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.13
Benzo (a) anthracene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Benzo (a) pyrene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Benzo (b) fluoranthene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Benzo (g,h,i) perylene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Benzo (k) fluoranthene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Chrysene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Dibenz (a,h) anthracene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Fluoranthene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.15
Fluorene	0.096 U	0.19	0.41	0.36	0.43	0.52	0.12	0.21	0.84	0.28	0.095 U	0.096 U	0.77	0.63	1.1	1.0	0.23	1.9
Indeno (1,2,3-c,d) pyrene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Naphthalene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	7.9
Phenanthrene	0.096 U	0.095 U	0.13	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.15	0.39	0.095 U	0.096 U	0.42	0.096 U	0.096 U	0.096 U	0.89	1.3
Pyrene	0.096 U	0.095 U	0.095 U	0.095 U	0.096 U	0.095 U	0.097 U	0.095 U	0.14	0.096 U	0.095 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Total cPAHs	0.0725 U	0.0717 U	0.0717 U	0.0717 U	0.0725 U	0.0717 U	0.0732 U	0.0717 U	0.0717 U	0.0725 U	0.0717 U	0.0725 U	0.0725 U	0.0725 U	0.0725 U	0.0725 U	0.0725 U	0.0725 U
VOCs (µg/L)																		
Benzene	4.3	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl-t-Butyl Ether (MTBE)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p/m-Xylene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

TABLE E-1: GROUNDWATER SAMPLE ANALYTICAL RESULTS ^{1,2}

ExxonMobil/ADC Property, Ecology Site ID 2728

Everett, Washington

Well ID	MW-A5	MW-A6	MW-A7	MW-A8	RW-2	Sump 1	Sump 2	W-1	W-2		W-3	W-6	W-10R	W-15R	W-15R	W-17
Date Sampled	**01/05/2015**	**01/05/2015**	**01/05/2015**	**01/05/2015**	**01/06/2015**	**01/08/2015**	**01/08/2015**	**01/07/2015**	**01/07/2015**	**01/07/2015 FD**	**01/07/2015**	**01/08/2015**	**1/7/2015**	**01/08/2015**	**1/8/2015 FD**	**01/08/2015**
TPH (µg/L)																
TPH as Gasoline	100 U	100 U	100 U	100 U	340	100 U	1,900	300	490 J	1,000 J	100 U	450	350	2,500	2,900 J	1,000
TPH as Diesel	240	100 U	100 U	100 U	270	100 U	11,000	1,900	1,300	970	250	390	870	3,000	3,000	990
TPH as Motor Oil Range	100 U	100 U	100 U	100 U	100 U	100 U	2,900	230	100 U	100 U	100 U	100 U	150	100 U	100 U	290
PAHs (µg/L)																
1-Methylnaphthalene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	38	14	25	23	0.75	7.9	17	92	93	0.45
2-Methylnaphthalene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	4.5	9.1	12	11	0.095 U	0.097 U	4.2	120	120	0.096 U
Acenaphthene	2.8	0.28	0.095 U	0.096 U	0.096 U	0.099 U	8.8	1.9	2.6	2.3	0.46	0.82	3.8	3.3	4.1	0.32
Acenaphthylene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	2.6	0.096 U	0.096 U	0.095 U	0.095 U	0.16	0.096 U	0.36	0.53	0.096 U
Anthracene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	3.8	0.35	0.14	0.14	0.095 U	0.097 U	0.19	0.28	0.26	0.096 U
Benzo (a) anthracene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	8.3	0.24	0.096 U	0.095 U	0.095 U	0.097 U	0.096 U	0.095 U	0.095 U	0.096 U
Benzo (a) pyrene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	8.1	0.11	0.096 U	0.095 U	0.095 U	0.097 U	0.096 U	0.095 U	0.095 U	0.096 U
Benzo (b) fluoranthene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	4.4	0.14	0.096 U	0.095 U	0.095 U	0.097 U	0.096 U	0.095 U	0.095 U	0.096 U
Benzo (g,h,i) perylene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	4.3	0.096 U	0.096 U	0.095 U	0.095 U	0.097 U	0.096 U	0.095 U	0.095 U	0.096 U
Benzo (k) fluoranthene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	5.0	0.10	0.096 U	0.095 U	0.095 U	0.097 U	0.096 U	0.095 U	0.095 U	0.096 U
Chrysene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	6.3	0.36	0.096 U	0.095 U	0.095 U	0.097 U	0.096 U	0.095 U	0.095 U	0.096 U
Dibenz (a,h) anthracene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	1.7	0.096 U	0.096 U	0.095 U	0.095 U	0.097 U	0.096 U	0.095 U	0.095 U	0.096 U
Fluoranthene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	24	2.2	0.096 U	0.095 U	0.095 U	0.097 U	0.21	0.26	0.19	0.13
Fluorene	0.13	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	8.3	1.9	2.8	2.2	0.37	1.0	2.3	4.1	4.0	0.36
Indeno (1,2,3-c,d) pyrene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	3.5	0.096 U	0.096 U	0.095 U	0.095 U	0.097 U	0.096 U	0.095 U	0.095 U	0.096 U
Naphthalene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	0.97 U	0.096 U	0.096 U	0.095 U	0.095 U	0.097 U	0.096 U	0.095 U	0.095 U	0.096 U
Phenanthrene	0.19	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	12	3.5	2.6	2.5	0.095 U	0.64	2.1	3.2	3.6	0.15
Pyrene	0.095 U	0.096 U	0.095 U	0.096 U	0.096 U	0.099 U	32	1.5	0.10	0.095 U	0.095 U	0.097 U	0.14	0.20	0.13	0.33
Total cPAHs	0.0717 U	0.0725 U	0.0717 U	0.0725 U	0.0725 U	0.0747 U	10.45	0.1712	0.0725 U	0.0717 U	0.0717 U	0.0732 U	0.0725 U	0.0717 U	0.0717 U	0.0725 U
VOCs (µg/L)																
Benzene	0.50 U	0.50 U	0.50 U	0.50 U	0.53	0.50 U	0.72	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	1.9	2.1	0.50 U
Ethylbenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl-t-Butyl Ether (MTBE)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.4	1.4	1.0 U
p/m-Xylene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.9	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.6	2.3	1.0 U
Toluene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.2	1.2	1.0 U
Xylenes (total)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.9	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0	3.6	1.0 U

Notes:

1. Data qualifiers are as follows:
   J = The result is an approximation.
   NJ = The result is estimated and the identification is tentative due to a poor match with the reference standard.
   U = not detected at or above the laboratory reporting limit shown.
   UJ = not detected at or above value shown, which is the estimated reporting limit.

Abbreviations:

-- = not analyzed
µg/L = micrograms per liter
cPAHs = carcinogenic polycyclic aromatic hydrocarbons
FD = field duplicate
TPH = total petroleum hydrocarbons
PAHs = polycyclic aromatic hydrocarbons
VOCs = volatile organic compounds

TABLE E-2: SOIL TPH AND BTEX RESULTS, 1993 TO 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		AD-1	AD-1	AD-2	AD-2	AD-3	AD-3	AD-4	AD-5	AD-5	AD-5	AD-6	AD-7	AD-8	AD-8	AD-8	AD-9	AD-9	AD-10
	Sample Date	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990
Analyte	**Depth[3]**	0.5 to 1	3 to 3	0.5 to 1	2.5 to 3	0.5 to 1	1.5 to 2	0.5 to 1	0.5 to 1	1.5 to 2	2.5 to 3	0.5 to 1	0.5 to 1	0.5 to 1	2.5 to 3	4.5 to 5	0.5 to 1	1.5 to 2	0.5 to 1
TPH																			
Total Petroleum Hydrocarbons		780	3,900	250	280	31	9	720	8,800	1,900	2,300	2,700	5,800	1,600	2,700	6,200	630	4,400	33,000
Gasoline Range Organics		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Motor Oil		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs																			
Benzene		--	0.4 U	--	--	--	--	--	--	--	0.4 U	--	--	--	0.4 U	0.4 U	--	--	--
SVOCs																			
Carcinogenic PAHs as B(a)P[4]		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE E-2: SOIL TPH AND BTEX RESULTS, 1993 TO 2001[1,2]

ExxonMobil/ADC Property
Everett, Washington

		AD-11	AD-11	AD-12	AD-12	AD-12	AD-13	AD-13	AD-14	AD-14	AD-15	AD-15	AD-16	AD-17	AD-18	AD-18	AD-19	AD-19	B-1
	Sample Date	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	1/15/1990	10/9/1990
Analyte	**Depth[3]**	0.5 to 1	1.5 to 2	0.5 to 1	2.5 to 3	3 to 3.5	0.5 to 1	2 to 2.5	0.5 to 1	2 to 2.5	0.5 to 1	2.5 to 3	0.5 to 1	0.5 to 1	0.5 to 1	4 to 5	0.5 to 1	1 to 1.5	NA
TPH																			
Total Petroleum Hydrocarbons		8,000	12,000	230	14,000	16,000	4,400	27,000	13,000	17,000	61	2,400	2,200	8,500	24	520	23,000	100,000	2,117
Gasoline Range Organics		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Motor Oil		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs																			
Benzene		--	--	--	0.4 U	0.4 U	--	0.4 U	--	5.1	0.4 U	0.4 U	0.4 U	0.4 U	--	--	--	--	--
SVOCs																			
Carcinogenic PAHs as B(a)P[4]		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE E-2: SOIL TPH AND BTEX RESULTS, 1993 TO 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		B-1	B-2	B-3	B-3	B-4	B-5	B-6	B-7	B-8	B-8	B-9	B-9	B-10	B-10	B-11	B-11	B-12	B-12
	Sample Date	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990
Analyte	**Depth[3]**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH																			
Total Petroleum Hydrocarbons		446	90.6	213	831	65.2	701	428	434	126	174	469	643	206	231	323	406	191	11,775
Gasoline Range Organics		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Motor Oil		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs																			
Benzene		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs																			
Carcinogenic PAHs as B(a)P[4]		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE E-2: SOIL TPH AND BTEX RESULTS, 1993 TO 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		B-13	B-13	B-14	B-14	B-15	B-15	B-16	B-16	B-17	B-17	B-18	B-18	B-19	B-19	B-20	B-20	B-21	B-21
	Sample Date	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990	10/9/1990
Analyte	**Depth[3]**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH																			
Total Petroleum Hydrocarbons		277	15.9	212	128	132	17	1,898	9,718	1,513	2,139	46	738	626	10,577	117	46.9	2,116	1,974
Gasoline Range Organics		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Motor Oil		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs																			
Benzene		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs																			
Carcinogenic PAHs as B(a)P[4]		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE E-2: SOIL TPH AND BTEX RESULTS, 1993 TO 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

Analyte		B-21	B-21	B-22	B-22	B-23	B-23	B-24	B-24	B-24	B-25	B-25	MW-10	MW-11	MW-12	MW-15	MW-16	MW-17	MW-18
	Sample Date	6/24/1991	6/24/1991	10/9/1990	10/9/1990	10/9/1990	10/9/1990	03/11/91	03/11/91	10/9/1990	10/9/1990	10/9/1990	3/9/1988	3/9/1988	3/9/1988	3/9/1988	3/9/1988	3/9/1988	3/9/1988
	Depth[3]	23.5 to 24	27.5 to 29	NA	NA	NA	NA	2 to 4	3 to 5.5	NA	NA	NA	1.5 to 3	1.5 to 3	1.5 to 3	1.5 to 3	1.5 to 3	1.5 to 3	1.5 to 3
TPH																			
Total Petroleum Hydrocarbons		12000	27	360	1,800	1,691	6,421	260	1,300	560	76	29.8	1,260	9,480	5 U	3,030	5 U	124	777
Gasoline Range Organics		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Motor Oil		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs																			
Benzene		0.035	0.05 U	--	--	--	--	0.05 U	0.05 U	--	--	--	0.015 U	0.362	0.015 U	0.158 U	0.015 U	0.015 U	0.048
SVOCs																			
Carcinogenic PAHs as B(a)P[4]		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE E-2: SOIL TPH AND BTEX RESULTS, 1993 TO 2001[1,2]

ExxonMobil/ADC Property
Everett, Washington

		MW-19	MW-19	MW-20	MW-20	MW-21	MW-21	MW-22	MW-22	MW-23	MW-24	MW-24	MW-27	MW-27	MW-28	MW-28	MW-29
	Sample Date	**3/11/1991**	**3/11/1991**	**3/11/1991**	**3/11/1991**	**3/11/1991**	**3/11/1991**	**3/11/1991**	**3/11/1991**	**3/11/1991**	**3/11/1991**	**3/11/1991**	**06/24/91**	**06/24/91**	**06/24/91**	**06/24/91**	**06/24/91**
Analyte	**Depth[3]**	**3.5 to 3.5**	**5 to 5**	**3.5 to 3.5**	**5 to 5**	**3.5 to 3.5**	**5 to 5**	**4 to 4**	**5 to 5**	**2.5 to 2.5**	**NA**	**NA**	**8.5 to 9**	**12.5 to 13.5**	**7.5 to 9**	**12.5 to 13.5**	**3 to 4**
TPH																	
Total Petroleum Hydrocarbons		53	14	18	20	110	12,000	41,000	24,000	300	260	1,300	4,700	61	93	51	590
Gasoline Range Organics		--	--	--	--	--	--	--	--	--	--	--					
Diesel Range Organics		--	--	--	--	--	--	--	--	--	--	--					
Motor Oil		--	--	--	--	--	--	--	--	--	--	--					
VOCs																	
Benzene		0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
SVOCs																	
Carcinogenic PAHs as B(a)P[4]		--	--	--	--	--	--	--	--	--	--	--					

TABLE E-2: SOIL TPH AND BTEX RESULTS, 1993 TO 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		MW-29	MW-30	MW-30	MW-6	MW-7	MW-8	MW-9	RW-1	W-1	W-2	W-3	W-4	W-5	W-6	W-7	B-34	B-34
	Sample Date	06/24/91	06/24/91	06/24/91	3/9/1988	3/9/1988	3/9/1988	3/9/1988	3/9/1988	2/23/1990	2/23/1990	2/23/1990	2/23/1990	2/23/1990	2/23/1990	2/23/1990	12/6/1993	12/6/1993
Analyte	**Depth[3]**	**7.5 to 9**	**8 to 9**	**13 to 13.5**	**1.5 to 3**	**1.5 to 3.5**	**1.5 to 3**	**1.5 to 3**	**to**	**3 to 3**	**to**	**3 to 3**	**4 to 4**	**3 to 3**	**3 to 3**	**3 to 3**	**4 to 5.5**	**12.5 to 14**
TPH																		
Total Petroleum Hydrocarbons		730,000	4,900	7,700	80	605	1,580	33,500	1,730	13,000	17,000	28	4,600	2,300	1,200	910	--	--
Gasoline Range Organics					--	--	--	--	--	--	--	--	--	--	--	--	670	2,600
Diesel Range Organics					--	--	--	--	--	--	--	--	--	--	--	--	500	4,800
Motor Oil					--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs																		
Benzene		0.18	0.05 U	0.5	0.015 U	0.015 U	0.015 U	0.015 U	0.575	--	--	--	--	--	--	--	0.63	6.6
SVOCs																		
Carcinogenic PAHs as B(a)P[4]					--	--	--	--	--	--	--	--	--	--	--	--	0.0755 U	1.51 U

TABLE E-2: SOIL TPH AND BTEX RESULTS, 1993 TO 2001[1,2]

ExxonMobil/ADC Property
Everett, Washington

Analyte		DM-6	DM-7	DM-8	GP-1	GP-2	GP-3	GP-4	GP-7	GP-8	GP-8	GP-9	GP-10	GP-11	GP-12	GP-12	GP-13	GP-13	JP-1
	Sample Date	12/6/1999	12/8/1999	12/1/1999	3/20/1996	3/20/1996	3/20/1996	3/20/1996	3/20/1996	3/20/1996	3/20/1996	3/20/1996	3/20/1996	3/20/1996	3/20/1996	3/20/1996	3/20/1996	3/20/1996	6/21/2001
	Depth[3]	5 to 6.5	NA	NA	10 to 10	11.5 to 11.5	6.5 to 6.5	6 to 6	5.5 to 5.5	7 to 7	8 to 8	8 to 8	7 to 7	6.5 to 6.5	11 to 11	12.5 to 12.5	7 to 7	10 to 10	4.5 to 7.5
TPH																			
Total Petroleum Hydrocarbons		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gasoline Range Organics		10.5	20.1	5 U	--	--	--	--	150	3.9	--	880	--	160	--	--	--	1 U	5 U
Diesel Range Organics		44.3	482	44.4	276	322	1370	297	3,800	77	6.55	12,000	383	40.2	382	414	2 U	15	73.8
Motor Oil		25 U	225	102	--	--	--	--	4,300	160	--	2,900	--	60	--	--	--	41	100
VOCs																			
Benzene		--	--	--	--	--	--	--	0.05 U	0.05 U	--	0.05 U	--	0.05 U	--	--	--	0.05 U	0.05 U
SVOCs																			
Carcinogenic PAHs as B(a)P[4]		--	--	--	--	--	--	--	0.69	0.52	--	0.31	--	0.038	--	--	--	0.052	--

TABLE E-2: SOIL TPH AND BTEX RESULTS, 1993 TO 2001^{1,2}

ExxonMobil/ADC Property

Everett, Washington

		JP-2	JP-2	JP-3	JP-4	JP-5	JP-6	JP-7	MW-31	MW-31	MW-32	MW-32	MW-33	MW-33	MW-35	MW-35	MW-36	MW-36	MW-37
	Sample Date	6/21/2001	6/21/2001	6/21/2001	6/21/2001	6/21/2001	6/21/2001	6/21/2001	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993
Analyte	Depth^{3}	0 to 3	3 to 6	4 to 6	3 to 6	3 to 6	6 to 9	1 to 2	2.5 to 4	12.5 to 14	NA	7.5 to 9	5 to 6.5	12.5 to 14	2.5 to 4	12.5 to 14	2.5 to 4	12.5 to 14	NA
TPH																			
Total Petroleum Hydrocarbons		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gasoline Range Organics		5 U	5 U	5 U	6.04	5 U	5 U	26.5	1 U	31	1 U	1 U	49	1 U	1 U	1.3	30	1 U	180
Diesel Range Organics		134	379	10 U	180	210	26.6	264	13	49	17	10 U	1100	11	10 U	16	700	22	3,500
Motor Oil		341	942	25 U	58.2	375	69.3	923	--	--	--	--	--	--	--	--	--	--	--
VOCs																			
Benzene		0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.77
SVOCs																			
Carcinogenic PAHs as B(a)P^{4}		--	--	--	--	--	--	--	0.0755 U	0.0755 U	0.367	0.0755 U	0.0755 U	0.0755 U	0.0755 U	0.0755 U	1.51 U	0.0755 U	0.3775 U

TABLE E-2: SOIL TPH AND BTEX RESULTS, 1993 TO 2001[1,2]

ExxonMobil/ADC Property
Everett, Washington

Analyte		MW-37	TP-2	TP-3	TP-5	UG-1	UG-2	UG-3	UG-4	UG-5	UG-6	UG-7	UG-8	UG-9	UG-9	UG-10	UG-11	UG-12
	Sample Date	12/6/1993	12/6/1993	12/6/1993	12/6/1993	9/25/2000	9/25/2000	9/25/2000	9/25/2000	9/25/2000	9/26/2000	9/26/2000	9/26/2000	9/26/2000	9/26/2000	9/26/2000	9/26/2000	9/26/2000
	Depth[3]	NA	NA	NA	NA	5 to 7	10 to 12	7.5 to 9.5	5 to 7	5 to 7	5 to 7	5 to 7	5 to 7	2.5 to 4.5	10 to 12	5 to 7	5 to 7	5 to 7
TPH																		
Total Petroleum Hydrocarbons		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gasoline Range Organics		170	1 U	3.4	1 U	173	55.3	108	5 U	5 U	5 U	5 U	3,410	6,050	630	5 U	5 U	5 U
Diesel Range Organics		380	10 U	16	10 U	27,100	364	190	10 U	10 U	10 U	402	5,180	8,560	2,170	10 U	153	10 U
Motor Oil		--	--	--	--	52,300	353	79.5	25 U	25 U	25 U	1,860	730	327	320	25 U	176	25 U
VOCs																		
Benzene		0.18	0.05 U	0.05 U	0.05 U	--	--	--	--	--	--	--	--	2.5 U	--	--	--	--
SVOCs																		
Carcinogenic PAHs as B(a)P[4]		0.0755 U	0.076 U	0.076 U	0.076 U	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
1. Data qualifiers are as follows:
   U = not detected.
2. Results reported in milligrams per kilogram.
3. Depth measured in feet below ground surface.
4. The total toxic equivalent concentration was calculated following WAC 173-340-708(8)(e)

Abbreviations:
-- = no data available
B(a)P = benzo(a)pyrene
NA = not available
PAHs = polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons
VOCs = volatile organic compounds

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		AB-1	AB-1	AB-1A	AB-2	AB-2	AB-2 *	AB-3	AB-3	AB-4	AB-5	AB-5	AB-5A	AP-1	AP-1	AP-2
	Sample Date	12/3/2010	12/3/2010	12/3/2010	6/21/2010	6/23/2010	6/23/2010	6/21/2010	6/22/2010	6/23/2010	6/25/2010	6/25/2010	6/22/2010	6/24/2010	6/24/2010	11/30/2010
Analyte	**Depth[3]**	14	27	14	4.5 to 5	14 to 14	14 to 14	4.5 to 5	20 to 20	17.2 to 17.4	22 to 22.25	5 to 5.5	3 to 3.5	5 to 6.5	15 to 16.5	1 to 1.25
TPH																
Gasoline Range Organics		5.29 U	6.09 U	5.29 U	354	6.39 U	5.27 U	3.85 U	7.64 U	5.3 U	5.41 U	131	804	44.1	18.6 U	4.12 U
Diesel Range Organics		44.7	5.2	44.7	752	4.49 U	4.65 U	4.35 U	5.61 U	4.95 U	4.01 U	8840	7580	989	14.2	4.39 U
Motor Oil		21.9	9.37	21.9	803	6.54	4.65 U	4.35 U	9.4	8.36	5.45	11,000	464 U	1360	35.5	32.5
VOCs																
Benzene		0.00187 U	0.00219 U	0.00187 U	0.0048 U	0.00209 U	0.00192 U	0.00149 U	0.00277 U	0.0293	0.0969 U	0.0949	0.195	0.00222 U	0.00631 U	0.0009 U
SVOCs																
Carcinogenic PAHs as B(a)P[4]		0.00652405	0.006 U	0.00652405	0.027882	0.003 U	0.003 U	0.003 U	0.004 U	0.003 U	0.003 U	0.0200215	0.15679	0.18503	0.007 U	0.018131

New PAH calculations from DB															
Carcinogenic PAHs (3 sig figs)	0.00652	0.00319 U	0.00652	0.0279	0.00286 U	0.00286 U	0.00282 U	0.00362 U	0.00319 U	0.00297 U	0.0200	0.157	0.185	0.00684 U	0.00291 U
Carcinogenic PAHs (2 sig figs)	0.0065	0.0032 U	0.0065	0.028	0.0029 U	0.0029 U	0.0028 U	0.0036 U	0.0032 U	0.0030 U	0.020	0.16	0.19	0.0068 U	0.0029 U
Carcinogenic PAHs (all digits)	0.00652405	0.0031861 U	0.00652405	0.027882	0.00286145 U	0.00286145 U	0.00281615 U	0.003624 U	0.0031861 U	0.0029747 U	0.0200215	0.15679	0.18503	0.0068403 U	0.00290675 U

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		AP-2	AP-3	AP-3	AP-4	AP-4	AP-4	AP-5	AP-5	AP-5	AP-6	AP-6	AP-6	AP-7	AP-7	AP-7	AP-7
	Sample Date	12/7/2010	11/30/2010	12/7/2010	11/30/2010	12/7/2010	12/7/2010	11/30/2010	12/07/2010	12/07/2010	11/30/2010	12/02/2010	12/02/2010	10/28/2010	12/07/2010	12/07/2010	12/07/2010
Analyte	**Depth[3]**	13.5 to 14	1 to 1.25	8.5 to 9	1 to 1.25	6 to 6.5	14.5 to 15	1 to 1.25	1.5 to 1.75	14 to 14.5	NA	23 to 23	23 to 23.25	NA	10 to 10.5	10 to 10.5	14.5 to 15
TPH																	
Gasoline Range Organics		5.44 U	4.81 U	9.43 U	6.04 U	8.25 U	4.91 U	44.8	652	45.1 U	184	5.12 U	5.65 U	4.63 U	1.39 U	44.3	51.8
Diesel Range Organics		4.56 U	8.37	4.62 U	6.95	6.64 U	4.73 U	44.4	440	8,660	1,990	45.3	13.2	3.43	3.04	553	717
Motor Oil		8.98	106	15.7	111	16.6	4.73 U	369	176	8,980	129	37.1	10.5	2.39	119	836	861
VOCs																	
Benzene		0.0022 U	0.00117 U	0.0032 U	0.00119 U	0.00316 U	0.00202 U	0.00094 U	0.0353	0.0168 U	0.00156	0.00115 U	0.00123 U	0.00108 U	0.00101 U	0.00962 U	0.00441 U
SVOCs																	
Carcinogenic PAHs as B(a)P[4]		0.003 U	0.0091646	0.0090492	0.0119794	0.00866615	--	0.009754	0.045062	0.39632	0.0464755	0.0044549	0.0044718	0.0060143	0.042179	0.072838	0.00280105 U

New PAH calculations from DB																
Carcinogenic PAHs (3 sig figs)	0.0181	0.00916	0.00905	0.0120	0.00783	--	0.00975	0.0451	0.396	0.0465	0.00445	0.00447	0.00601	0.0422	0.0728	0.00280 U
Carcinogenic PAHs (2 sig figs)	0.018	0.0092	0.0090	0.012	0.0078	--	0.0098	0.045	0.40	0.046	0.0045	0.0045	0.0060	0.042	0.073	0.0028 U
Carcinogenic PAHs (all digits)	0.018131	0.0091646	0.0090492	0.0119794	0.00783265	--	0.009754	0.045062	0.39632	0.0464755	0.0044549	0.0044718	0.0060143	0.042179	0.072838	0.00280105 U

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		BN-SB04	BN-SB04	BN-SB05	BN-SB05	BN-SB06	BN-SB06	BN-SB06 *	BN-SB07	BN-SB07	BN-SB08	BN-SB08	BN-SB09	BN-SB09	B-POE	B-WROW
	Sample Date	10/21/2013	10/21/2013	10/21/2013	10/21/2013	10/21/2013	10/21/2013	10/21/2013	10/18/2013	10/18/2013	2/4/2014	2/10/2014	2/4/2014	2/10/2014	11/3/2010	7/1/2010
Analyte	**Depth[3]**	4 to 5	24 to 24.5	4 to 5	24 to 24.5	4 to 5	24 to 24.5	24 to 24.5	4 to 5	24.5 to 25	5 to 5.5	23.5 to 24	8.5 to 9	23.5 to 24	NA	NA
TPH																
Gasoline Range Organics		8.15 U	5.86 U	4.76 U	7.89 U	5.96 U	6.46 U	6.37 U	5.74 U *	6.03 U *	5.28 U	6.12 U	5.71 U	4.82 U	579	365
Diesel Range Organics		4.46 U	4.84 U	27.1	4.94 U	4.82 U	4.87 U	4.93 U	12.8	5.85 U	13.2	5.89 U	5.6 U	5.46 U	5,540	3,400
Motor Oil		4.46 U	4.84 U	236	4.94 U	30	4.87 U	4.93 U	23.4	16	19.1	5.89 U	19.1	5.46 U	4,560	406
VOCs																
Benzene		0.00215 U	0.0018 U	0.00186 U	0.00237 U	0.00194 U	0.00198 U	0.00202 U	0.00206 U	0.00198 U	0.00194 U	0.0019 U	0.00166 U	0.00184 U	0.0116	0.118 U
SVOCs																
Carcinogenic PAHs as B(a)P[4]		0.00827585	0.003 U	0.225606	0.004 U	0.0114253	0.003 U	0.003 U	0.0412686	0.003 U	0.002 U	0.003 U	0.002 U	0.003 U	0.49277	0.1186485

New PAH calculations from DB															
Carcinogenic PAHs (3 sig figs)	0.00748	0.00310 U	0.225	0.00354 U	0.0107	0.00311 U	0.00310 U	0.0394	0.00304 U	0.00248 U	0.00297 U	0.00247 U	0.00283 U	0.287	0.0725
Carcinogenic PAHs (2 sig figs)	0.0075	0.0031 U	0.22	0.0035 U	0.011	0.0031 U	0.0031 U	0.039	0.0030 U	0.0025 U	0.0030 U	0.0025 U	0.0028 U	0.29	0.073
Carcinogenic PAHs (all digits)	0.0074799	0.0030955 U	0.22459	0.00354095 U	0.0107261	0.0031106 U	0.0030955 U	0.039412	0.00304265 U	0.00248395 U	0.00296715 U	0.00246885 U	0.00283125 U	0.28676	0.072545

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		CE-1	CE-1	CE-1	CE-1	CE-2	CE-2	CE-2	CE-2	CE-2 *	CE-2	CE-2 *	CE-3	CE-3	CE-3	CE-3	CE-4	CE-4	CE-4
	Sample Date	2/18/2010	2/18/2010	2/19/2010	2/19/2010	2/18/2010	2/18/2010	2/22/2010	2/22/2010	2/22/2010	2/22/2010	2/22/2010	2/18/2010	2/18/2010	2/22/2010	2/22/2010	2/18/2010	2/18/2010	2/19/2010
Analyte	**Depth[3]**	0.5 to 1	0.5 to 3	6.5 to 8	7.5 to 7.5	1 to 4	3 to 3.5	2 to 4.5	4 to 8	4 to 8	7 to 7	7 to 7	1 to 4	3.5 to 4	4 to 8	4.5 to 4.5	0.5 to 4	2.5 to 3	5 to 7
TPH																			
Gasoline Range Organics		5.45 U	--	--	--	--	--	367	--	--	348	711	--	7.88 U	--	89.8	--	6.36 U	--
Diesel Range Organics		--	4.81 U	237	--	5,800	--	--	494	369	--	--	4.05 U	--	2,040	--	189	--	16
Motor Oil		--	6.79	286	--	661	--	--	55.9	60.8	--	--	4.05 U	--	304	--	446	--	40.5
VOCs																			
Benzene		0.00203 U	--	--	0.0158 U	--	0.189 U	0.00211 U	--	--	0.00234 U	0.00255 U	--	0.00214 U	--	0.0019	--	0.00564	--
SVOCs																			
Carcinogenic PAHs as B(a)P[4]		--	0.55852	0.1128	--	0.332005	--	--	0.23535	0.14868	--	--	0.07039	--	0.0392309	--	0.062055	--	0.0071545

New PAH calculations from DB																		
Carcinogenic PAHs (3 sig figs)	--	0.505	0.0971	--	0.283	--	--	0.186	0.121	--	--	0.0750	--	0.0276	--	0.0605	--	0.00629
Carcinogenic PAHs (2 sig figs)	--	0.51	0.097	--	0.28	--	--	0.19	0.12	--	--	0.075	--	0.028	--	0.061	--	0.0063
Carcinogenic PAHs (all digits)	--	0.50535	0.09712	--	0.28344	--	--	0.18578	0.1207	--	--	0.074986	--	0.027574	--	0.060511	--	0.0062853

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		CE-4	CE-5	CE-5	CE-5	CE-5	CE-6	CE-6	CE-6	CE-6	CE-7	CE-7	CE-7	CE-7	CE-8	CE-8	CE-8	CE-8 *
	Sample Date	2/19/2010	2/18/2010	2/18/2010	2/19/2010	2/19/2010	6/13/2011	6/13/2011	6/13/2011	6/13/2011	6/13/2011	6/13/2011	6/13/2011	6/13/2011	6/13/2011	6/13/2011	6/13/2011	6/13/2011
Analyte	**Depth[3]**	7 to 7	0.5 to 4	2.5 to 3	5 to 8	6 to 6	0.5 to 5	4 to 4	5 to 8	7.5 to 7.5	0.5 to 5	2 to 2	5 to 8	6 to 6	0.5 to 5	2.2 to 2.2	5 to 10	5 to 10
TPH																		
Gasoline Range Organics		5.4 U	--	5.93 U	--	6.39 U	--	1.12 J	--	3.83 J	--	142 B	--	2470 B	--	5.41 B	--	--
Diesel Range Organics		--	10.1	--	6.58	--	1.47 J	--	5390	--	5600	--	1740	--	5,290	--	2,540	2,580
Motor Oil		--	40.6	--	20.7	--	8.46 B	--	1220	--	4620	--	2030	--	5,810	--	2,850	2,820
VOCs																		
Benzene		0.00397	--	0.00245 U	--	0.0023 U	--	0.00166 U	--	0.00128 U	--	0.00175 J	--	0.053	--	0.0011 U	--	--
SVOCs																		
Carcinogenic PAHs as B(a)P[4]		--	0.0625177	--	0.00290705	--	0.00088726	--	0.261309	--	0.59763	--	0.553626	--	0.380409	--	0.2461205	0.241073

New PAH calculations from DB																	
Carcinogenic PAHs (3 sig figs)	--	0.0573	--	0.00273 U	--	0.000546	--	0.228	--	0.512	--	0.488	--	0.361	--	0.226	0.223
Carcinogenic PAHs (2 sig figs)	--	0.057	--	0.0027 U	--	0.00055	--	0.23	--	0.51	--	0.49	--	0.36	--	0.23	0.22
Carcinogenic PAHs (all digits)	--	0.057262	--	0.00272555 U	--	0.0005461	--	0.2283	--	0.5117	--	0.4881	--	0.3609	--	0.226475	0.22297

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		CE-8	CE-8 *	CE-SB01	CE-SB01	CE-SB01	CE-SB02	CE-SB02	EA-SB01	EA-SB01	EA-SB02	EA-SB02	EA-SB03 *	EA-SB03	EA-SB03	EA-SB03	EA-SB04
	Sample Date	**6/13/2011**	**6/13/2011**	**10/23/2013**	**10/23/2013**	**10/23/2013**	**10/14/2013**	**10/23/2013**	**10/14/2013**	**10/28/2013**	**10/14/2013**	**10/28/2013**	**10/30/2013**	**10/30/2013**	**10/30/2013**	**10/30/2013**	**10/17/2013**
Analyte	**Depth[3]**	**8 to 8**	**8 to 8**	**4 to 5**	**9.5 to 10.5**	**24 to 24.5**	**4 to 5**	**19.5 to 20**	**4.5 to 5**	**19.5 to 20**	**4 to 5**	**21 to 21.5**	**4 to 5**	**4 to 5**	**12 to 12.5**	**19.5 to 20**	**4.5 to 5**
TPH																	
Gasoline Range Organics		33.1 B	27.4 B	42.2	318	6.87 U	1920	9.01 U	697	25.2	120	46.2 U	124	98.6	25 U	9.02 U	613
Diesel Range Organics		--	--	20.2	786	4.93 U	1670	4.86 U	25100	87.2	1840	46.4	534	721	180	4.98 U	249
Motor Oil		--	--	19.2	661	4.93 U	205	4.86 U	3240	49.1	581	64.1	249	357	410	7.46	50.1
VOCs																	
Benzene		0.00155 U	0.00239 J	0.00265	0.126	0.00218 U	0.0176	0.00234 U	0.114 U	0.00195 U	0.00549	0.0119 U	0.00489	0.0171	0.00699 U	0.0027 U	0.0187
SVOCs																	
Carcinogenic PAHs as B(a)P[4]		--	--	0.726133	81.7425	0.04886665	0.224456	0.002 U	0.5927955	0.002 U	0.261857	0.01 U	0.066892	0.0813715	0.424714	0.00293505	0.01252905

New PAH calculations from DB																
Carcinogenic PAHs (3 sig figs)	--	--	0.605	64.0	0.0358	0.168	0.00250 U	0.426	0.00249 U	0.225	0.0112 U	0.0505	0.0612	0.260	0.00250 U	0.00851
Carcinogenic PAHs (2 sig figs)	--	--	0.60	64	0.036	0.17	0.0025 U	0.43	0.0025 U	0.23	0.011 U	0.051	0.061	0.26	0.0025 U	0.0085
Carcinogenic PAHs (all digits)	--	--	0.60477	64.015	0.0357675	0.16763	0.00249905 U	0.425915	0.0024915 U	0.22519	0.011174 U	0.050507	0.061176	0.26018	0.00249905 U	0.0085085

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		EA-SB04	EA-SB05	EA-SB05	EA-SB06	EA-SB06	EA-SB06	EA-SB06	FA-SB01	FA-SB01 *	FA-SB01	FA-SB02	FA-SB02	FA-SB03	FA-SB03	FA-SB03
	Sample Date	**10/23/2013**	**10/29/2013**	**10/29/2013**	**10/14/2013**	**10/28/2013**	**10/28/2013**	**10/28/2013**	**10/15/2013**	**10/25/2013**	**10/25/2013**	**10/15/2013**	**10/24/2013**	**10/24/2013**	**10/24/2013**	**10/24/2013**
Analyte	**Depth[3]**	**19.5 to 20**	**4.5 to 5**	**19 to 19.5**	**3.5 to 4.5**	**6 to 6.5**	**12 to 12.5**	**19.5 to 20**	**5 to 5.5**	**19.5 to 20**	**19.5 to 20**	**5 to 6**	**19.5 to 20**	**4 to 5**	**6.5 to 7**	**19.25 to 19.75**
TPH																
Gasoline Range Organics		4.85 U	165	44.9 U	1,200	1480	47.5 U	5.78 U	110	5.33 U	5.38 U	432	6.73 U	30.3	175	5.96 U
Diesel Range Organics		4.82 U	1,300	20.8 U	1,200	750	21.8	6.05	662	4.94 U	4.89 U	8,360	4.97 U	144	77.6	4.93 U
Motor Oil		4.82 U	571	149	56 U	4.92 U	59.7	6.42	186	4.94 U	4.89 U	343	4.97 U	270	78.1	4.93 U
VOCs																
Benzene		0.00652	0.00914	0.00989 U	2.79	1.92	0.0827	0.00182 U	0.00257 U	0.00176 U	0.00178 U	0.0022 U	0.00193 U	0.00259	0.00193 U	0.00175 U
SVOCs																
Carcinogenic PAHs as B(a)P[4]		0.003 U	0.042333	0.01 U	0.1502214	0.3085254	0.153892	0.0029395	0.302975	0.002 U	0.002 U	0.1872005	0.002 U	0.0478557	0.0191474	0.002 U

New PAH calculations from DB															
Carcinogenic PAHs (3 sig figs)	0.00251 U	0.0327	0.0105 U	0.00655	0.0207	0.0664	0.00249 U	0.279	0.00247 U	0.00248 U	0.119	0.00248 U	0.0399	0.0176	0.00246 U
Carcinogenic PAHs (2 sig figs)	0.0025 U	0.033	0.010 U	0.0065	0.021	0.066	0.0025 U	0.28	0.0025 U	0.0025 U	0.12	0.0025 U	0.040	0.018	0.0025 U
Carcinogenic PAHs (all digits)	0.00251415 U	0.032727	0.0104945 U	0.006546	0.020726	0.06637	0.0024915 U	0.2789	0.00246885 U	0.00248395 U	0.118865	0.00248395 U	0.039904	0.017634	0.0024613 U

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		FA-SB04	FA-SB04	FA-SB05	FA-SB05	FA-SB06	FA-SB06	FA-SB06	FA-SB07	FA-SB07	KC-SB01 *	KC-SB01	KC-SB01	KC-SB02	KC-SB02	KC-SB02 *
	Sample Date	10/24/2013	10/24/2013	10/24/2013	10/24/2013	10/25/2013	10/25/2013	10/25/2013	10/25/2013	10/25/2013	10/30/2013	10/30/2013	10/30/2013	2/4/2014	2/10/2014	2/10/2014
Analyte	Depth[3]	4 to 5	19.5 to 20	4.5 to 5	19.5 to 20	4 to 5	7.5 to 8	19.5 to 20	4 to 5	19.5 to 20	4.5 to 5	4.5 to 5	24.5 to 25	4.5 to 5	6.5 to 7	19.5 to 20
TPH																
Gasoline Range Organics		106	6.68 U	29.6	6.58 U	13.8	381	9.12	14.3	5.27 U	4.68 U	4.23 U	6.46 U	15.7	29.9 U	30.7 U
Diesel Range Organics		105	4.96 U	49.3	4.94 U	86.1	3,130	4.89 U	24.1 U	4.94 U	25 U	24.9 U	4.86 U	95.1	13.4	5.08
Motor Oil		103	4.96 U	60	4.94 U	107	244 U	4.89 U	112	4.94 U	102	109	4.86 U	5.93	46.9	22.4
VOCs																
Benzene		0.0026	0.00214 U	0.00263	0.00202 U	0.00178 U	0.104 U	0.00182 U	0.00224 U	0.00168 U	0.00137 U	0.0017 U	0.00202 U	0.00152 U	0.00784 U	0.00815 U
SVOCs																
Carcinogenic PAHs as B(a)P[4]		0.190065	0.002 U	0.00549225	0.003 U	0.505989	0.074794	0.002 U	0.0967848	0.002 U	0.026091	0.095772	0.002 U	0.0030245	0.007 U	0.0076 U

New PAH calculations from DB															
Carcinogenic PAHs (3 sig figs)	0.171	0.00250 U	0.00508	0.00251 U	0.469	0.0319	0.00248 U	0.0883	0.00250 U	0.0251	0.0848	0.00248 U	0.00268	0.00731 U	0.00755 U
Carcinogenic PAHs (2 sig figs)	0.17	0.0025 U	0.0051	0.0025 U	0.47	0.032	0.0025 U	0.088	0.0025 U	0.025	0.085	0.0025 U	0.0027	0.0073 U	0.0076 U
Carcinogenic PAHs (all digits)	0.17144	0.00249905 U	0.0050822	0.00251415 U	0.4686	0.03188	0.0024764 U	0.088301	0.00249905 U	0.025095	0.084818	0.00248395 U	0.0026805	0.0073084 U	0.00755 U

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		KC-SB02	MW-A1	MW-A1	MW-A2	MW-A2	MW-A3	MW-A3	MW-A4	MW-A4 *	MW-A4	MW-A5	MW-A5	MW-A6	MW-A6	MW-7A	MW-7AB	MW-A8
	Sample Date	**2/10/2014**	**2/4/2008**	**2/4/2008**	**2/4/2008**	**2/4/2008**	**6/24/2010**	**6/24/2010**	**6/24/2010**	**6/24/2010**	**6/24/2010**	**6/24/2010**	**6/24/2010**	**6/25/2010**	**6/25/2010**	**11/30/2010**	**12/1/2010**	**10/29/2013**
Analyte	**Depth[3]**	**19.5 to 20**	**7 to 7**	**8.5 to 8.5**	**6 to 6.5**	**7.5 to 8**	**10 to 11**	**20 to 21**	**20 to 21**	**15 to 15**	**15 to 15**	**10 to 10**	**20 to 20**	**12 to 12**	**20 to 20**	**1 to 1**	**11.5 to 12**	**6 to 6.5**
TPH																		
Gasoline Range Organics		32.8 U	3.22 U	168	10.2 U	203	5.98 U	4.69 U	4.74 U	7.5 U	4.74 U	7.16 U	5.39 U	5.74 U	6.29 U	4.41 U	5.85 U	4.34 U
Diesel Range Organics		5.08	74.1	5,160	33.3	2,370	7.63	4.57 U	7.25	46.1	12.1	3.74 U	3.95 U	23.8	273	10	2.36	48.8 U
Motor Oil		16.3	79.5	471 U	290	279	22.1	6.81	17	81.1	12.2	4.7	4.06	119	482	228	2.93	535
VOCs																		
Benzene		0.00859 U	0.0322 U	0.0319 U	0.102 U	0.0355	0.00212 U	0.002 U	0.00192 U	0.002 U	0.00215 U	0.00236 U	0.00191 U	0.00225 U	0.00318 U	0.0009 U	0.00123 U	0.00152 U
SVOCs																		
Carcinogenic PAHs as B(a)P[4]		0.0075 U	--	--	--	--	0.0121667	0.062577023	0.013497	0.1729998	0.122063	0.0162077	0.00354135	0.01151025	0.127304	0.0329254	0.0028948	0.1333165

New PAH calculations from DB																	
Carcinogenic PAHs (3 sig figs)	0.00753 U	--	--	--	--	0.00996	0.0575	0.00667	0.0542	0.0342	0.0124	0.00292 U	0.00840	0.115	0.0329	0.00331	0.120
Carcinogenic PAHs (2 sig figs)	0.0075 U	--	--	--	--	0.0100	0.057	0.0067	0.054	0.034	0.012	0.0029 U	0.0084	0.12	0.033	0.0033	0.12
Carcinogenic PAHs (all digits)	0.0075349 U	--	--	--	--	0.009963	0.057476	0.006674	0.054214	0.03418	0.012402	0.00292185 U	0.008401	0.11532	0.032931	0.0033107	0.120265

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property
Everett, Washington

		MW-A8	PE-SB02	PE-SB02	PE-SB03	PE-SB03	PE-SB04	PE-SB04	PE-SB05	PE-SB05	PE-SB06	PE-SB06	PE-SB06	PE-SB07	PE-SB07	PE-SB07
	Sample Date	10/29/2013	10/22/2013	10/22/2013	10/16/2013	10/22/2013	10/22/2013	10/22/2013	2/7/2014	2/7/2014	2/7/2014	2/7/2014	2/7/2014	2/3/2014	2/7/2014	2/7/2014
Analyte	Depth[3]	14.5 to 15	6.5 to 7	19.5 to 20	4 to 5	19.5 to 20	4 to 5	19.5 to 20	8.5 to 9	19.5 to 20	6.5 to 7	11 to 11.5	19.5 to 20	4.5 to 5	10.5 to 11	12.5 to 13
TPH																
Gasoline Range Organics		5.34 U	1330	13.2	210	10 U	115	8.01 U	5.11 U	5.27 U	4.78 U	6.23 U	6.17 U	384	5.66 U	22.8
Diesel Range Organics		5 U	8,790	4.9 U	5,180	5.98	122 U	4.87 U	15	5.59 U	49.5	8.97	5.76 U	5550	5.69 U	68.5
Motor Oil		5 U	3,450	4.9 U	1,590	4.89 U	649	4.87 U	50.7	20.7	511	49	5.76 U	2700	5.69 U	29.7
VOCs																
Benzene		0.00172 U	0.00192 U	0.00192 U	0.00209 U	0.00287 U	0.00173 U	0.00229 U	0.00167 U	0.00192 U	0.00234 U	0.00195 U	0.00209 U	0.00213 U	0.00183 U	0.00213 U
SVOCs																
Carcinogenic PAHs as B(a)P[4]		0.002 U	0.5593369	0.003 U	0.0615071	0.004 U	0.0354661	0.004 U	0.0034139	0.003 U	0.0437901	0.00326165	0.003 U	0.4146625	0.003 U	0.01970075

New PAH calculations from DB															
Carcinogenic PAHs (3 sig figs)	0.00249 U	0.259	0.00284 U	0.0431	0.00410 U	0.0315	0.00368 U	0.00312	0.00282 U	0.0393	0.00299	0.00297 U	0.316	0.00285 U	0.0169
Carcinogenic PAHs (2 sig figs)	0.0025 U	0.26	0.0028 U	0.043	0.0041 U	0.032	0.0037 U	0.0031	0.0028 U	0.039	0.0030	0.0030 U	0.32	0.0029 U	0.017
Carcinogenic PAHs (all digits)	0.0024915 U	0.259179	0.0028388 U	0.043092	0.00409965 U	0.03153	0.00367685 U	0.0031249	0.00281615 U	0.039272	0.0029948	0.00296715 U	0.316205	0.0028539 U	0.0168785

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		PE-SB07	PE-SB07	PE-SB07 *	PE-SB07	PE-SB07	PE-SB07	PE-SB08	PE-SB08	PE-SB08	PE-SB08	PE-SB09	PE-SB09	PE-SB10	PE-SB10	SA-B-1
	Sample Date	2/7/2014	2/7/2014	2/7/2014	2/7/2014	2/7/2014	2/7/2014	2/6/2014	2/6/2014	2/6/2014	2/6/2014	2/10/2014	2/10/2014	2/6/2014	2/6/2014	12/30/2011
Analyte	Depth[3]	14.5 to 15	16.5 to 17	19.5 to 20	19.5 to 20	6.5 to 7	8.5 to 9	11 to 11.5	20.5 to 21	22.5 to 23	7 to 7.5	19.5 to 20	5 to 5.5	19.5 to 20	8.5 to 9	9
TPH																
Gasoline Range Organics		14.3	6.08 U	5.56 U	5.8 U	193	123	61.3	5.45	5.39 U	6.13 U	5.4 U	45.2	4.19 U	4.82 U	249 U
Diesel Range Organics		12.5	4.86 U	17.6	25.1	4,220	1,440	484	24.9	9.45	6.12	5.84 U	96.3	5.55 U	5.63	61.6
Motor Oil		5.57 U	8.08	62.2	24.8	2,200	450	748	27.9	8.97	5.89 U	8.33	435	5.55 U	5.32 U	122
VOCs																
Benzene		0.00196 U	0.0019 U	0.0018 U	0.00187 U	0.00203 U	0.00185 U	0.00217 U	0.00179 U	0.00184 U	0.00279 U	0.00178 U	0.00198 U	0.00152 U	0.00178 U	0.0154 U
SVOCs																
Carcinogenic PAHs as B(a)P[4]		0.003 U	0.003 U	0.003 U	0.003 U	0.20567725	0.0884605	0.159621	0.0036353	0.003 U	0.0041731	0.00349265	0.082304	0.0033721	0.003 U	0.01 U
New PAH calculations from DB																
Carcinogenic PAHs (3 sig figs)		0.00276 U	0.00299 U	0.00295 U	0.00299 U	0.139	0.0692	0.133	0.00294	0.00292 U	0.00290	0.00297 U	0.0529	0.00273 U	0.00263 U	0.0129 U
Carcinogenic PAHs (2 sig figs)		0.0028 U	0.0030 U	0.0030 U	0.0030 U	0.14	0.069	0.13	0.0029	0.0029 U	0.0029	0.0030 U	0.053	0.0027 U	0.0026 U	0.013 U
Carcinogenic PAHs (all digits)		0.0027633 U	0.0029898 U	0.00295205 U	0.0029898 U	0.1391425	0.069245	0.13285	0.0029362	0.00292185 U	0.0029042	0.00296715 U	0.052916	0.0027331 U	0.00263495 U	0.0129105 U

TABLE E-3: SOIL TPH AND BTEX RESULTS SINCE 2001[1,2]

ExxonMobil/ADC Property

Everett, Washington

		SA-B-2 *	SA-B-2	SA-B-3	SA-B-4	SA-B-5	SA-B-6	SA-B-7	SA-B-8	SA-B-9	SA-B-10	SA-B-11
	Sample Date	**12/30/2011**	**12/30/2011**	**1/3/2012**	**1/5/2012**	**1/6/2012**	**1/13/2012**	**2/9/2012**	**3/26/2012**	**3/27/2012**	**3/27/2012**	**3/27/2012**
Analyte	**Depth[3]**	**9**	**9**	**10**	**9**	**8**	**8**	**8**	**8**	**8**	**8**	**8**
TPH												
Gasoline Range Organics		297 U	45.7 U	338 U	315 U	9.15 U	7.49 U	46.7	42.5 U	51.6 U	47 U	54.7 U
Diesel Range Organics		156	30.9	27.7 U	25.6 U	11.1	5.27 U	822	24.6 U	61.3	291	99.5
Motor Oil		363	125	189	123	40.2	5.98	1,040	173	649	907	641
VOCs												
Benzene		0.0184 U	0.0183 U	0.0227 U	0.643 UJ	0.00376 U	0.00224 U	0.0109 U	0.0188 U	0.0196 U	0.0198 U	0.0206 U
SVOCs												
Carcinogenic PAHs as B(a)P[4]		0.3531765	0.3070745	0.0701435	0.02 U	0.003 U	0.003 U	0.133976	0.016 U	0.016 U	0.019118	0.02 U

New PAH calculations from DB											
Carcinogenic PAHs (3 sig figs)	0.353	0.307	0.0701	0.0161 U	0.00308 U	0.00329 U	0.126	0.0156 U	0.0160 U	0.0163 U	0.0165 U
Carcinogenic PAHs (2 sig figs)	0.35	0.31	0.070	0.016 U	0.0031 U	0.0033 U	0.13	0.016 U	0.016 U	0.016 U	0.016 U
Carcinogenic PAHs (all digits)	0.3531765	0.3070745	0.0701435	0.0160815 U	0.0030804 U	0.0032918 U	0.126331	0.0156285 U	0.016006 U	0.016308 U	0.016459 U

Notes:

1. Data qualifiers are as follows:
    J = detected at or above the reported estimate
    U = not detected
    UJ = estimated at the reporting limit
2. Results reported in milligrams per kilogram.
3. Depth measured in feet below ground surface.
4. The total toxic equivalent concentration was calculated following WAC 173-340-708(8)(e)

Abbreviations:

-- = no data available
B(a)P = benzo(a)pyrene
NA = not available
PAHs = polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons
VOCs = volatile organic compounds

APPENDIX F

PORT OF EVERETT—EXCAVATION DELINEATION REPORT

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April 21, 2021
Cardno 03144702.R04

Mr. Jason Cook
Washington State Department of Ecology
Toxics Cleanup Program
P.O. Box 47600
Olympia, Washington 98504-7600

SUBJECT **Port of Everett – Excavation Delineation Report**
ExxonMobil ADC
Agreed Order No.: DE 6184
2717/2731 Federal Avenue
Everett, Washington

Mr. Cook:

At the request of ExxonMobil Environmental and Property Solutions, on behalf of ExxonMobil Oil Corporation (ExxonMobil) and American Distribution Company (ADC), Cardno prepared the enclosed *Port of Everett – Excavation Delineation Report* presenting results of the soil investigation conducted between October 12 through October 14, 2020, January 25 through January 27, 2021, and February 5, 2021, at the subject site.

The purpose of the work was to pre-establish the vertical and lateral extents of the proposed remedial excavation such that collection of soil samples at the time of excavation is not necessary. Cardno requests that the Washington State Department of Ecology provide an opinion regarding whether the excavation extents have been adequately vertically and laterally defined as summarized in the enclosed report.

Please contact Mr. Bobby Thompson, Cardno Project Manager for this site, at 206 510 5855, or Ms. Jennifer Sedlachek, ExxonMobil Project Manager for this site at 469 913 3672 with any questions.

Sincerely,

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ENCLOSURE

Cardno's ExxonMobil Environmental and Property Solutions *Port of Everett – Excavation Delineation Drilling Report*, dated April 21, 2021

Australia • Belgium • Canada • Colombia • Ecuador • Germany • Indonesia • Kenya •
Myanmar • New Zealand • Nigeria • Papua New Guinea • Peru • Philippines • Singapore •
Timor-Leste • United Kingdom • United States • Operations in over 100 countries

cc: w/ enclosure
Mr. Erik Gerking, Port of Everett *(Electronic copy via email)*
Mr. Steve Miller, American Distribution Company *(Electronic copy via email)*
Ms. Sandra Caldwell, Washington State Department of Ecology *(Electronic copy via email)*
Ms. Jennifer Sedlachek, ExxonMobil Environmental and Property Solutions Company *(Filed in project folder)*

Port of Everett – Excavation Delineation Report

ExxonMobil ADC
2717/2731 Federal Avenue
Everett, Washington

Cardno 03144702.R04

Prepared for
ExxonMobil Environmental and Property Solutions

April 21, 2021

Port of Everett – Excavation Delineation Report

ExxonMobil ADC
2717/2731 Federal Avenue
Everett, Washington

Cardno 03144702.R04

April 21, 2021

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1 Introduction

1.1 Site Information

Site Name:	ExxonMobil ADC
Address:	2717/2731 Federal Avenue Everett, Washington
Township/Section/Range:	Township 29 North, Section 19, Range 5 East
Northern Tax Parcels:	00437161900101 00437161900100
Southern Tax Parcels:	00437161901000
Current Property Owners:	Northern Parcel – American Distribution Company (ADC) Southern Parcel – ExxonMobil Oil Corporation (ExxonMobil)
Agency/Regulatory ID No:	Washington Department of Ecology (Ecology) / FSID #2728 Agreed Order No.: DE 6184

1.2 Purpose

Cardno prepared this report presenting results of the soil sampling investigation conducted on October 12 to October 14, 2020, January 25 to January 27, 2021, and February 5, 2021, on Port of Everett property. The scope of work was performed in order to achieve the following objectives:

- Advance exploratory soil borings to delineate the proposed remedial excavation extents.
- Evaluate soil heterogeneity as related to potential preferential pathways that might impact the lateral and vertical extents of the proposed targeted remedial excavation.
- Characterize the extent of hydrocarbons in soil on the Port of Everett property so that the collection of soil samples during the remedial excavation is not necessary.

The scope of work included:

- The advancement of 44 excavation delineation soil borings (EB1 through EB41, EB31A, EB31B, and EB32A) to define the extents of the proposed remedial excavation on the Port of Everett property.
- The advancement of seven step out excavation delineation soil borings (SB1 through SB7) to further define the extents of the proposed remedial excavation on the Port of Everett property.
- The advancement of two geotechnical borings (GB1 and GB2) to aid in the development of future shoring wall plans to protect Federal Avenue during the remedial excavation.
- Conduct a site survey by a professional survey contractor following the delineation drilling activities to survey the locations of the borings and other relevant site features and utilities. The survey will be used to accurately document the lateral and vertical spacing of each data point to direct the planned remedial activities with a high level of precision.

2 Background

The ExxonMobil ADC site is located at 2717/2731 Federal Avenue, Everett, Snohomish County, Washington, adjacent to the Port of Everett (Plate 1). The site consists of three tax parcels: 00437161900101, 00437161900100, and 00437161901000 (Snohomish County, 2018). The northern parcels are owned by ADC and the southern parcel is owned by ExxonMobil. The property historically operated as a bulk petroleum storage, transfer, and distribution facility. The area of proposed excavation is located directly west of the ExxonMobil ADC site within five combined tax parcels: 29051900301600, 29051900302500, 29051900302700, 29051900302800, and 29051900302900 (Snohomish County, 2018). The combined tax parcels, located within the Port of Everett, are currently leased for heavy industrial use to Everett Ship Repair, LLC, a subsidiary of Ice Cap Holding, LLC, and Dunlap Towing Company (Wood, 2019). In the early 1900s, the historical shoreline was approximately located along present day Federal Avenue (Plate 2). As development continued, the shoreline was extended westward until it reached its current boundary in 1973 (Wood, 2019). The proposed excavation will take place primarily in material used to backfill the bay and extend the shoreline.

3 Cleanup Level Selection

The site-specific residual saturation concentrations used as remediation levels to guide excavation delineation drilling activities, as defined in Wood Environmental & Infrastructure Solutions, Inc. draft *Site characterization/focused feasibility study report*, dated August 23, 2019 (Wood, 2019), are as follows:

- TPHg: 2,470 mg/kg
- TPHd: 4,800 mg/kg
- TPHmo: 5,810 mg/kg

4 Port of Everett Subsurface Investigation and Survey

The purpose of this work was to delineate the proposed remedial excavation on the Port of Everett property. All soil boring activities were conducted in accordance with Cardno's *Excavation Delineation Work Plan – Port of Everett Property,* dated September 1, 2020 (Cardno 2020a); Cardno's *Subsequent Excavation Delineation Drilling Work Plan,* dated December 21, 2020 (Cardno, 2020b); Cardno's standard field protocol (Appendix A); and under the supervision of a licensed geologist.

4.1 Pre-Field Activities

During pre-planning, Cardno contracted Advanced Underground Utility Locating (AUUL), of Bellevue, Washington, to conduct a comprehensive evaluation of subsurface structures located on Port of Everett property and the City of Everett right-of-way (Federal Avenue). Using a combination of ground penetrating radar and portable electromagnetic survey, AUUL located the extents of sanitary sewer lines, underground power lines, telecommunication lines, and storm sewer lines. Holocene Drilling, Inc. (Holocene), of Puyallup, Washington, obtained Washington start cards from Ecology.

4.2 Subsurface Investigation

In order to completely define the extents of the Port of Everett targeted remedial excavation such that soil sampling at the time of the excavation will not be necessary, Cardno observed Holocene advance 51 excavation delineation soil borings (EB1 through EB41, EB31A, EB31B, EB32A, and SB1 through SB7) where historical data indicated residual concentrations of hydrocarbons above the site-specific residual saturation levels. Drilling was performed during two mobilizations with the first occurring in October 2020 and the second in late January through early February 2021. It was determined following the initial mobilization in October 2020 that supplementary delineation was required; however, additional coordination with the various stakeholders was necessary prior to the second mobilization.

4.2.1 October 2020 Mobilization

On October 12 through October 14, 2020, Cardno observed Holocene advance excavation delineation soil borings in accordance with Cardno's *Excavation Delineation Work Plan – Port of Everett Property*, dated September 1, 2020 (Cardno, 2020a). Per the work plan, 21 borings were advanced by a direct push drill rig. Based on the analytical results reported by the mobile laboratory (Appendix B), nine additional step out borings were advanced to further delineate the extents of the proposed remedial excavation. The locations of borings EB1 through EB30 are shown on Plates 3 through Plate 9 and boring logs are located in Appendix C. Soil samples collected from the borings were field screened and evaluated for the presence of residual hydrocarbon concentrations. Soil samples that indicated the presence of residual hydrocarbons were analyzed on site by Libby Environmental, Inc. (Libby Environmental), a State of Washington-certified mobile laboratory, for constituents of concern. Samples that did not indicate the presence of residual hydrocarbons were preserved for analysis at Libby Environmental's fixed-based laboratory.

Delineation of the remedial excavation extents was largely achieved during the October 2020 mobilization; however, it was determined a subsequent delineation drilling event was warranted to complete delineation activities to the north, northwest, and south.

4.2.2 January/February 2021 Mobilization

On January 25 through January 27 and February 5, 2021, Cardno observed Holocene advance excavation delineation soil borings in accordance with Cardno's *Subsequent Excavation Delineation Drilling Work Plan,* dated December 21, 2020 (Cardno, 2020b). A total of 11 borings were advanced by a direct push drill rig during the mobilization. Based on the analytical results reported by the mobile laboratory, seven additional step out borings were advanced by a direct push drill rig to further delineate the extents of the proposed remedial excavation. The locations of borings EB31 through EB41 and step out borings SB1 through SB7 are shown on Plates 3 through Plate 9 and boring logs are located in Appendix C. Soil samples collected from the borings were field screened and evaluated for the presence of residual hydrocarbon concentrations. Soil samples that indicated the presence of residual hydrocarbons were analyzed on site by Libby Environmental for constituents of concern. Samples that did not indicate the presence of residual hydrocarbons were preserved for analysis at the Libby Environmental fixed-based laboratory.

4.2.3 January 2021 Duplicate Borings

On January 25, 2021, boring EB31 met refusal at 9.5 feet bgs. The 9.5-foot sample depth contained residual hydrocarbons below the site-specific residual saturation remediation levels. On January 25, 2021, boring EB32 was advanced to a maximum depth of 12.5 feet bgs and soil samples were collected at intervals of 10 and 12.5 feet bgs for laboratory analysis. The 10-foot sample depth contained residual hydrocarbons above the site-specific residual saturation remediation levels. Boring EB32 was located approximately 30 feet west of boring EB31 and it was determined that vertical delineation was not achieved at boring EB31 due to the presence of residual hydrocarbons above the site-specific residual saturation remediation levels in the 10-foot sample at boring EB32. On January 27, 2021, boring EB31A, located approximately 4 feet north of EB31, was advanced to a maximum depth of 15 feet bgs and soil samples were collected at 15 feet bgs for laboratory analysis. Field screening of the 15-foot sample at location EB31A did not indicate the presence of residual hydrocarbons and the boring was terminated at that depth. The fixed-based laboratory later reported that the 15-foot sample depth contained residual hydrocarbons above the site-specific residual saturation remediation levels. Vertical delineation was not achieved at EB31A thus EB31B, located approximately 4 feet north of EB31A, was advanced to a maximum depth of 20 feet bgs and soil samples were collected at 17.5 and 20 feet bgs for laboratory analysis. Both the 17.5 and 20-foot samples contained residual hydrocarbons below the site-specific residual saturation remediation levels and boring locations EB31, EB31A, and EB31B were determined to be vertically delineated.

Boring EB32 was located approximately 30 feet west of boring EB31A and it was determined that vertical delineation was not achieved at boring EB32 due to the presence of residual hydrocarbons above the site-specific residual saturation remediation levels in the 15-foot sample at boring EB31A. On January 27, 2021, boring EB32A was advanced to a maximum depth of 20 feet bgs and soil samples were collected at 5, 7.5, 10, 15, 17.5, and 20 feet bgs for laboratory analysis. Only one sample, collected at 10 feet bgs, contained residual hydrocarbon concentrations above the site-specific residual saturation remediation levels and boring locations EB32 and EB32A were determined to be vertically delineated.

4.3 Laboratory Analyses

Soil samples were analyzed by either Libby's mobile or fixed-based laboratory for:

- TPHg in accordance with NWTPH-Gx.
- TPHd and TPHmo in accordance with NWTPH-Dx.

Cardno directed soil samples to be either analyzed in near real time in the mobile laboratory or preserved for analysis at the fixed-based laboratory based on field screening results. Laboratory results and COC documentation is included as Appendix B.

4.4 Geotechnical Boring Advancement

January 26, 2021, Cardno observed Holocene clear geotechnical borings GB1 and GB2 to 5 feet bgs using air knife clearance drilling equipment and hand tools. On January 27, 2021, Cardno observed Holocene advanced two geotechnical borings (GB1 and GB2) to aid in the development of a future shoring wall to protect Federal Avenue during the remedial excavation. The borings were advanced with a truck mounted hollow-stem auger drill rig. A split spoon sampler was advanced by a Diedric D-120 140-pound auto hammer calibrated and certified by Robber Miner Dynamic Testing, Inc., on November 19, 2020. Boring logs for GB1 and GB2 are included in Appendix C. Additional geotechnical data will be included in a future engineering design report for the site.

4.5 Topographic Land Survey

On February 4, 5, and 8, 2021, Cardno observed Alpha Subdivision Pro's Inc. Land Surveying and Planning (ASPI), of Everett, Washington, perform a comprehensive survey. The survey was conducted on and around the ExxonMobil ADC site and the Port of Everett parcels leased by Everett Ship Repair and Dunlap Towing Company. The survey consisted of physical site features, monitoring well locations, soil boring locations, above and below ground utilities, fence lines, property lines, right-of-ways, driveways, and vegetated areas. A comprehensive survey file was provided to Cardno on February 19, 2021.

4.6 Waste Management

The soil and decontamination water generated during drilling activities was temporarily stored on the ExxonMobil property in DOT-approved 55-gallon drums. Soil and decontamination water was transported by Advanced Chemical Transport, Inc., of Kent, Washington, to US Ecology Idaho Inc.'s Grandview, Idaho, facility, an ExxonMobil Approved Waste Sites List disposal facility. Waste documentation for soil and water are included in Appendix D.

5 Results of Excavation Delineation Investigation

Soil encountered during this investigation consisted of stratified layers of sand, silt, gravel with sand, and sand with gravel from surface to approximately 31.5 feet bgs (Appendix C). Laboratory results indicate 22 of 51 soil boring locations contained residual hydrocarbons above the site-specific residual saturation remediation levels for at least one sample-depth interval (Table 1). Soil concentrations exceeding the site-specific residual saturation remediation levels were confined to a north/south trending line of approximately 300 feet along Federal Avenue and extending west towards Possession Sound, approximately 75 feet.

As shown on Cross Section A-A’ (Plate 10) as well as the depth-interval map series (Plates 3 through 9), soil samples exceeding the site-specific residual saturation remediation levels (illustrated in red) tend to deepen from the 5-foot bgs range in the southern area to the 15-foot bgs range in the northern area. The depth of first encountered groundwater identified during the drilling activities demonstrates a similar pattern where groundwater was first observed at shallower depths in the 5-foot bgs range to the south and deeper depths in the 15-foot bgs range to the north.

According to historical aerial photography (Wood, 2019), most of the proposed remedial excavation area was infilled during shoreline expansion efforts between 1914 and 1947. The northwestern corner (north of approximately EB25 and east to the N-S cross section line A-A’ drawn on Plates 3 through 9) was infilled during shoreline expansion efforts between 1967 and 1976. Select infill materials used in the northwestern corner differ from those in the south.

Cardno observed a concrete debris layer up to 4 feet thick in the northwestern corner in EB32, EB32A, and EB34 along with several gravel layers across the entire area that were not observed in other areas of the proposed remedial excavation. Additionally, the sandy infill material in the northwest corner has a higher average percent gravel component; this coarser-grained material has the potential to permit hydrocarbons to travel deeper in this area than in the mid- to southern portions of the proposed remedial excavation area.

In the southern portion of the proposed remedial excavation area, from approximately EB19 to the southern proposed remedial excavation extent, Cardno observed wood debris in layers up to 4 feet thick. The wood debris was characterized by a clay-like texture and matrix. This finer-grained material has the potential to inhibit the vertical migration of hydrocarbons.

Aside from the presence of coarser-grained gravel and concrete debris material in the north that may have permitted additional vertical migration of hydrocarbons, and the finer-grained wood debris material in the south that may have inhibited vertical migration of hydrocarbons, Cardno did not identify any subsurface preferential pathways. The subsurface is remarkably homogeneous given its infill history, comprising primarily coarse-grained sandy sediments. The vertical extent of residual hydrocarbon concentrations has been defined as illustrated on Plate 10 and Plates 3 through 9.

The lateral migration of hydrocarbons from east to west across the Port of Everett property is well-defined on its western extent along a predominantly straight line running longitudinally north-south from SB3 to EB37. The expression of the straight line, perpendicular to groundwater flow direction and downgradient of the known historical release, demonstrates that migration of hydrocarbons occurred uniformly and the likelihood of preferential pathways existing along any east-west axis across the area is low. The western boundary of the excavation, and the interpreted western extent of residual hydrocarbon concentrations, has been defined as illustrated on Plates 3 through 9.

6 Conclusions

The extents of the proposed Port of Everett remedial excavation have been defined and soil sampling at the time of the excavation will not be necessary.

7 Recommendations

The purpose of the work was to establish the vertical and lateral extents of the proposed remedial excavation such that collection of soil samples at the time of excavation is not necessary. Cardno requests that Ecology confirm whether the excavation extents have been adequately vertically and laterally defined based on comparison against the site-specific residual saturation remediation levels and that soil sampling at the time of excavation will not be necessary.

8 Contact Information

The responsible party contact is Ms. Jennifer Sedlachek, ExxonMobil Environmental and Property Solutions Company, 4096 Piedmont Avenue #194, Oakland, California 94611.

The consultant contact is Mr. Bobby Thompson, Cardno, 801 Second Avenue, Suite 1150, Seattle, Washington 98104.

The agency contact is Mr. Jason Cook, Washington State Department of Ecology, Toxics Cleanup Program, P.O. Box 47600, Olympia, Washington 98504.

9 Limitations

For documents cited that were not generated by Cardno, the data taken from those documents is used “as is” and is assumed to be accurate. Cardno does not guarantee the accuracy of this data and makes no warranties for the referenced work performed nor the inferences or conclusions stated in these documents.

This report and the work performed have been undertaken in good faith, with due diligence and with the expertise, experience, capability and specialized knowledge necessary to perform the work in a good and workmanlike manner and within all accepted standards pertaining to providers of environmental services in Washington at the time of investigation. No soil engineering or geotechnical references are implied or should be inferred. The evaluation of the geologic conditions at the site for this investigation is made from a limited number of data points. Subsurface conditions may vary away from these data points.

10 References

Snohomish County Online Property Information (Snohomish County). January 1, 2018. *Interactive Map (SCOPI).* https://snohomishcountywa.gov/5414/Interactive-Map-SCOPI. Accessed August 27, 2020.

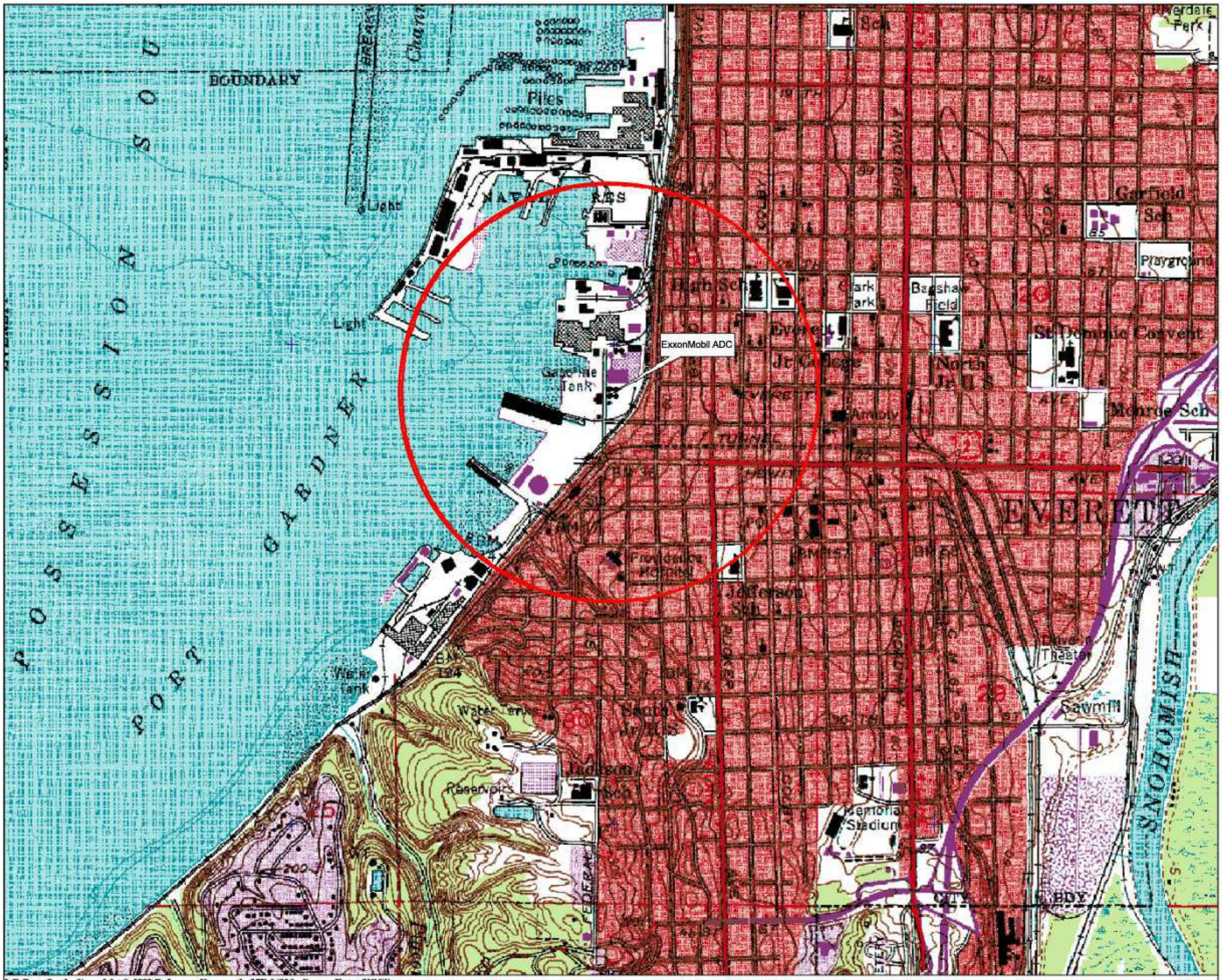
Cardno. September 1, 2020a. *Excavation Delineation Work Plan – Port of Everett Property.* ExxonMobil ADC, 2717/2713 Federal Avenue, Everett, Washington.

Cardno. December 21, 2020b. Subsequent *Excavation Delineation Drilling Work.* ExxonMobil ADC, 2717/2713 Federal Avenue, Everett, Washington.

Wood Environmental & Infrastructure Solutions, Inc. (Wood). August 23, 2019. draft *Site characterization/focused feasibility study report, ExxonMobil/ADC Property, Ecology Site ID 2728, Everett, Washington.*

9 Acronym List

µg/L	Micrograms per liter
µg/m^3	Micrograms per cubic meter
µs	Microsiemens
1,2-DCA	1,2-dichloroethane
acfm	Actual cubic feet per minute
AS	Air sparge
AST	Aboveground storage tank
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
cfm	Cubic feet per minute
COC	Chain-of-Custody
CPT	Cone Penetration (Penetrometer) Test
DIPE	Di-isopropyl ether
DO	Dissolved oxygen
DOT	Department of Transportation
DPE	Dual-phase extraction
DTW	Depth to water
EDB	1,2-dibromoethane
EPA	Environmental Protection Agency
ESL	Environmental screening level
ETBE	Ethyl tertiary butyl ether
FID	Flame-ionization detector
fpm	Feet per minute
GAC	Granular activated carbon
gpd	Gallons per day
gpm	Gallons per minute
GWPTS	Groundwater pump and treat system
HIT	High-intensity targeted
HVOC	Halogenated volatile organic compound
J	Estimated value between MDL and PQL (RL)
LEL	Lower explosive limit
LPC	Liquid-phase carbon
LRP	Liquid-ring pump
LUFT	Leaking underground fuel tank
LUST	Leaking underground storage tank
MCL	Maximum contaminant level
MDL	Method detection limit
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mg/m^3	Milligrams per cubic meter
MPE	Multi-phase extraction
MRL	Method reporting limit
msl	Mean sea level
MTBE	Methyl tertiary butyl ether
MTCA	Model Toxics Control Act
NAI	Natural attenuation indicators
NAPL	Non-aqueous phase liquid
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
ORP	Oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OVA	Organic vapor analyzer
P&ID	Process and Instrumentation Diagram
PAH	Polycyclic aromatic (or polyaromatic) hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene or perchloroethylene
PID	Photo-ionization detector
PLC	Programmable logic control
POTW	Publicly-owned treatment works
ppmv	Parts per million by volume
PQL	Practical quantitation limit
psi	Pounds per square inch
PVC	Polyvinyl chloride
QA/QC	Quality assurance/quality control
RBSL	Risk-based screening levels
RCRA	Resource Conservation and Recovery Act
RL	Reporting limit
scfm	Standard cubic feet per minute
SSTL	Site-specific target level
STLC	Soluble threshold limit concentration
SVE	Soil vapor extraction
SVOC	Semi-volatile organic compound
TAME	Tertiary amyl methyl ether
TBA	Tertiary butyl alcohol
TCE	Trichloroethene
TOC	Top of well casing elevation; datum is msl
TOG	Total oil and grease
TPH	Total petroleum hydrocarbons
TPHd	Total petroleum hydrocarbons as diesel
TPHg	Total petroleum hydrocarbons as gasoline
TPHmo	Total petroleum hydrocarbons as motor oil
TPHs	Total petroleum hydrocarbons as stoddard solvent
TRPH	Total recoverable petroleum hydrocarbons
UCL	Upper confidence level
USCS	Unified Soil Classification System
USGS	United States Geologic Survey
UST	Underground storage tank
VCP	Voluntary Cleanup Program
VOC	Volatile organic compound
VPC	Vapor-phase carbon



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS 544 ft Scale: 1 : 19,200 Detail: 13-0 Datum: NAD27

FN 0314470001

EXPLANATION

○ 1/2-mile radius circle

APPROXIMATE SCALE

Cardno®

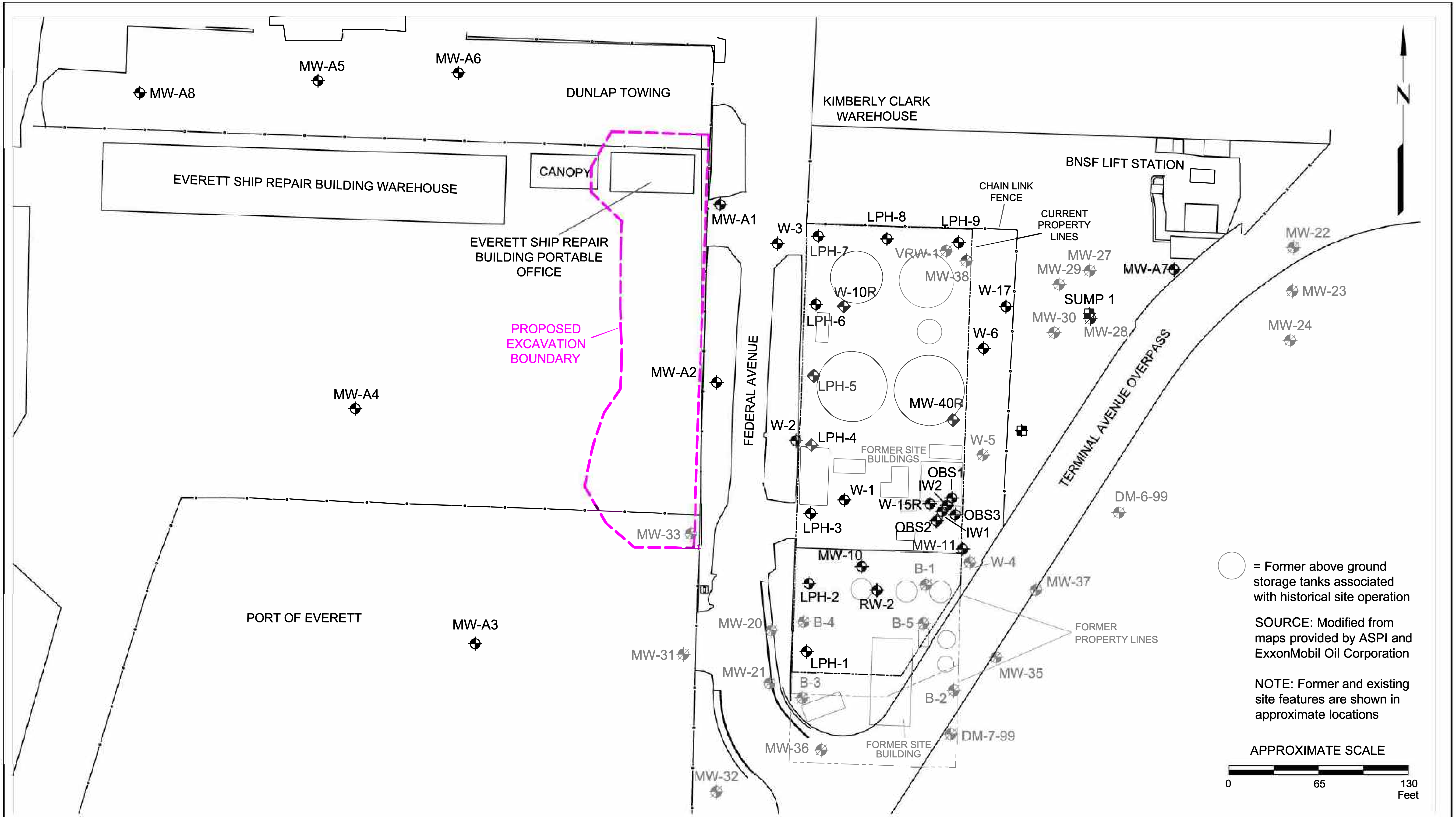
SITE LOCATION MAP

ExxonMobil ADC
2717/2731 Federal Avenue
Everett, Washington

PROJECT NO.
031447

PLATE
1

CPA: 04/01/21



○ = Former above ground storage tanks associated with historical site operation

SOURCE: Modified from maps provided by ASPI and ExxonMobil Oil Corporation

NOTE: Former and existing site features are shown in approximate locations

FN 0314470002

Cardno®

GENERALIZED SITE PLAN

ExxonMobil ADC
2717/2731 Federal Avenue
Everett, Washington

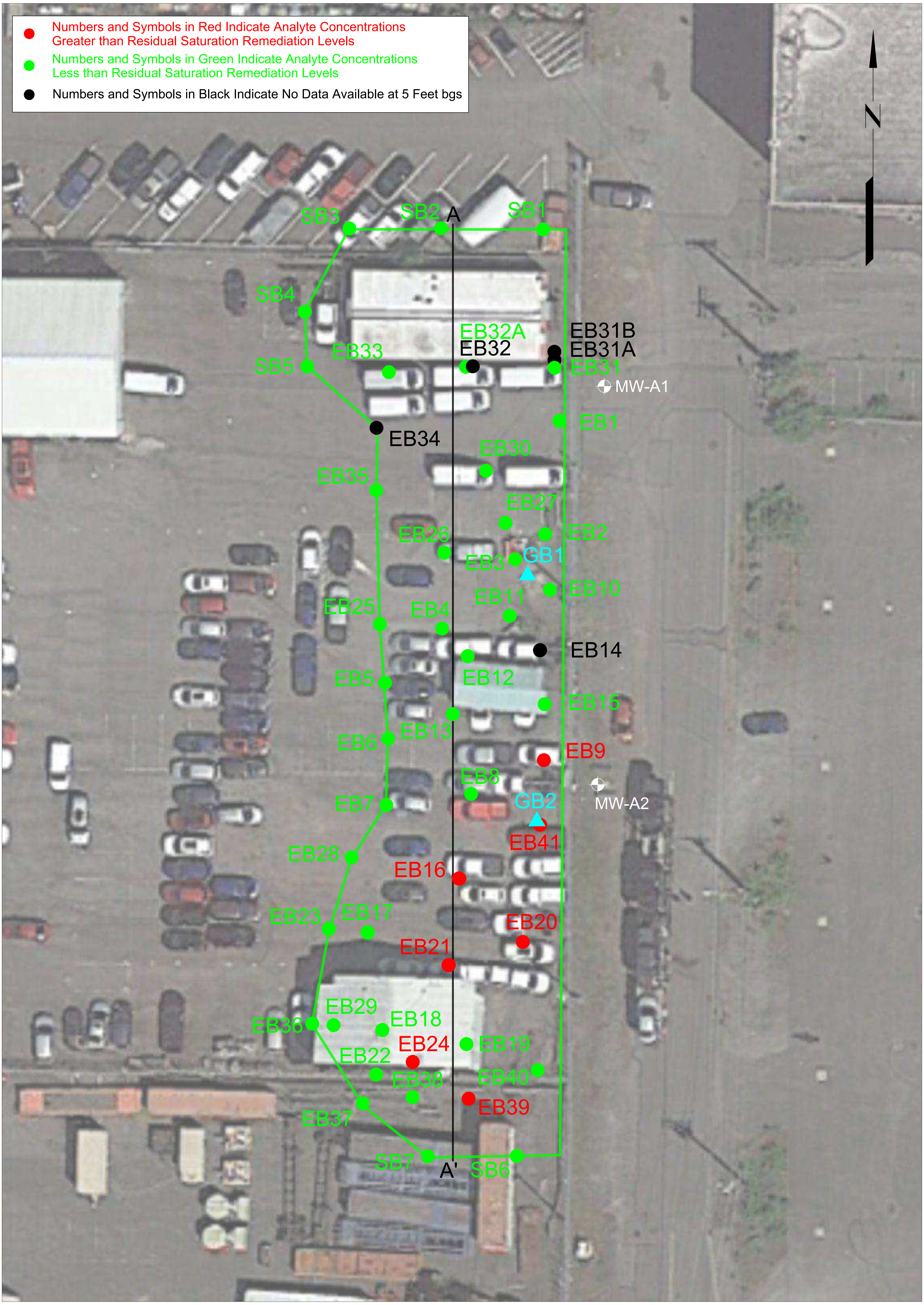
EXPLANATION

MW-A8 ⊕	Groundwater Monitoring Well
SUMP 2 ⊞	Groundwater Sump
MW37 ⊕	Destroyed Groundwater Monitoring Well

PROJECT NO.
031447

PLATE
2

CPA: 03/30/21



FN 0314470002

EXPLANATION

MW-A2
⊕ Groundwater Monitoring Well

GB2
▲ Geotechnical Boring

EB41
○ Excavation Delineation Boring

SB7
○ Step Out Excavation Delineation Boring

— Defined Excavation Extents

BGS = Below Ground Surface

APPROXIMATE SCALE
0 30 60
Feet

Cardno®

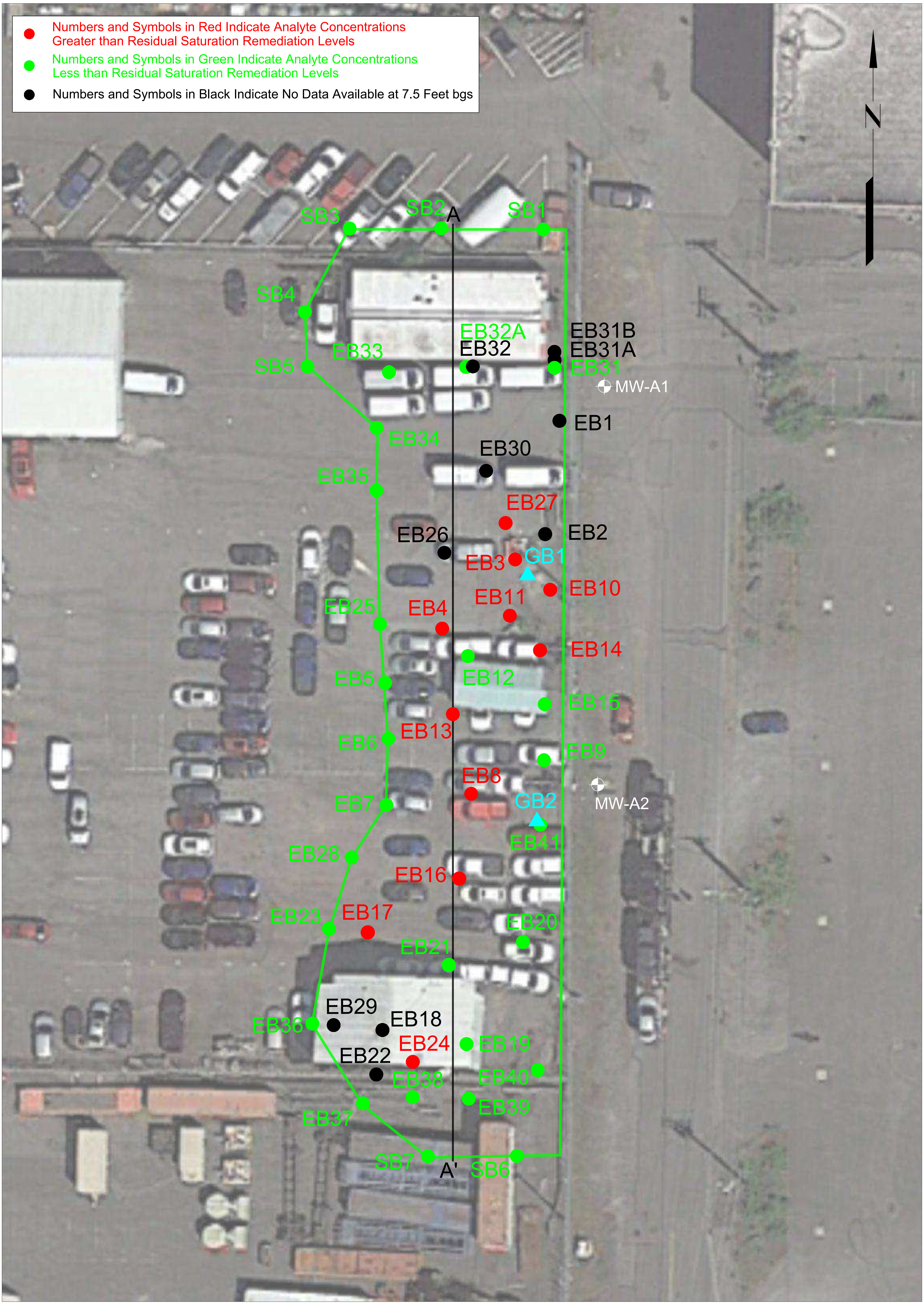
PORT OF EVERETT EXCAVATION DELINEATION MAP - 5 FEET BGS

EXXONMOBIL ADC
2717/2731 Federal Avenue
Everett, Washington

PROJECT NO.
031447

PLATE
3

CPA: 04/01/21



FN 0314470002

EXPLANATION

MW-A2
⌖ Groundwater Monitoring Well

GB2
▲ Geotechnical Boring

EB41
○ Excavation Delineation Boring

SB7
○ Step Out Excavation Delineation Boring

Defined Excavation Extents

BGS = Below Ground Surface

APPROXIMATE SCALE
0 30 60
Feet

Cardno

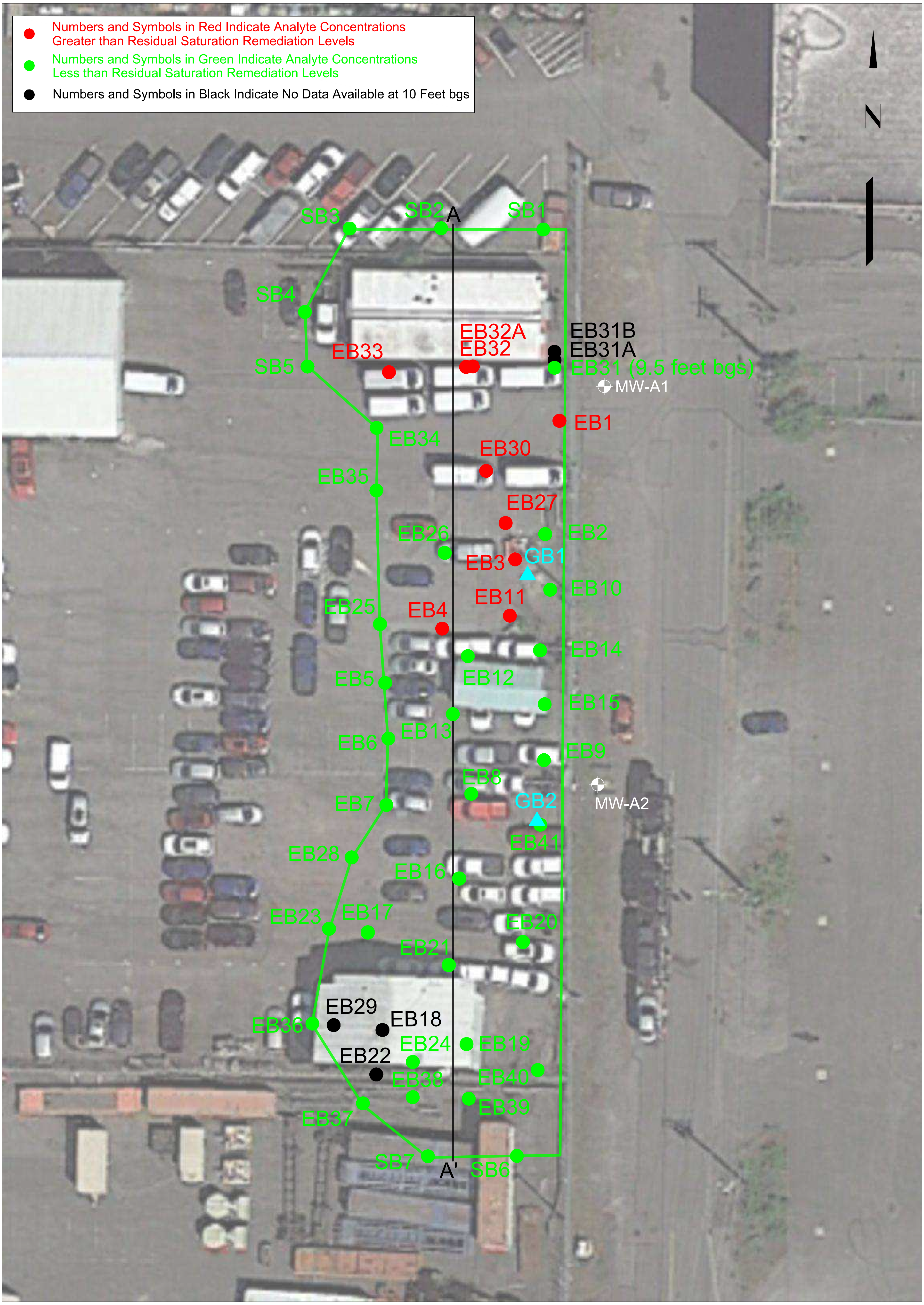
PORT OF EVERETT EXCAVATION DELINEATION MAP - 7.5 FEET BGS

EXXONMOBIL ADC
2717/2731 Federal Avenue
Everett, Washington

PROJECT NO.
031447

PLATE
4

CPA: 03/30/21


🟥 Numbers and Symbols in Red Indicate Analyte Concentrations Greater than Residual Saturation Remediation Levels

🟩 Numbers and Symbols in Green Indicate Analyte Concentrations Less than Residual Saturation Remediation Levels

● Numbers and Symbols in Black Indicate No Data Available at 10 Feet bgs

FN 0314470002

EXPLANATION

MW-A2
⊕ Groundwater Monitoring Well

GB2
▲ Geotechnical Boring

EB41
○ Excavation Delineation Boring

SB7
○ Step Out Excavation Delineation Boring

Defined Excavation Extents

BGS = Below Ground Surface

APPROXIMATE SCALE

0 30 60
Feet

Cardno

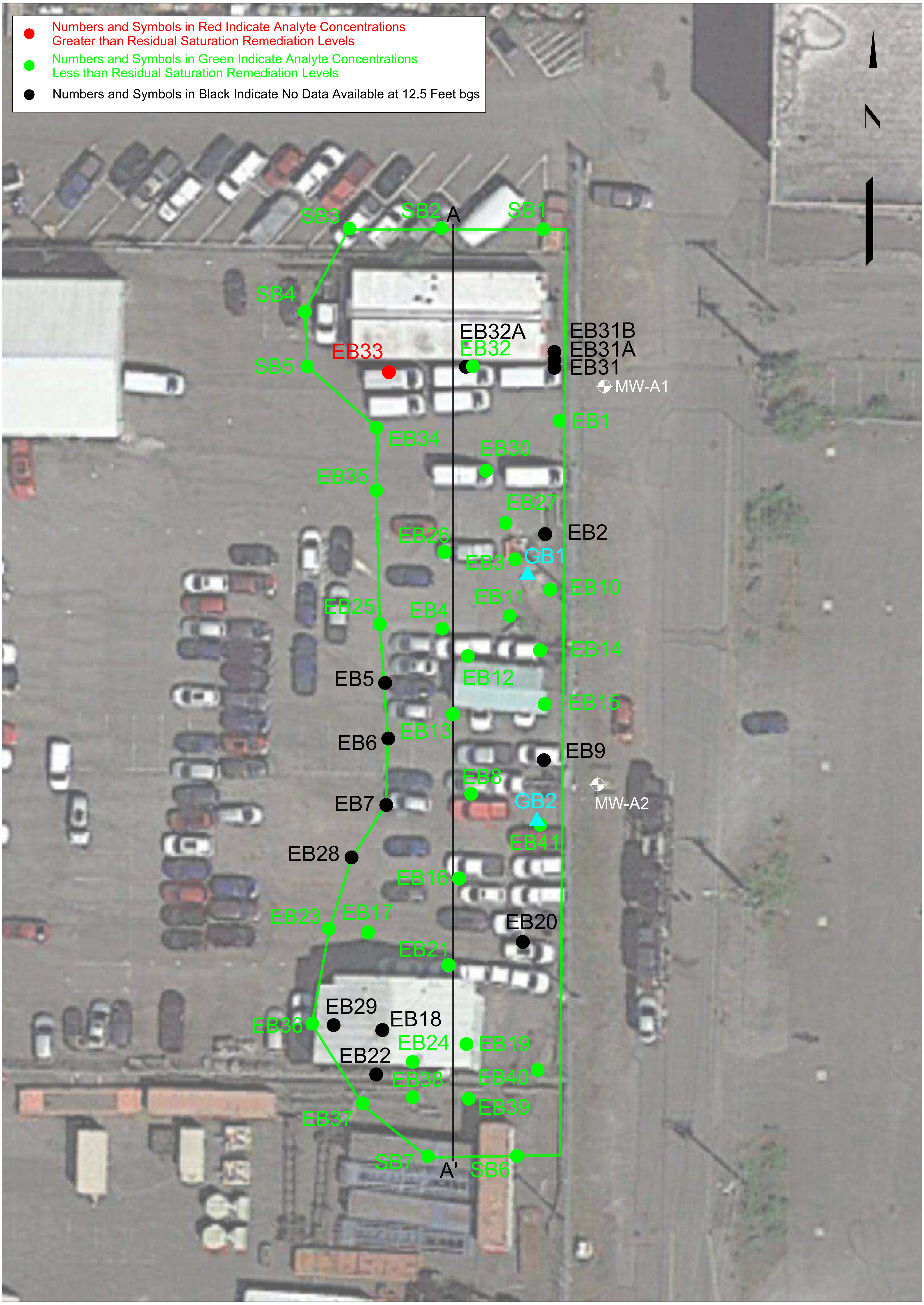
PORT OF EVERETT EXCAVATION DELINEATION MAP - 10 FEET BGS

EXXONMOBIL ADC
2717/2731 Federal Avenue
Everett, Washington

PROJECT NO.
031447

PLATE
5

CPA: 03/30/21



FN 0314470002

EXPLANATION

MW-A2
Groundwater Monitoring Well

GB2
▲ Geotechnical Boring

EB41
○ Excavation Delineation Boring

SB7
○ Step Out Excavation Delineation Boring

Defined Excavation Extents

BGS = Below Ground Surface

APPROXIMATE SCALE

0 30 60 Feet

Cardno

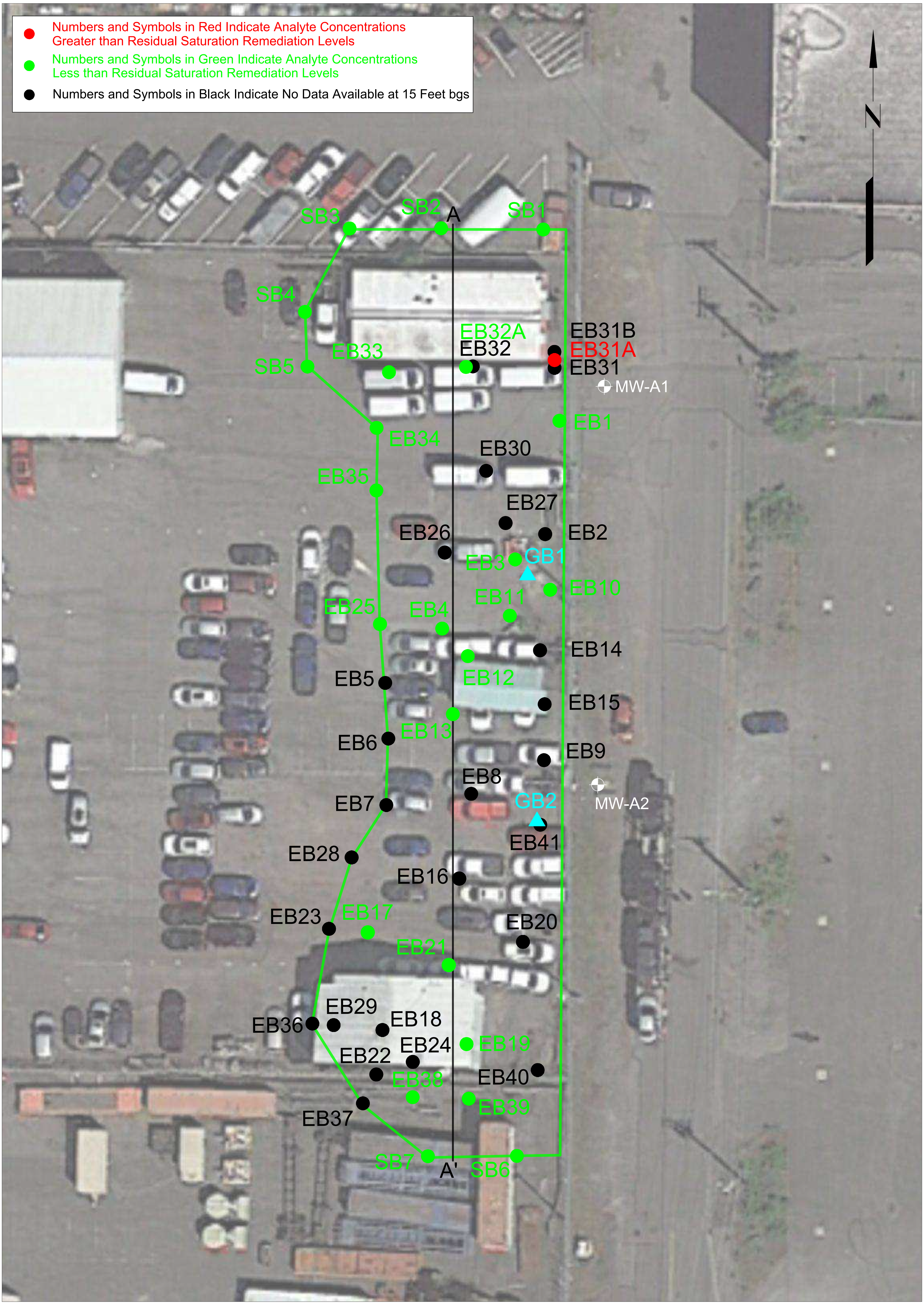
PORT OF EVERETT EXCAVATION DELINEATION MAP - 12.5 FEET BGS

EXXONMOBIL ADC
2717/2731 Federal Avenue
Everett, Washington

PROJECT NO.
031447

PLATE
6

CPA: 04/01/21



FN 0314470002

EXPLANATION

MW-A2
⊕ Groundwater Monitoring Well

GB2
▲ Geotechnical Boring

EB41
○ Excavation Delineation Boring

SB7
○ Step Out Excavation Delineation Boring

—— Defined Excavation Extents

BGS = Below Ground Surface

APPROXIMATE SCALE

0 30 60
Feet

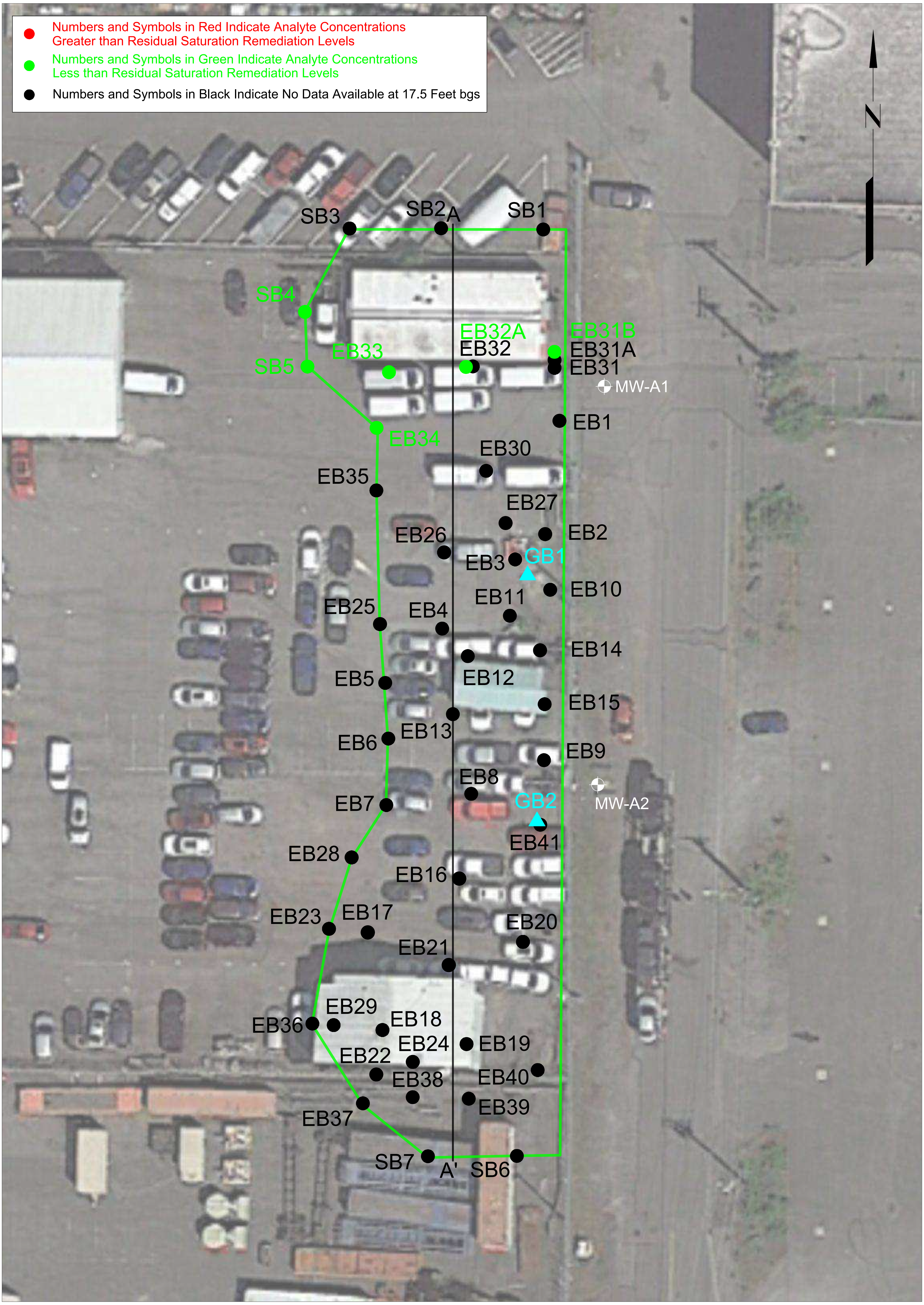
PORT OF EVERETT EXCAVATION DELINEATION MAP - 15 FEET BGS

EXXONMOBIL ADC
2717/2731 Federal Avenue
Everett, Washington

PROJECT NO.
031447

PLATE
7

CPA: 03/30/21



FN 0314470002

EXPLANATION

MW-A2
⊕ Groundwater Monitoring Well

GB2
▲ Geotechnical Boring

EB41
○ Excavation Delineation Boring

SB7
○ Step Out Excavation Delineation Boring

Defined Excavation Extents

BGS = Below Ground Surface

APPROXIMATE SCALE

0 30 60
Feet

Cardno

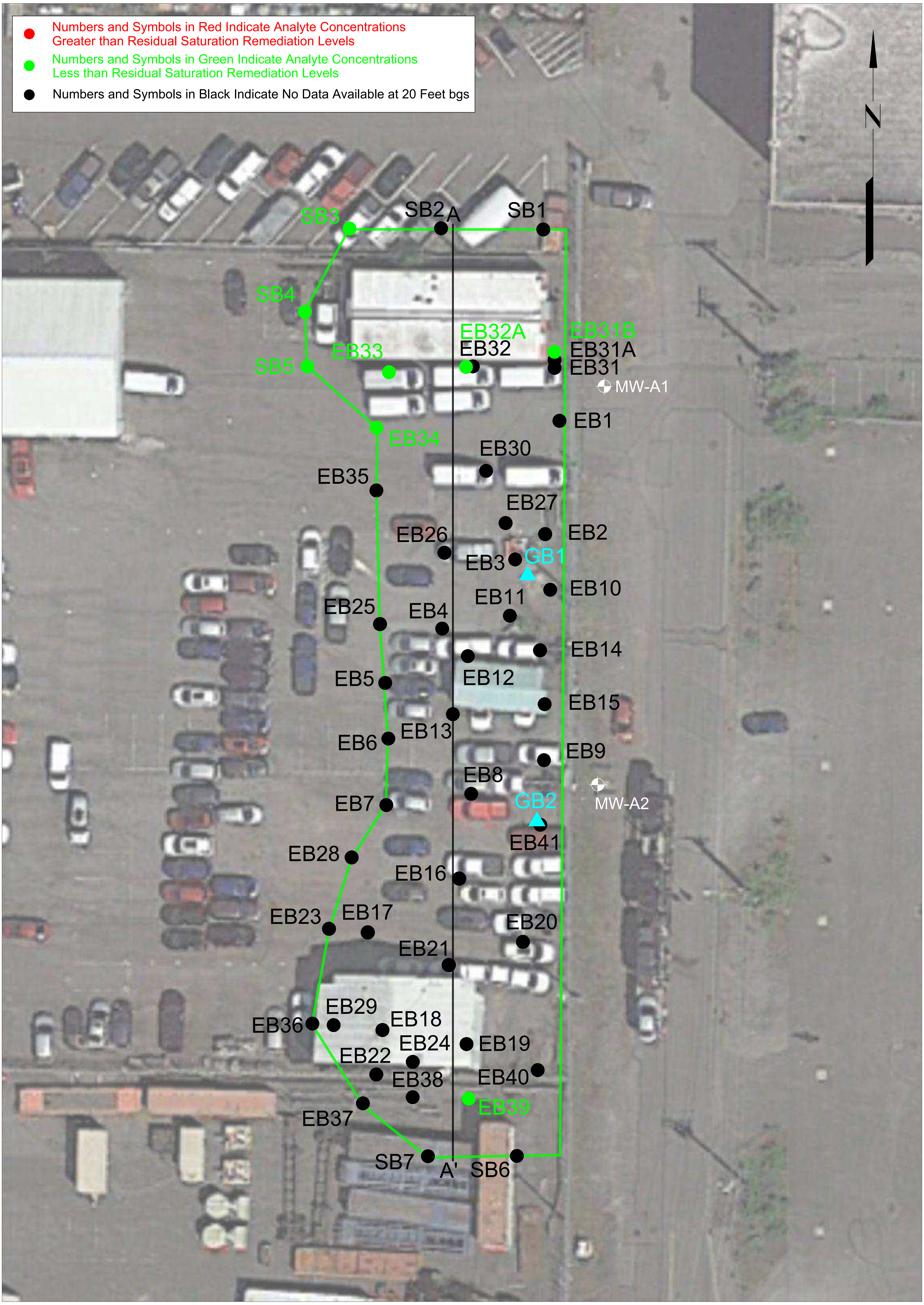
PORT OF EVERETT EXCAVATION DELINEATION MAP - 17.5 FEET BGS

EXXONMOBIL ADC
2717/2731 Federal Avenue
Everett, Washington

PROJECT NO.
031447

PLATE
8

CPA: 03/30/21



FN 0314470002

EXPLANATION

MW-A2
⊕ Groundwater Monitoring Well

GB2
▲ Geotechnical Boring

EB41
○ Excavation Delineation Boring

SB7
○ Step Out Excavation Delineation Boring

— Defined Excavation Extents

BGS = Below Ground Surface

APPROXIMATE SCALE
0 30 60
Feet

Cardno

PORT OF EVERETT EXCAVATION DELINEATION MAP - 20 FEET BGS

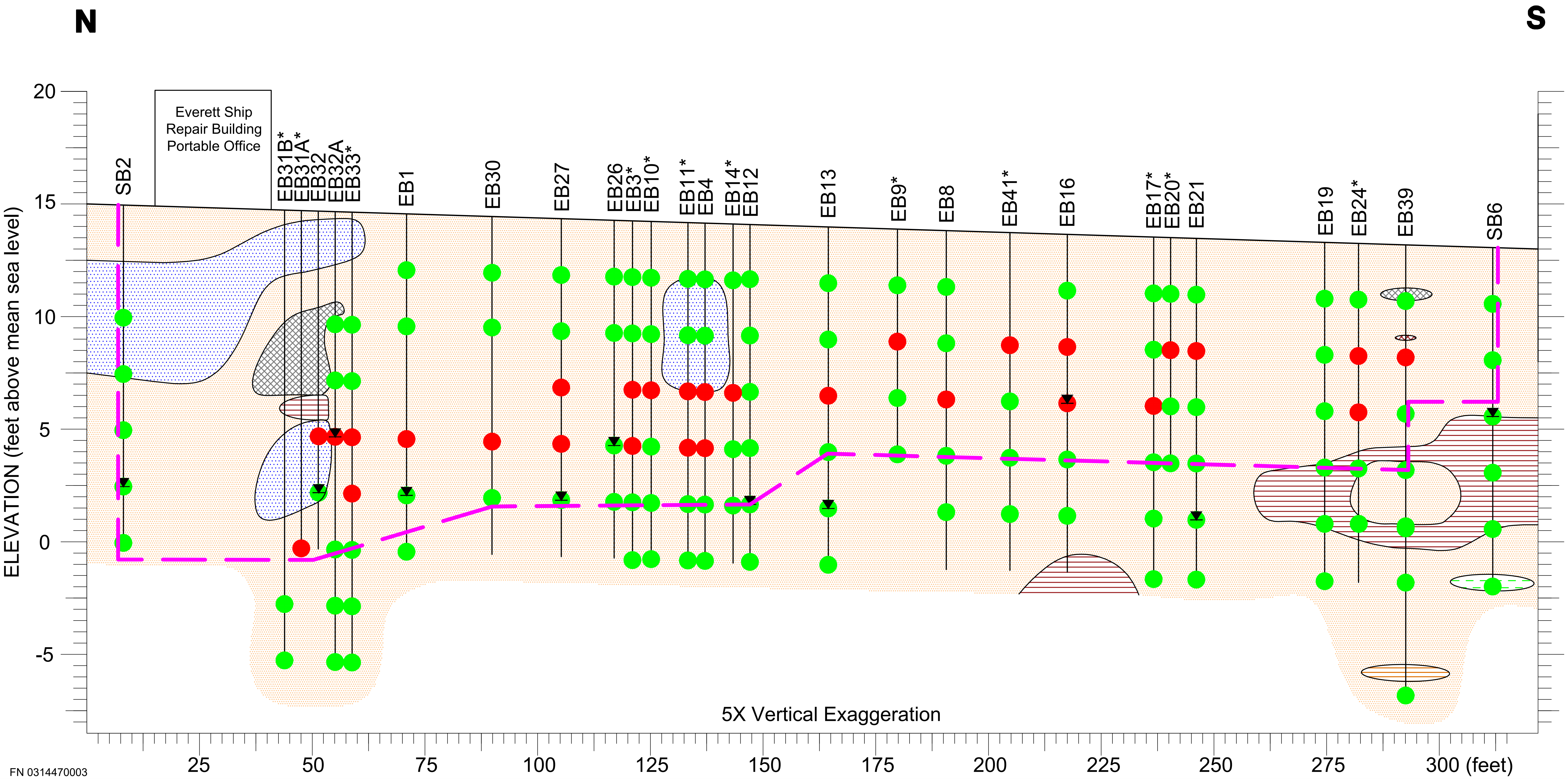
EXXONMOBIL ADC
2717/2731 Federal Avenue
Everett, Washington

PROJECT NO.
031447

PLATE
9

CPA: 03/30/21

* = EB1, EB3, EB9, EB10, EB11, EB14, EB17, EB20, EB24, EB31A, EB31B, EB33, and EB41 are projected onto the cross section for hydrocarbon concentration distribution purposes; projected borings were not used to construct lithology illustration.



FN 0314470003

CROSS SECTION N-S

EXXONMOBIL ADC
2717/2731 Federal Avenue
Everett, Washington

EXPLANATION

- ▼ Water Level Encountered During Drilling
- ● Hydrocarbon Concentrations In Soil Less Than Site-Specific Cleanup Levels
- ● Hydrocarbon Concentrations In Soil Greater Than Site-Specific Cleanup Levels
- ▬ ▬ Proposed Excavation Extents
- ▨ Coarse-grained Gravelly Sediments (GW, GC)
- ▨ Coarse-grained Sandy Sediments (SW, SP, SM, SC)
- ▨ Fine-grained Sediments (CL, CH, ML)
- ▨ Organic Sediments (OH, PT, Wood Debris)
- ▨ Concrete Debris

PROJECT
031447

PLATE
10

CPA: 04/01/21

TABLE 1
EXCAVATION DELINEATION SOIL ANALYTICAL RESULTS

ExxonMobil ADC
2717/2731 Federal Avenue
Everett, Washington
Page 1 of 6

Sample Name	Well ID / Location	Date	Sample Depth (feet bgs)	TPHg (mg/kg)	TPHd (mg/kg)	TPHmo (mg/kg)
S-2.5-EB1	EB1	10/13/20	2.5	<10	<50	<250
S-5-EB1	EB1	10/13/20	5	<10	<50	<250
S-10-EB1	EB1	10/13/20	10	<100	**16,000E**	<250
S-12.5-EB1	EB1	10/13/20	12.5	<50	3,500	<250
S-15-EB1	EB1	10/13/20	15	<10	<50	<250
S-2.5-EB2	EB2	10/13/20	2.5	<10	<50	<250
S-5-EB2	EB2	10/13/20	5	<10	<50	<250
S-10-EB2	EB2	10/13/20	10	<10	<50	<250
S-2.5-EB3	EB3	10/12/20	2.5	<10	<50	<250
S-5-EB3	EB3	10/12/20	5	<10	<50	<250
S-7.5-EB3	EB3	10/12/20	7.5	<100	**43,000**	<250
S-10-EB3	EB3	10/12/20	10	<50	**15,000**	<250
S-12.5-EB3	EB3	10/12/20	12.5	<50	188	<250
S-15-EB3	EB3	10/12/20	15	<10	<50	<250
S-2.5-EB4	EB4	10/12/20	2.5	<10	<50	<250
S-5-EB4	EB4	10/12/20	5	18	4,700	<250
S-7.5-EB4	EB4	10/12/20	7.5	<100	**36,000**	<250
S-10-EB4	EB4	10/12/20	10	<100	**5,500E**	<250
S-12.5-EB4	EB4	10/12/20	12.5	<50	4,400	<250
S-15-EB4	EB4	10/12/20	15	<10	<50	<250
S-2.5-EB5	EB5	10/12/20	2.5	<10	<50	<250
S-5-EB5	EB5	10/12/20	5	<10	<50	<250
S-7.5-EB5	EB5	10/12/20	7.5	<10	<50	<250
S-10-EB5	EB5	10/12/20	10	<10	51	<250
S-2.5-EB6	EB6	10/12/20	2.5	<10	<50	<250
S-5-EB6	EB6	10/12/20	5	<10	<50	<250
S-7.5-EB6	EB6	10/12/20	7.5	<10	<50	<250
S-10-EB6	EB6	10/12/20	10	<10	<50	<250
S-5-EB7	EB7	10/12/20	5	<10	<50	<250
S-7.5-EB7	EB7	10/12/20	7.5	<10	74	<250
S-10-EB7	EB7	10/12/20	10	<10	<50	<250
S-2.5-EB8	EB8	10/14/20	2.5	<10	<50	<250
S-5-EB8	EB8	10/14/20	5	<10	2,600	4,300
S-7.5-EB8	EB8	10/14/20	7.5	<10	**7,400**	**13,000**
S-10-EB8	EB8	10/14/20	10	<20	1,800	1,300
S-12.5-EB8	EB8	10/14/20	12.5	<10	<50	<250
S-2.5-EB9	EB9	10/14/20	2.5	<10	<50	<250
S-5-EB9	EB9	10/14/20	5	<50	2,700	**11,000E**
S-7.5-EB9	EB9	10/14/20	7.5	<10	<50	<250
S-10-EB9	EB9	10/14/20	10	<10	<50	<250
S-2.5-EB10	EB10	10/14/20	2.5	<10	<50	<250
S-5-EB10	EB10	10/14/20	5	<10	<50	<250
S-7.5-EB10	EB10	10/14/20	7.5	<10	**12,000**	<250
S-10-EB10	EB10	10/14/20	10	<10	4,300	<250
S-12.5-EB10	EB10	10/14/20	12.5	<10	<50	<250
S-15-EB10	EB10	10/14/20	15	<10	<50	<250
Site-Specific Cleanup Levels				2,470	4,800	5,810

Continued on Page 2

TABLE 1
EXCAVATION DELINEATION SOIL ANALYTICAL RESULTS

ExxonMobil ADC
2717/2731 Federal Avenue
Everett, Washington
Page 2 of 6

Sample Name	Well ID / Location	Date	Sample Depth (feet bgs)	TPHg (mg/kg)	TPHd (mg/kg)	TPHmo (mg/kg)
S-2.5-EB11	EB11	10/12/20	2.5	<10	<50	550
S-5-EB11	EB11	10/12/20	5	<100	2,400	<250
S-7.5-EB11	EB11	10/12/20	7.5	<100	**44,000**	2,700
S-10-EB11	EB11	10/12/20	10	<100	**11,000**	1,300
S-12.5-EB11	EB11	10/12/20	12.5	<10	370	<250
S-15-EB11	EB11	10/12/20	15	<10	<50	<250
S-2.5-EB12	EB12	10/12/20	2.5	<10	<50	<250
S-5-EB12	EB12	10/12/20	5	<10	160	<250
S-7.5-EB12	EB12	10/12/20	7.5	<10	3,600	<250
S-10-EB12	EB12	10/12/20	10	<100	3,000	<250
S-12.5-EB12	EB12	10/12/20	12.5	<100	2,000	<250
S-15-EB12	EB12	10/12/20	15	<10	460	<250
S-2.5-EB13	EB13	10/14/20	2.5	<10	<50	<250
S-5-EB13	EB13	10/14/20	5	<50	1,400	1,800
S-7.5-EB13	EB13	10/14/20	7.5	190	**11,000**	1,800
S-10-EB13	EB13	10/14/20	10	<10	320	<250
S-12.5-EB13	EB13	10/14/20	12.5	<10	<50	<250
S-15-EB13	EB13	10/14/20	15	<10	<50	<250
S-2.5-EB14	EB14	10/14/20	2.5	<10	<50	<250
S-7.5-EB14	EB14	10/14/20	7.5	<10	**5,000**	**6,900**
S-10-EB14	EB14	10/14/20	10	<10	4,100	1,500
S-12.5-EB14	EB14	10/14/20	12.5	<10	<50	<250
S-2.5-EB15	EB15	10/14/20	2.5	<10	<50	<250
S-5-EB15	EB15	10/14/20	5	<10	1,100	2,000
S-7.5-EB15	EB15	10/14/20	7.5	19	2,200	260
S-10-EB15	EB15	10/14/20	10	<10	<50	<250
S-12.5-EB15	EB15	10/14/20	12.5	<10	<50	<250
S-2.5-EB16	EB16	10/13/20	2.5	<10	<50	<250
S-5-EB16	EB16	10/13/20	5	<100	**4,800**	1,100
S-7.5-EB16	EB16	10/13/20	7.5	<100	**9,700**	3,900
S-10-EB16	EB16	10/13/20	10	<10	170	<250
S-12.5-EB16	EB16	10/13/20	12.5	<10	<50	<250
S-2.5-EB17	EB17	10/13/20	2.5	<10	<50	<250
S-5-EB17	EB17	10/13/20	5	<10	<50	<250
S-7.5-EB17	EB17	10/13/20	7.5	11	**33,000**	<250
S-10-EB17	EB17	10/13/20	10	<50	2,600	<250
S-12.5-EB17	EB17	10/13/20	12.5	<10	<50	<250
S-15-EB17	EB17	10/13/20	15	<10	<50	<250
S-5-EB18	EB18	10/13/20	5	<10	450	210J
S-2.5-EB19	EB19	10/13/20	2.5	<10	<50	<250
S-5-EB19	EB19	10/13/20	5	<50	1,900	360
S-7.5-EB19	EB19	10/13/20	7.5	<50	4,500	760
S-10-EB19	EB19	10/13/20	10	<10	<50	<250
S-12.5-EB19	EB19	10/13/20	12.5	<10	<50	<250
S-15-EB19	EB19	10/13/20	15	<10	<50	<250
S-2.5-EB20	EB20	10/13/20	2.5	<10	170	<250
Site-Specific Cleanup Levels				2,470	4,800	5,810

Continued on Page 3

TABLE 1
EXCAVATION DELINEATION SOIL ANALYTICAL RESULTS
ExxonMobil ADC
2717/2731 Federal Avenue
Everett, Washington
Page 3 of 6

Sample Name	Well ID / Location	Date	Sample Depth (feet bgs)	TPHg (mg/kg)	TPHd (mg/kg)	TPHmo (mg/kg)
S-5-EB20	EB20	10/13/20	5	<10	**8,400**	2,200
S-7.5-EB20	EB20	10/13/20	7.5	<10	180	<250
S-10-EB20	EB20	10/13/20	10	<10	<50	<250
S-2.5-EB21	EB21	10/13/20	2.5	<10	<50	<250
S-5-EB21	EB21	10/13/20	5	<10	**8,100**	**12,000**
S-7.5-EB21	EB21	10/13/20	7.5	<50	3,700	640
S-10-EB21	EB21	10/13/20	10	<10	<50	<250
S-12.5-EB21	EB21	10/13/20	12.5	<10	<50	<250
S-15-EB21	EB21	10/13/20	15	<10	<50	<250
S-5-EB22	EB22	10/13/20	5	<10	<50	<250
S-2.5-EB23	EB23	10/13/20	2.5	<10	<50	<250
S-5-EB23	EB23	10/13/20	5	<10	<50	<250
S-7.5-EB23	EB23	10/13/20	7.5	<10	<50	<250
S-10-EB23	EB23	10/13/20	10	<10	4,100	<250
S-12.5-EB23	EB23	10/13/20	12.5	<10	62	<250
S-2.5-EB24	EB24	10/13/20	2.5	<10	<50	<250
S-5-EB24	EB24	10/13/20	5	<50	<50	**6,300**
S-7.5-EB24	EB24	10/13/20	7.5	<10	**8,100**	1,200
S-10-EB24	EB24	10/13/20	10	<10	2,300	<250
S-12.5-EB24	EB24	10/13/20	12.5	<10	<50	<250
S-2.5-EB25	EB25	10/13/20	2.5	<10	<50	<250
S-5-EB25	EB25	10/13/20	5	<10	<50	<250
S-7.5-EB25	EB25	10/13/20	7.5	<10	<50	<250
S-10-EB25	EB25	10/13/20	10	<10	2,400	860
S-12.5-EB25	EB25	10/13/20	12.5	<10	<50	<250
S-15-EB25	EB25	10/13/20	15	--	<50	<250
S-2.5-EB26	EB26	10/14/20	2.5	<10	<50	<250
S-5-EB26	EB26	10/14/20	5	<10	76	<250
S-10-EB26	EB26	10/14/20	10	<20	1,600	<250
S-12.5-EB26	EB26	10/14/20	12.5	<10	<50	<250
S-2.5-EB27	EB27	10/14/20	2.5	<10	<50	<250
S-5-EB27	EB27	10/14/20	5	<10	<50	<250
S-7.5-EB27	EB27	10/14/20	7.5	<100	**10,000**	**11,000**
S-10-EB27	EB27	10/14/20	10	<100	**9,100E**	<250
S-12.5-EB27	EB27	10/14/20	12.5	<10	<50	<250
S-2.5-EB28	EB28	10/14/20	2.5	<10	<50	<250
S-5-EB28	EB28	10/14/20	5	<10	<50	<250
S-7.5-EB28	EB28	10/14/20	7.5	<10	<50	<250
S-10-EB28	EB28	10/14/20	10	<50	<50	<250
S-2.5-EB29	EB29	10/14/20	2.5	<10	<50	<250
S-5-EB29	EB29	10/14/20	5	<10	<50	<250
S-2.5-EB30	EB30	10/14/20	2.5	<10	<50	<250
S-5-EB30	EB30	10/14/20	5	<10	<50	560
S-10-EB30	EB30	10/14/20	10	<100	**39,000**	<250
S-12.5-EB30	EB30	10/14/20	12.5	<10	<50	<250
S-5-EB31	EB31	01/25/21	5	<10	<50	<250
Site-Specific Cleanup Levels				2,470	4,800	5,810

Continued on Page 4

TABLE 1
EXCAVATION DELINEATION SOIL ANALYTICAL RESULTS

ExxonMobil ADC
2717/2731 Federal Avenue
Everett, Washington
Page 4 of 6

Sample Name	Well ID / Location	Date	Sample Depth (feet bgs)	TPHg (mg/kg)	TPHd (mg/kg)	TPHmo (mg/kg)
S-7.5-EB31	EB31	01/25/21	7.5	<10	<50	<250
S-9.5-EB31	EB31	01/25/21	9.5	<100	3,400	<250
S-15-EB31A	EB31A	01/27/21	15	<100	**7,000E**	<250
S-17.5-EB31B	EB31B	01/27/21	17.5	<10	<50	<250
S-20-EB31B	EB31B	01/27/21	20	<10	<50	<250
S-10-EB32	EB32	01/25/21	10	<10	**6,200**	<250
S-10-EB32[b]	EB32	01/25/21	10	--	**4,700**	<250
S-12.5-EB32	EB32	01/25/21	12.5	<10	410	<250
S-12.5-EB32[b]	EB32	01/25/21	12.5	--	340	<250
S-5-EB32A	EB32A	01/27/21	5	<10	56	<250
S-7.5-EB32A	EB32A	01/27/21	7.5	<25	2,040	290
S-10-EB32A	EB32A	01/27/21	10	<10	**6,100**	<250
S-15-EB32A	EB32A	01/27/21	15	<10	<50	<250
S-17.5-EB32A	EB32A	01/27/21	17.5	<10	<50	<250
S-20-EB32A	EB32A	01/27/21	20	<10	<50	<250
S-5-EB33	EB33	01/25/21	5	<10	<50	<250
S-7.5-EB33	EB33	01/25/21	7.5	<10	<50	<250
S-10-EB33	EB33	01/25/21	10	<40	**28,000**	1,580
S-12.5-EB33	EB33	01/25/21	12.5	<10	**21,000E**	<250
S-15-EB33	EB33	01/25/21	15	<1,000	150	<250
S-17.5-EB33	EB33	01/25/21	17.5	<10	63	<250
S-20-EB33	EB33	01/25/21	20	<10	<50	310
S-7.5-EB34	EB34	01/25/21	7.5	<10	<50	<250
S-10-EB34	EB34	01/25/21	10	<10	2,100	<250
S-12.5-EB34	EB34	01/25/21	12.5	<50	1,600	760
S-15-EB34	EB34	01/25/21	15	<10	<50	<250
S-17.5-EB34	EB34	01/25/21	17.5	<10	<50	<250
S-20-EB34	EB34	01/25/21	20	<10	<50	<250
S-5-EB35	EB35	01/25/21	5	<10	<50	<250
S-7.5-EB35	EB35	01/25/21	7.5	<10	<50	<250
S-10-EB35	EB35	01/25/21	10	<10	<50	<250
S-12.5-EB35	EB35	01/25/21	12.5	<15	520	430
S-15-EB35	EB35	01/25/21	15	<10	<50	<250
S-5-EB36	EB36	01/26/21	5	<10	<50	<250
S-7.5-EB36	EB36	01/26/21	7.5	<10	<50	<250
S-10-EB36	EB36	01/26/21	10	<10	<50	<250
S-12.5-EB36	EB36	01/26/21	12.5	<10	<50	<250
S-5-EB37	EB37	01/27/21	5	<10	<50	<250
S-7.5-EB37	EB37	01/27/21	7.5	<10	<50	<250
S-10-EB37	EB37	01/27/21	10	<10	<50	<250
S-12.5-EB37	EB37	01/27/21	12.5	<10	<50	<250
S-2.5-EB38	EB38	01/27/21	2.5	<10	<50	490
S-5-EB38	EB38	01/27/21	5	<10	<50	<250
S-7.5-EB38	EB38	01/27/21	7.5	<10	<50	<250
S-10-EB38	EB38	01/27/21	10	<10	<50	<250
S-12.5-EB38	EB38	01/27/21	12.5	<10	<50	<250
Site-Specific Cleanup Levels				2,470	4,800	5,810

Continued on Page 6

TABLE 1
EXCAVATION DELINEATION SOIL ANALYTICAL RESULTS

ExxonMobil ADC
2717/2731 Federal Avenue
Everett, Washington
Page 5 of 6

Sample Name	Well ID / Location	Date	Sample Depth (feet bgs)	TPHg (mg/kg)	TPHd (mg/kg)	TPHmo (mg/kg)
S-15-EB38	EB38	01/27/21	15	<10	<50	<250
S-2.5-EB39	EB39	01/27/21	2.5	<10	2,200	<250
S-2.5-EB39[b]	EB39	01/27/21	2.5	<10	--	--
S-5-EB39	EB39	01/27/21	5	<10	**5,600**	<250
S-5-EB39[b]	EB39	01/27/21	5	--	4,500	<250
S-7.5-EB39	EB39	01/27/21	7.5	<50	2,200	<250
S-10-EB39	EB39	01/27/21	10	<10	<50	<250
S-12.5-EB39	EB39	01/27/21	12.5	<10	<50	<250
S-15-EB39	EB39	01/27/21	15	<10	<50	<250
S-20-EB39	EB39	01/27/21	20	<10	<50	<250
S-5-EB40	EB40	01/26/21	5	<10	490[a]	<250
S-7.5-EB40	EB40	01/26/21	7.5	<10	<50	<250
S-10-EB40	EB40	01/26/21	10	<10	<50	<250
S-12.5-EB40	EB40	01/26/21	12.5	<10	<50	<250
S-5-EB41	EB41	01/27/21	5	<15	**9,300**	**6,700**
S-7.5-EB41	EB41	01/27/21	7.5	<10	630	310
S-10-EB41	EB41	01/27/21	10	<10	<50	<250
S-12.5-EB41	EB41	01/27/21	12.5	<10	<50	<250
S-5-SB1	SB1	01/26/21	5	<10	<50	<250
S-7.5-SB1	SB1	01/26/21	7.5	<10	110	660
S-10-SB1	SB1	01/26/21	10	<10	<50	<250
S-12.5-SB1	SB1	01/26/21	12.5	<10	<50	<250
S-15-SB1	SB1	01/26/21	15	<10	<50	<250
S-5-SB2	SB2	01/26/21	5	<10	<50	790
S-7.5-SB2	SB2	01/26/21	7.5	<10	<50	<250
S-10-SB2	SB2	01/26/21	10	<10	<50	<250
S-12.5-SB2	SB2	01/26/21	12.5	<10	<50	<250
S-15-SB2	SB2	01/26/21	15	<10	<50	<250
S-5-SB3	SB3	01/26/21	5	<10	440	2,200
S-7.5-SB3	SB3	01/26/21	7.5	<10	<50	<250
S-10-SB3	SB3	01/26/21	10	<10	130	680
S-12.5-SB3	SB3	01/26/21	12.5	<10	<50	<250
S-15-SB3	SB3	01/26/21	15	<10	<50	<250
S-20-SB3	SB3	01/26/21	20	<10	<50	<250
S-5-SB4	SB4	01/25/21	5	<10	<50	<250
S-7.5-SB4	SB4	01/25/21	7.5	<10	<50	<250
S-10-SB4	SB4	01/25/21	10	<10	3,900	<250
S-12.5-SB4	SB4	01/25/21	12.5	<50	1,700	<250
S-15-SB4	SB4	01/25/21	15	<10	56	<250
S-17.5-SB4	SB4	01/25/21	17.5	<10	<50	<250
S-20-SB4	SB4	01/25/21	20	<20	610	<250
S-5-SB5	SB5	01/26/21	5	<10	<50	1,630
S-7.5-SB5	SB5	01/26/21	7.5	<10	<50	<250
S-10-SB5	SB5	01/26/21	10	<10	<50	760
S-12.5-SB5	SB5	01/26/21	12.5	<10	<50	<250
S-15-SB5	SB5	01/26/21	15	<10	82	580
S-17.5-SB5	SB5	01/26/21	17.5	<10	<50	<250
Site-Specific Cleanup Levels				2,470	4,800	5,810

Continued on Page 7

TABLE 1
EXCAVATION DELINEATION SOIL ANALYTICAL RESULTS

ExxonMobil ADC
2717/2731 Federal Avenue
Everett, Washington
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Sample Name	Well ID / Location	Date	Sample Depth (feet bgs)	TPHg (mg/kg)	TPHd (mg/kg)	TPHmo (mg/kg)
S-20-SB5	SB5	01/26/21	20	<10	<50	<250
S-2.5-SB6	SB6	02/05/21	2.5	<10	2,800	<250
S-5-SB6	SB6	02/05/21	5	<10	57	<250
S-7.5-SB6	SB6	02/05/21	7.5	<10	<50	<250
S-10-SB6	SB6	02/05/21	10	<10	<50	<250
S-12.5-SB6	SB6	02/05/21	12.5	<10	<50	<250
S-15-SB6	SB6	02/05/21	15	<10	<50	<250
S-5-SB7	SB7	02/05/21	5	<10	<50	<250
S-7.5-SB7	SB7	02/05/21	7.5	<10	<50	<250
S-10-SB7	SB7	02/05/21	10	<10	<50	<250
S-12.5-SB7	SB7	02/05/21	12.5	<10	<50	<250
S-15-SB7	SB7	02/05/21	15	<10	<50	<250
Site-Specific Cleanup Levels				2,470	4,800	5,810

EXPLANATION:
feet bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
TPHg = Total Petroleum Hydrocarbons as Gasoline in accordance with Ecology Method NWTPH-Gx
TPHd, TPHmo = Total Petroleum Hydrocarbons as Diesel and as Oil, respectively, in accordance with Ecology Method NWTPH-Dx
< = Less than the stated laboratory reporting limit
-- = Not Analyzed
All samples run with silica gel cleanup
Shaded values equal or exceed Site-Specific Cleanup Levels
a = Indicates light diesel range
b = Sample reanalyzed by laboratory
E = Reported result exceeds the calibration range and is an estimate
J = Indicates analyte was positively identified. Reported result is an estimate.

APPENDIX A
FIELD PROTOCOL

Cardno
Soil Boring and Well Installation
Field Protocol

Preliminary Activities

Prior to the onset of field activities at the site, Cardno obtains the appropriate permit(s) from the governing agency(s). Advance notification is made as required by the agency(s) prior to the start of work. Cardno marks the borehole locations and contacts the local one call utility locating service at least 48 hours prior to the start of work to mark buried utilities. Borehole locations may also be checked for buried utilities by a private geophysical surveyor. Prior to drilling, the borehole location is cleared in accordance with the client's procedures. Fieldwork is conducted under the advisement of a registered professional geologist and in accordance with an updated site-specific safety plan prepared for the project, which is available at the job site during field activities.

Drilling and Soil Sampling Procedures

Cardno contracts a licensed driller to advance the boring and collect soil samples. The specific drilling method (e.g., hollow-stem auger, direct push method, or sonic drilling), sampling method [e.g., core barrel or California-modified split spoon sampler (CMSSS)] and sampling depths are documented on the boring log and may be specified in a work plan. Soil samples are typically collected at the capillary fringe and at 5-foot intervals to the total depth of the boring. To determine the depth of the capillary fringe prior to drilling, the static groundwater level is measured with a water level indicator in the closest monitoring well to the boring location, if available.

The borehole is advanced to just above the desired sampling depth. For CMSSSs, the sampler is placed inside the auger and driven to a depth of 18 inches past the bit of the auger. The sampler is driven into the soil with a standard 140-pound hammer repeatedly dropped from a height of 30 inches onto the sampler. The number of blows required to drive the sampler each 6-inch increment is recorded on the boring log. For core samplers (e.g., direct push), the core is driven 18 inches using the rig apparatus.

Soil samples are preserved in the metal or plastic sleeve used with the CMSSS or core sampler, in glass jars or other manner required by the local regulatory agency (e.g., Environmental Protection Agency Method 5035). Sleeves are removed from the sample barrel, and the lowermost sample sleeve is immediately sealed with Teflon^{TM} tape, capped and labeled. Samples are placed in a cooler chilled to 4° Celsius and transported to a state-certified laboratory. The samples are transferred under chain-of-custody (COC) protocol.

Field Screening Procedures

Cardno places the soil from the middle of the sampling interval into a plastic re-sealable bag. The bag is placed away from direct sunlight for approximately 20 minutes, after which the tip of a photo-ionization detector (PID) or similar device is inserted through the plastic bag to measure organic vapor concentrations in the headspace. The PID measurement is recorded on the boring log. At a minimum, the PID or other device is calibrated on a daily basis in accordance with manufacturer's specifications using a hexane or isobutylene standard. The calibration gas and concentration are recorded on a calibration log. Instruments such as the PID are useful for evaluating relative concentrations of volatilized hydrocarbons, but they do not measure the concentration of petroleum hydrocarbons in the soil matrix with the same precision as laboratory analysis. Cardno trained personnel describe the soil in the bag according to the Unified Soil Classification System and record the description on the boring log, which is included in the final report.

Air Monitoring Procedures

Cardno performs a field evaluation for volatile hydrocarbon concentrations in the breathing zone using a calibrated PID or lower explosive level meter.

Groundwater Sampling

A groundwater sample, if desired, is collected from the boring by using Hydropunch™ sampling technology or installing a well in the borehole. In the case of using Hydropunch™ technology, after collecting the capillary fringe soil sample, the boring is advanced to the top of the soil/groundwater interface and a sampling probe is pushed to approximately 2 feet below the top of the static water level. The probe is opened by partially withdrawing it and thereby exposing the screen. A new or decontaminated bailer is used to collect a water sample from the probe. The water sample is then emptied into laboratory-supplied containers constructed of the correct material and with the correct volume and preservative to comply with the proposed laboratory test. The container is slowly filled with the retrieved water sample until no headspace remains and then promptly sealed with a Teflon-lined cap, checked for the presence of bubbles, labeled, entered onto a COC record and placed in chilled storage at 4° Celsius. Laboratory-supplied trip blanks accompany the water samples as a quality assurance/quality control procedure. Equipment blanks may be collected as required. The samples are kept in chilled storage and transported under COC protocol to a client-approved, state-certified laboratory for analysis.

Backfilling of Soil Boring

If a well is not installed, the boring is backfilled from total depth to approximately 5 feet below ground surface (bgs) with either neat cement or bentonite grout using a tremie pipe. The boring is backfilled from 5 feet bgs to approximately 1 foot bgs with hydrated bentonite chips. The borehole is completed from 1 foot bgs to surface grade with material that best matches existing surface conditions and meets local agency requirements. Site-specific backfilling details are shown on the respective boring log.

Well Construction

A well (if constructed) is completed using materials documented on the boring log or specified in a work plan. The well is constructed with slotted casing across the desired groundwater sampling depth(s) and completed with blank casing to within 6 inches of surface grade. No further construction is conducted on temporary wells. For permanent wells, the annular space of the well is backfilled with Monterey sand from the total depth to approximately 2 feet above the top of the screened casing. A hydrated granular bentonite seal is placed on top of the sand filter pack. Grout may be placed on top of the bentonite seal to the desired depth using a tremie pipe. The well may be completed to surface grade with a 1-foot thick concrete pad. A traffic-rated well vault and locking cap for the well casing may be installed to protect against surface-water infiltration and unauthorized entry. Site-specific well construction details including type of well, well depth, casing diameter, slot size, length of screen interval and sand size are documented on the boring log or specified in the work plan.

Well Development and Sampling

If a permanent groundwater monitoring well is installed, the grout is allowed to cure a minimum of 48 hours before development. Cardno personnel or a contracted driller use a submersible pump or surge block to develop the newly installed well. Prior to development, the pump is decontaminated by allowing it to run and re-circulate while immersed in a non-phosphate solution followed by successive immersions in potable water and de-ionized water baths. The well is developed until sufficient well casing volumes are removed so that turbidity is within allowable limits and pH, conductivity and temperature levels stabilize in the purge water. The volume of groundwater extracted is recorded on a log.

Following development, groundwater within the well is allowed to recharge until at least 80% of the drawdown is recovered. A new or decontaminated bailer is slowly lowered past the air/water interface in the well, and a water sample is collected and checked for the presence of non-aqueous phase liquid, sheen or emulsions. The water sample is then emptied into laboratory-supplied containers as discussed above.

Surveying

If required, wells are surveyed by a licensed land surveyor relative to an established benchmark of known elevation above mean sea level to an accuracy of +/- 0.01 foot. The casing is notched or marked on one side to identify a consistent surveying and measuring point.

Decontamination Procedures

Cardno or the contracted driller decontaminates soil and water sampling equipment between each sampling event with a non-phosphate solution, followed by a minimum of two tap water rinses. De-ionized water may be used for the final rinse. Downhole drilling equipment is steam-cleaned prior to drilling the borehole and at completion of the borehole.

Waste Treatment and Soil Disposal

Soil cuttings generated from the drilling or sampling are stored on site in labeled, Department of Transportation-approved, 55-gallon drums or other appropriate storage container. The soil is removed from the site and transported under manifest to a client- and regulatory-approved facility for recycling or disposal. Decontamination fluids and purge water from well development and sampling activities, if conducted, are stored on site in labeled, regulatory-approved storage containers. Fluids are subsequently transported under manifest to a client- and regulatory-approved facility for disposal or treated with a permitted mobile or fixed-base carbon treatment system.

ExxonMobil ADC
Cardno 03144702.R04

APPENDIX B

LABORATORY ANALYTICAL RESULTS

ExxonMobil ADC

Cardno 03144702.R04

APPENDIX C

USCS & BORING LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM KEY

MAJOR DIVISIONS		LTR	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel sand mixture, little or no fines
		GM	Silty gravels, gravel-sand-clay mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures

MAJOR DIVISIONS		LTR	DESCRIPTION
FINE GRAINED SOILS	SILTS AND CLAYS LL<50	ML	Inorganic silts and very fine-grained sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	SILTS AND CLAYS LL>50	MH	Inorganic silts, micaceous or diatomaceous fine-grained sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils

BLOW COUNTS REPRESENT THE NUMBER OF BLOWS OF A 140- OR 300-POUND HAMMER FALLING 30 INCHES TO DRIVE THE SAMPLER THROUGH EACH 6 INCHES OF PENETRATION.

FN:QuiklogUSCS.dwg

DASHED LINES SEPARATING UNITS ON THE LOG REPRESENT APPROXIMATE BOUNDARIES ONLY. ACTUAL BOUNDARIES MAY BE GRADUAL. LOGS REPRESENT SUBSURFACE CONDITIONS AT THE BORING LOCATION AT THE TIME OF DRILLING ONLY.

Cardno®

UNIFIED SOIL CLASSIFICATION SYSTEM AND LOG OF BORINGS SYMBOL KEY

Cardno

BORING LOG EB1

(Page 1 of 1)

Date Drilled:	: 10/13/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 13' bgs

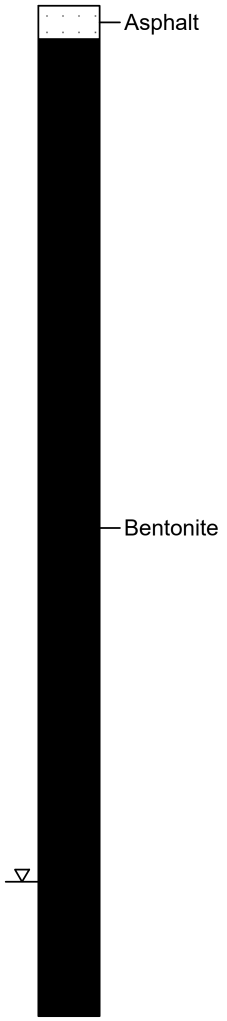
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB1

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.0	▨			SAND: fine- to medium-grained, light brown, dry, rounded, poorly graded, thin lamina; trace fine gravel; 100% recovery (0/0/95/5)
5			■			100% recovery (0/0/100/0)
		0.7	▨			
			☒			no recovery
			■		SP	
10			■			100% recovery (0/0/95/5)
		9.0	▨			
			■			gray, wet; 100% recovery
		18.6	▨			
			■			100% recovery
15		0.0	▨			
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB2

(Page 1 of 1)

Date Drilled: : 10/13/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 10' bgs
First GW Depth: : N/A

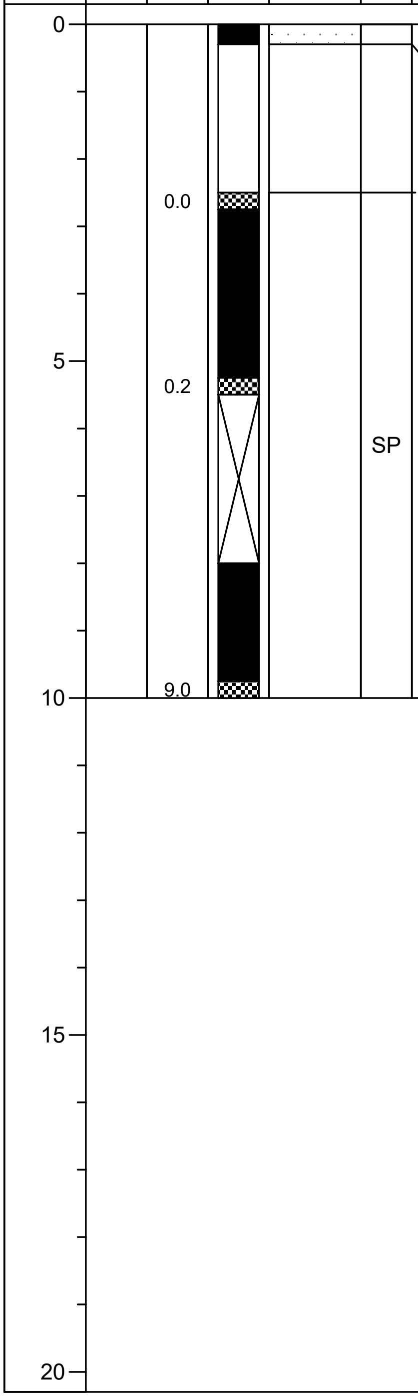
Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▨ Preserved Sample

Water Levels
▼ After Completion
▽ During Drilling

Boring: EB2

Depth (ft) | Blow Count | OVM/PID (ppmv) | Sample | Column | USCS | DESCRIPTION (%clay/silt/sand/gravel)



3" Asphalt

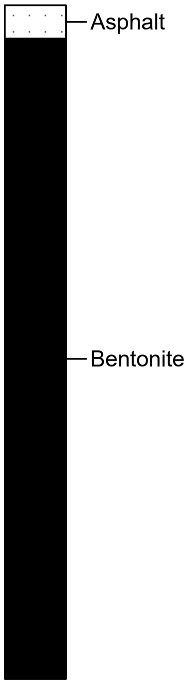
Borehole was not logged from 3 inches bgs to 2.5 feet bgs.

SAND: fine- to medium-grained, gray, dry, rounded, poorly graded, thin lamina; trace fine gravel; 100% recovery (0/0/95/5)

100% recovery

no recovery

brown, damp; 100% recovery (0/0/95/5)



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB3

(Page 1 of 1)

Date Drilled: : 10/12/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : N/A

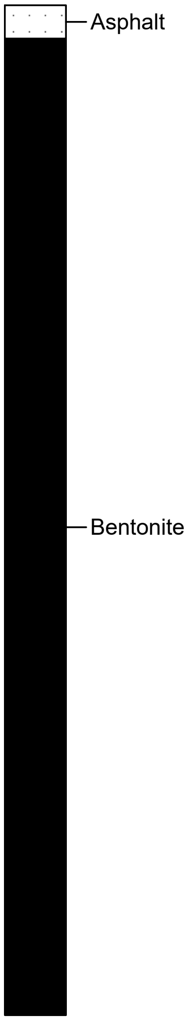
Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Paul Prevou
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▩ Preserved Sample

Water Levels
▼ After Completion
▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0						3" Asphalt
						Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
					SP	SAND: fine- to medium-grained, gray brown, dry; fine to coarse gravel, subangular; 40% recovery (0/10/50/40)
5					ML	SILT: dark brown to olive gray, damp, fine gravel, subangular; 50% recovery (0/90/0/10)
					SW	SAND: fine- to coarse-grained, dark brown, moist; trace silt; 60% recovery (0/5/95/0)
10						100% recovery
						100% recovery
15						100% recovery (0/5/90/5)
20						

Boring: EB3



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Note: PID unavailable for use during fieldwork on 10/12/20.

BORING LOG EB4

(Page 1 of 1)

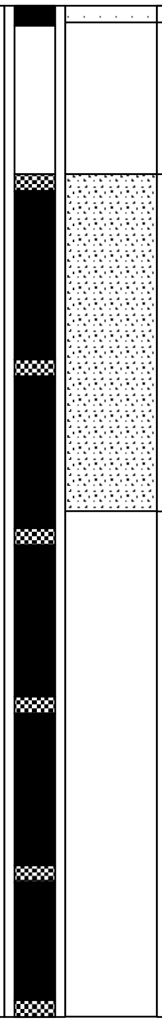
Date Drilled: : 10/12/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : 10' bgs

Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Paul Prevou
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

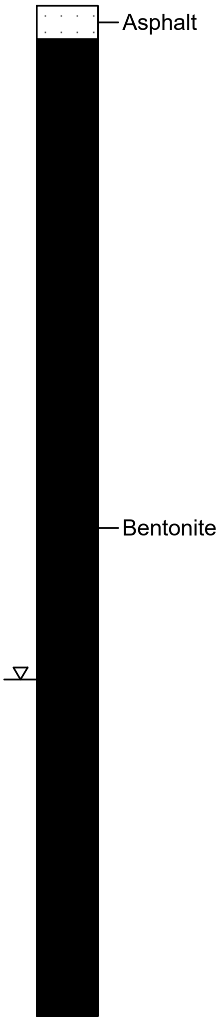
Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▨ Preserved Sample

Water Levels
▼ After Completion
▽ During Drilling

Boring: EB4



Depth (ft)	Blow Count	OVM/PID (ppmv)	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0				3" Asphalt
				Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
5			GP	GRAVEL with Sand: fine to coarse gravel, subrounded; medium- to coarse-grained sand, brown, damp; trace silt; 75% recovery (0/5/45/50)
			SP	SAND with Gravel: medium- to coarse-grained, dark brown, damp, poorly graded; fine to coarse gravel, subrounded, poorly graded; trace silt and silty clasts; 50% recovery (0/5/75/20)
10				black to dark gray, wet; gravel subangular; no silty clasts; 50% recovery (0/5/85/10)
				100% recovery
15				100% recovery
20				



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Note: PID unavailable for use during fieldwork on 10/12/20.

BORING LOG EB5

(Page 1 of 1)

Date Drilled:	: 10/12/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 10' bgs
First GW Depth:	: N/A

Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

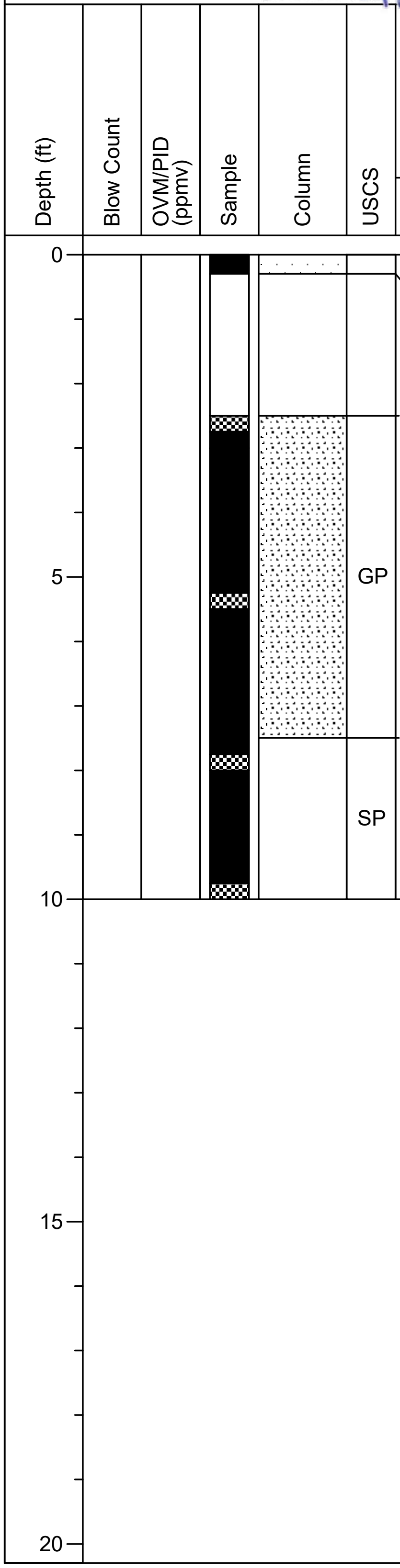
Sample Condition

☒ No Recovery
☐ Sampled Interval
■ Described Sample
▨ Preserved Sample

Water Levels

▼ After Completion
▽ During Drilling

Boring: EB5



DESCRIPTION (%clay/silt/sand/gravel)

3" Asphalt

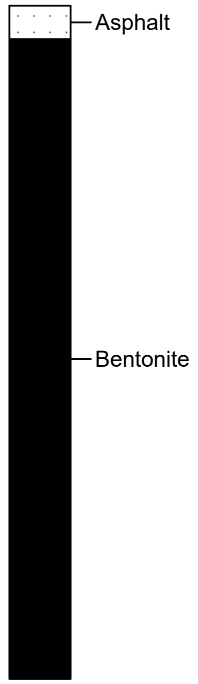
Borehole was not logged from 3 inches bgs to 2.5 feet bgs.

GRAVEL with Sand: fine to coarse gravel, subrounded to subangular; fine- to coarse-grained sand, light gray, dry, well graded; trace silt; 80% recovery (0/5/40/55)

well graded sand, occasional silty clasts; 80% recovery (0/5/30/65)

SAND with Gravel: medium- to coarse-grained, gray, dry, poorly graded; fine to coarse gravel, subangular to subrounded, well graded; trace silt; 80% recovery (0/5/70/25)

100% recovery



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Note: PID unavailable for use during fieldwork on 10/12/20.

Cardno

BORING LOG EB6

(Page 1 of 1)

Date Drilled:	: 10/12/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 10' bgs
First GW Depth:	: N/A

Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

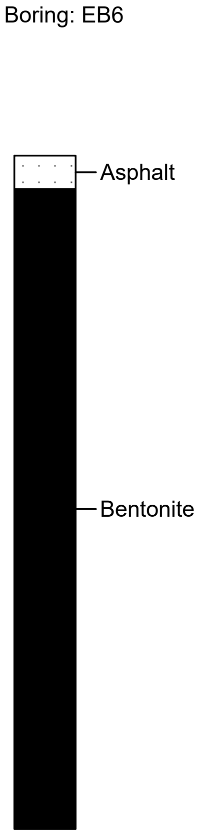
Sample Condition

- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels

- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
			▩ ■			GRAVEL with Sand: fine to coarse gravel, subangular to subrounded; fine- to coarse-grained sand, light gray, dry, well graded; trace silt; 60% recovery (0/5/40/55)
5			▩ ■		GW	gray, well graded sand; trace silty clasts; 80% recovery (0/5/30/65)
			▩ ■		SP	SAND with Gravel: medium- to coarse-grained, gray, damp, poorly graded; fine to coarse gravel, subangular to subrounded; trace silt; 80% recovery (0/5/75/20)
10			▩			100% recovery (0/5/75/20)



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Note: PID unavailable for use during fieldwork on 10/12/20.

15

20

BORING LOG EB7

(Page 1 of 1)

Date Drilled: : 10/12/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 10' bgs
First GW Depth: : N/A

Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Paul Prevou
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

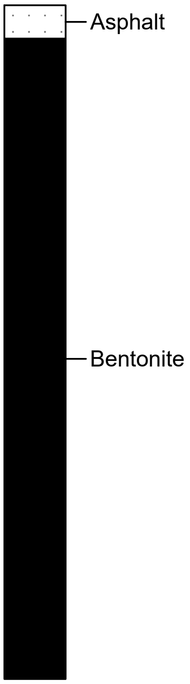
Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☒			Boring was not logged from 3 inches bgs to 5 feet bgs. No recovery
5			■ ▨		GW	GRAVEL with Sand: fine to coarse gravel, subrounded to subangular, well graded; fine- to coarse-grained sand, light brown, dry, well graded; trace silty clasts; 30% recovery (0/5/30/65)
			■ ▨		ML	SILT: olive brown, damp, well consolidated; 30% recovery (0/100/0/0)
10			■ ▨		SP	SAND: medium- to coarse-grained, damp, poorly graded, non-plastic; trace fine gravel, subangular; 80% recovery (0/5/90/5)
15						
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Note: PID unavailable for use during field work on 10/12/20.

Boring: EB7



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BORING LOG EB8

(Page 1 of 1)

Date Drilled:	: 10/14/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: N/A

Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition

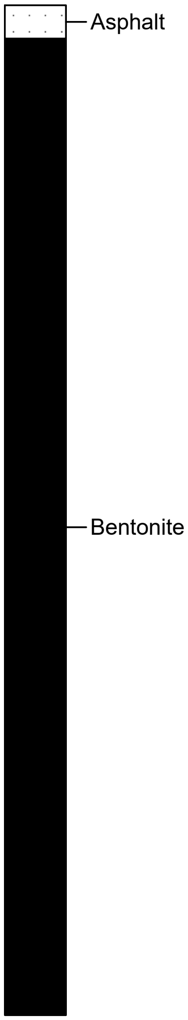
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels

- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.1	▨			SAND: coarse-grained, light gray, dry, poorly graded, medium bed; trace fine gravel; 100% recovery (0/0/95/5)
5			■			100% recovery
		12.9	▨			
			■			light brown, no gravel; 100% recovery (0/0/100/0)
		10.4	▨			
			■		SP	
10			■			moist; 100% recovery
		13.7	▨			
			■			100% recovery (0/0/100/0)
		0.1	▨			
			■			100% recovery
15		6.5	☐			
20						

Boring: EB8



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB9

(Page 1 of 1)

Date Drilled: : 10/14/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 10' bgs
First GW Depth: : N/A

Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▩ Preserved Sample

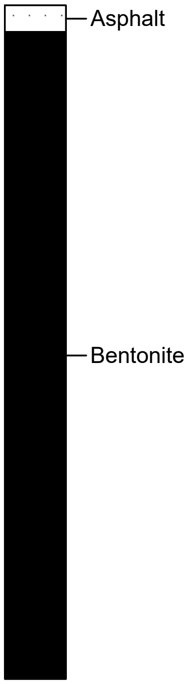
Water Levels
▼ After Completion
▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.0	▩		SP	SAND: coarse-grained, gray, dry, rounded, poorly graded, thin bed; trace fine gravel; 100% recovery (0/0/95/5)
5			■			100% recovery
		44.0	▩			
		2.0	▩			no gravel; 100% recovery (0/0/100/0)
10		0.3	▩		CH	CLAY: wood debris; 100% recovery (100/0/0/0)
15						
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Boring: EB9



BORING LOG EB10

(Page 1 of 1)

Date Drilled:	: 10/14/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 7.5' bgs

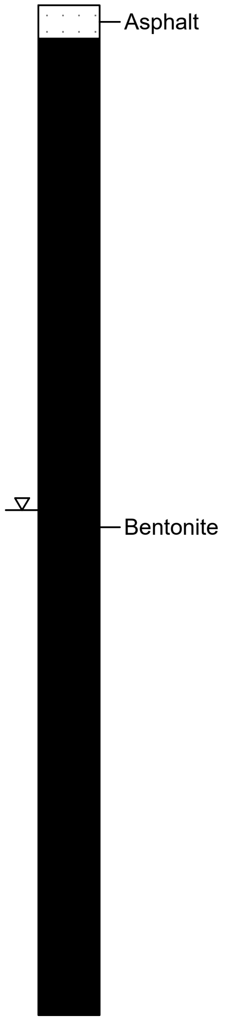
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB10

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.0	▨		SP	SAND: coarse-grained, brown, dry, rounded, poorly graded, thin bed; fine gravel; 100% recovery (0/0/90/10)
5		2.2	▨			100% recovery
		100.5	▨			dark brown, wet; 100% recovery
10		73.5	▨			100% recovery
		2.1	▨			100% recovery
15		2.6	▨			100% recovery
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB11

(Page 1 of 1)

Date Drilled: : 10/12/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : 7.5' bgs

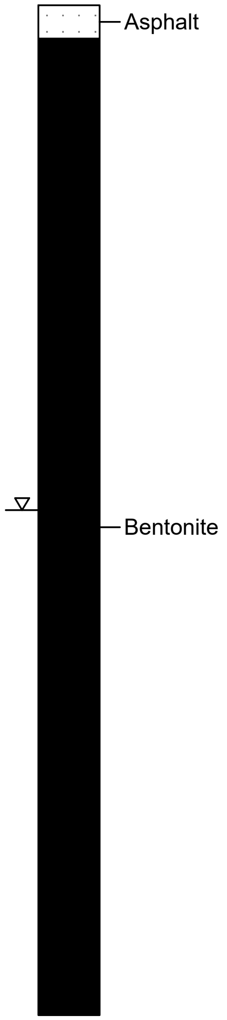
Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Paul Prevou
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB11

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
			▨ ■		SW	SAND with Gravel: fine- to coarse-grained, dark brown, damp, well graded; fine to coarse gravel, subangular to angular, well graded; 60% recovery (0/10/50/40)
			■		ML	SILT: moist, reduced organic material; 100% recovery (0/100/0/0)
5			▨ ■		SP	SAND: medium- to coarse-grained, light brown, damp, poorly graded; trace silt; 60% recovery (0/5/95/0)
			▨ ■			gray, wet, NAPL observed; 100% recovery
10			▨ ■			NAPL observed; 100% recovery
			▨ ■			NAPL observed; 100% recovery
15			▨			no NAPL; 100% recovery
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Note: PID unavailable for use during fieldwork on 10/12/20.

Cardno

BORING LOG EB12

(Page 1 of 1)

Date Drilled:	: 10/12/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 12.5' bgs

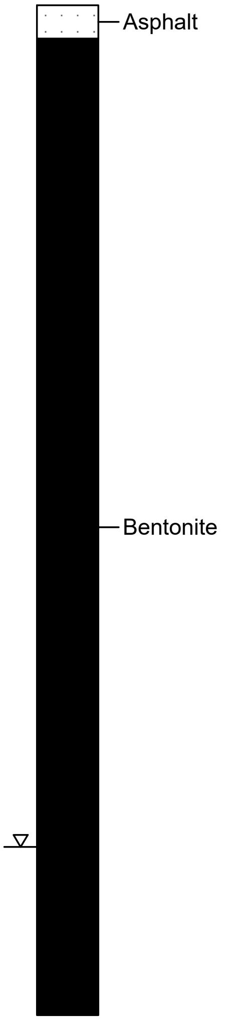
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB12

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0						3" Asphalt
						Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
					SW	SAND with Gravel: fine- to coarse-grained, gray brown, damp, well graded; fine to coarse gravel, subangular to subrounded, well graded; 60% recovery (0/5/55/40)
5					SP	SAND: fine- to coarse-grained, mostly medium- to coarse-grained, brown, damp, poorly graded; trace silt; 60% recovery (0/5/95/0)
						fine- to medium-grained, dark brown; trace silt; 100% recovery (0/5/95/0)
10						coarse-grained, gray, moist, poorly graded; 100% recovery
						NAPL observed, wet; 100% recovery
15						fine gravel, subrounded; 100% recovery (0/5/85/10)
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Note: PID unavailable for use during fieldwork on 10/12/20.

BORING LOG EB13

(Page 1 of 1)

Date Drilled:	: 10/14/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 12.5' bgs

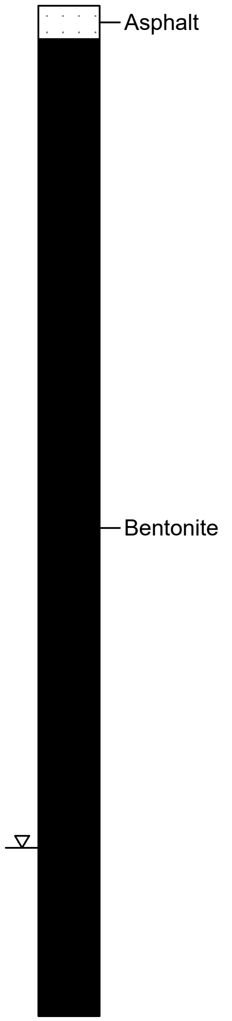
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- □ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			□			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.6	▨		SP	SAND: coarse-grained, gray brown, dry, rounded, poorly graded; fine gravel; thin bed; 100% recovery (0/0/90/10)
5		17.8	▨			100% recovery
		212.5	▨			damp; 100% recovery
10		112.3	▨			100% recovery
		8.4	▨			wet, 100% recovery
15		0.7	▨			100% recovery
20						

Boring: EB13



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB14

(Page 1 of 1)

Date Drilled: : 10/14/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : N/A

Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

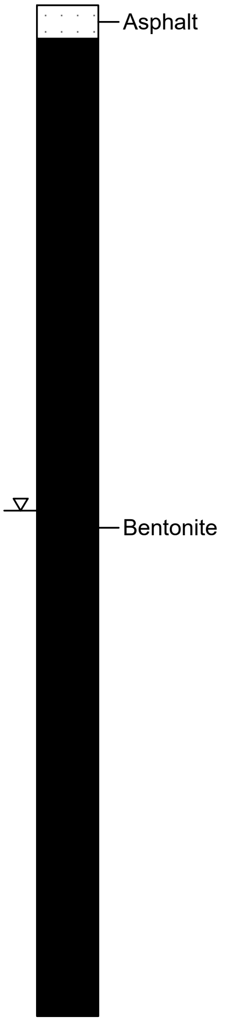
Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.0	▨ ■			SAND: coarse-grained, gray, dry, rounded, poorly graded, thin bed; trace fine gravel; 100% recovery (0/0/95/5)
5			☒			No recovery
		98.3	▨ ■		SP	brown, wet; 100% recovery
10		160.3	▨ ■			100% recovery
		4.5	▨ ■			100% recovery
15		0.5	☐			100% recovery
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Boring: EB14



BORING LOG EB15

(Page 1 of 1)

Date Drilled:	: 10/14/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 12.5' bgs

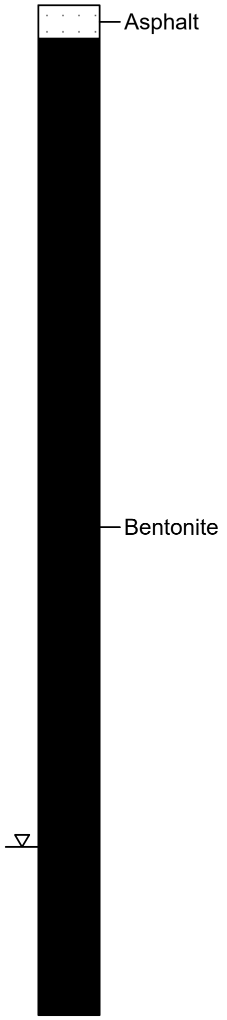
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB15

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.1	▨			SAND with Gravel: coarse-grained, dark gray, dry, rounded, poorly graded, thin bed; fine gravel; 100% recovery (0/0/80/20)
5			■		SP	
		22.0	▨			100% recovery
		174.0	▨			SAND: coarse-grained, dark gray, damp, rounded, poorly graded, thin bed; 100% recovery (0/0/100/0)
10		6.0	▨			100% recovery
			■		SP	
		3.4	▨			wet, 100% recovery
15		0.9	☐			100% recovery
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB16

(Page 1 of 1)

Date Drilled:	: 10/13/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 7.5' bgs

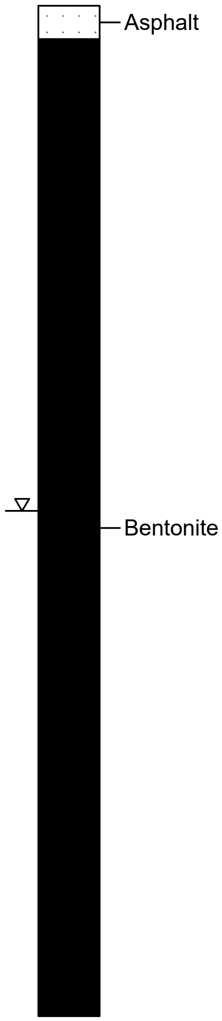
Project No.:	: 031447
Site:	: ExxonMobil/ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB16

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.3	▨ ■		SP	SAND: coarse-grained, gray, damp, rounded, poorly graded, thin bed; trace fine gravel; 100% recovery (0/0/95/5)
5		18.3	▨ ■		SC	Clayey SAND: coarse-grained, gray, damp, poorly graded, low plasticity; thin bed; wood debris; 100% recovery (25/0/75/0)
		72.9	▨ ■		SP	SAND: coarse-grained, gray, wet, rounded, poorly graded, thin bed; 100% recovery (0/0/100/0)
10		15.1	▨ ■			100% recovery
		0.0	▨ ■			100% recovery
		1.3	☐	■	OH	CLAY: 100% recovery (100/0/0/0)
15						
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB17

(Page 1 of 1)

Date Drilled: : 10/13/2020
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : 12.5' bgs

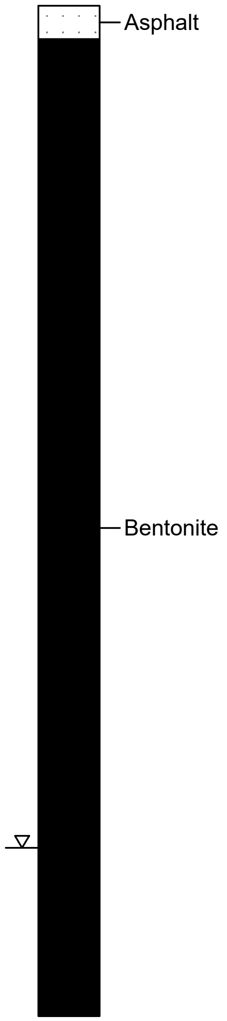
Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB17

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.1	▨		SP	SAND with Gravel: medium- to coarse-grained, gray, dry, rounded, poorly graded, thin lamina; trace fine gravel; 100% recovery (0/0/95/5)
5		0.4	▨			100% recovery
		35.6	▨			moist, medium bed; 100% recovery
10		11.6	▨			100% recovery
		0.2	▨			wet; 100% recovery
15		0.5	▨			100% recovery
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB18

(Page 1 of 1)

Date Drilled:	: 10/13/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 4.5' bgs
First GW Depth:	: N/A

Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

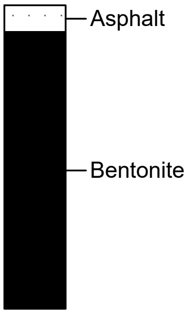
Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB18

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.0	■		SW	SAND: coarse-grained, medium brown, dry, moderately graded, thin lamina; fine gravel; 100% recovery (0/0/85/15)
		2.2	▨			dark brown; refusal at 4.5' bgs; 100% recovery
5						
10						
15						
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips



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BORING LOG EB19

(Page 1 of 1)

Date Drilled: : 10/13/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : N/A

Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

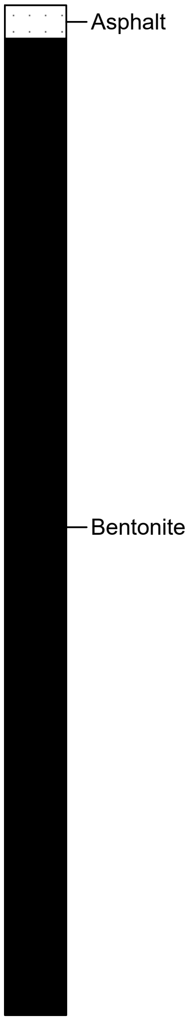
Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		7.0	▨		SP	SAND: coarse-grained, gray, damp, rounded, poorly graded, thin bed; 100% recovery (0/0/100/0)
5		95.7	▨			100% recovery
		77.2	▨			100% recovery
10		0.6	▨		PT	PEAT: reduced organics
		0.4	▨		SP	SAND: coarse-grained, gray, damp, poorly graded; thin bed, trace wood debris; 100% recovery (0/0/100/0)
15		52.3	▨			100% recovery
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Boring: EB19



BORING LOG EB20

(Page 1 of 1)

Date Drilled: : 10/13/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 10' bgs
First GW Depth: : N/A

Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

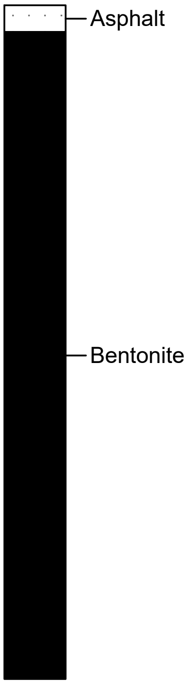
Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		2.7	▩		SP	SAND: coarse-grained, gray, damp, rounded, poorly graded, thin bed; trace gravel; 100% recovery (0/0/95/5)
5		53.4	▩			brown; 100% recovery
		3.7	▩			100% recovery
10		0.0	▩	■	OH	CLAY: organic; wood debris; 100% recovery (100/0/0/0)

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Boring: EB20



BORING LOG EB21

(Page 1 of 1)

Date Drilled:	: 10/13/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 12.5' bgs

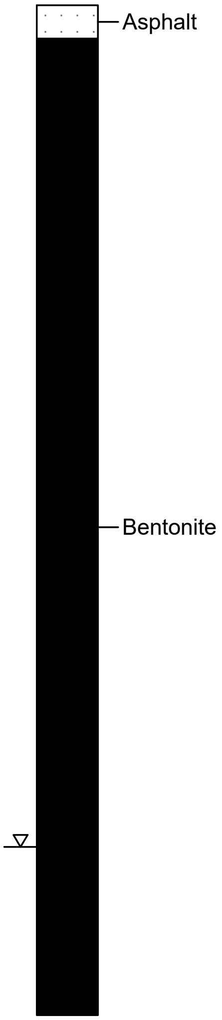
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB21

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.3	▨			SAND: coarse-grained, gray, dry, rounded, moderately graded, thin bed; fine gravel; 100% recovery (0/0/95/5)
5		54.5	▨			light brown; no gravel; trace wood debris; 100% recovery
		46.5	▨			damp; 100% recovery
					SP	
10		0.9	▨			100% recovery
		0.1	▨			wet; 100% recovery
15		0.0	▨			100% recovery
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB22

(Page 1 of 1)

Project No.:	031447
Site:	ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	Brett McLees
Reviewed By:	Keri Chappell, L.G. 2719
Signature:	Keri Chappell

Date Drilled:	10/13/20
Drilling Co.:	Holocene Drilling, Inc.
Drilling Method:	Push Probe
Sampling Method:	Dual Tube
Borehole Diameter:	3"
Casing Diameter:	N/A
Latitude	N/A
Longitude	N/A
Total Depth:	5' bgs
First GW Depth:	N/A

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

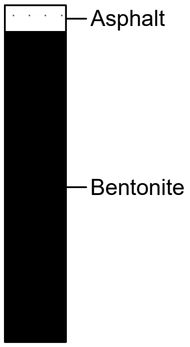
Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.0	☐ ■		SP	SAND: coarse-grained, brown, damp, rounded, poorly graded, lamina; 100% recovery (0/0/100/0)
5		1.0	▨			Refusal at 5' bgs; 100% recovery
10						
15						
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Boring: EB22



BORING LOG EB23

(Page 1 of 1)

Date Drilled: : 10/14/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : N/A

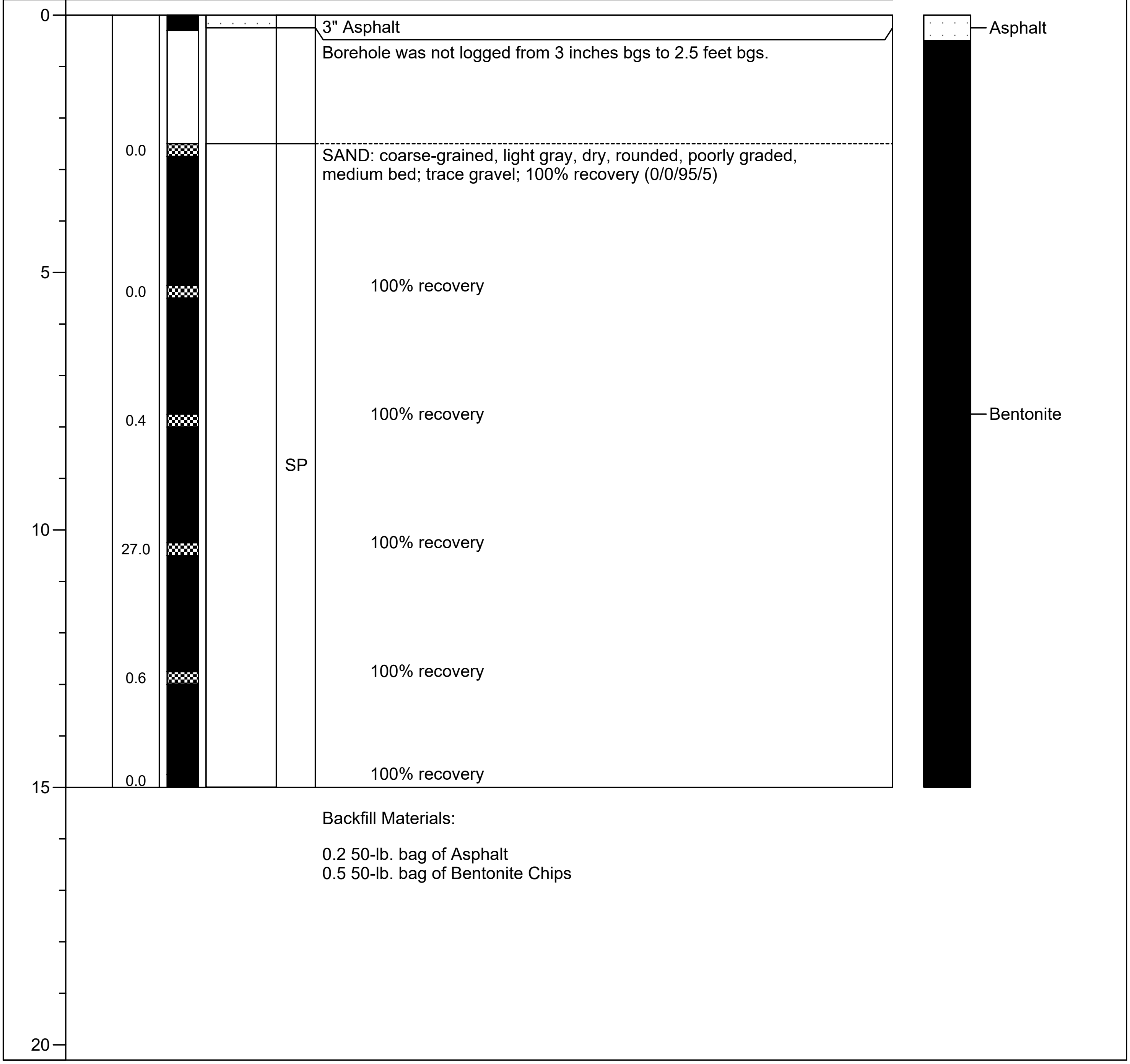
Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▨ Preserved Sample

Water Levels
▼ After Completion
▽ During Drilling

Boring: EB23

Depth (ft) | Blow Count | OVM/PID (ppmv) | Sample | Column | USCS | DESCRIPTION (%clay/silt/sand/gravel)



3" Asphalt

Borehole was not logged from 3 inches bgs to 2.5 feet bgs.

SAND: coarse-grained, light gray, dry, rounded, poorly graded, medium bed; trace gravel; 100% recovery (0/0/95/5)

100% recovery

100% recovery

100% recovery

100% recovery

100% recovery

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB24

(Page 1 of 1)

Date Drilled:	: 10/13/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 12.5' bgs

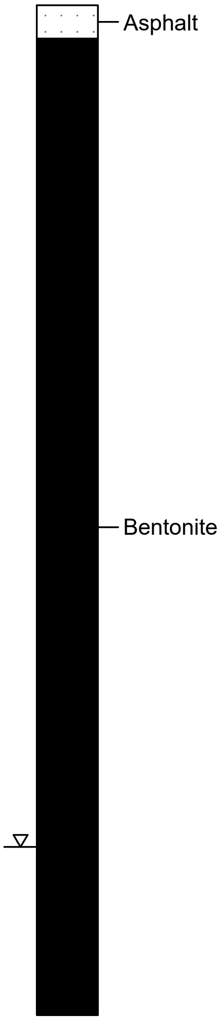
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.0	▩		SP	SAND: coarse-grained, gray, damp, rounded, poorly graded, thin bed; 100% recovery (0/0/100/0)
5		2.7	▩			brown; 100% recovery
		46.0	▩			100% recovery
10		33.4	▩			100% recovery
		0.2	▩			wet; 100% recovery
15		0.0	■			100% recovery
20						

Boring: EB24



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB25

(Page 1 of 1)

Date Drilled:	: 10/14/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 12.5' bgs

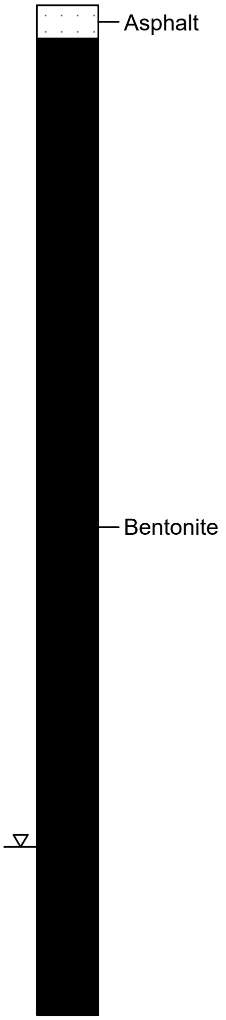
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.0	▩		SP	SAND: coarse-grained, gray, dry, poorly graded, medium bed; trace fine gravel; 100% recovery (0/0/90/10)
5		0.2	▩			100% recovery
		0.5	▩			no gravel; 100% recovery (0/0/100/0)
10		50.4	▩			gray brown; 100% recovery
		0.3	▩			wet; 100% recovery
15		0.2	▩			100% recovery
20						

Boring: EB25



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB26

(Page 1 of 1)

Date Drilled: : 10/14/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : 10' bgs

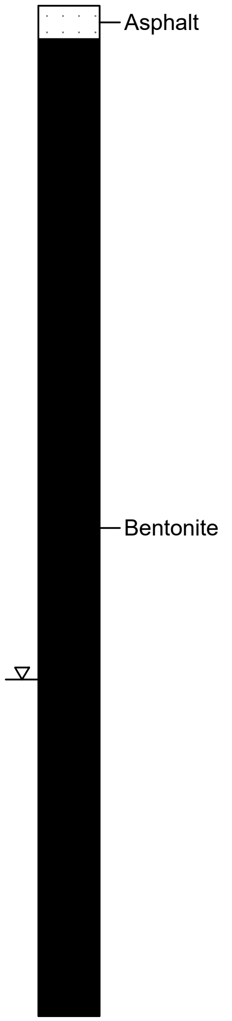
Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB26

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			5" Asphalt
			☐			Borehole was not logged from 5 inches bgs to 2.5 feet bgs.
		0.0	▨ ■		SP	SAND: coarse-grained, gray, dry, rounded, poorly graded, thin bed; trace fine gravel; 100% recovery (0/0/95/5)
5		6.6	▨			100% recovery
			☒			No recovery
10		85.7	▨ ■			wet; 100% recovery (0/0/95/5)
		0.8	▨ ■			no gravel; 100% recovery (0/0/100/0)
15						100% recovery
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

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BORING LOG EB27

(Page 1 of 1)

Date Drilled: : 10/14/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : 12.5' bgs

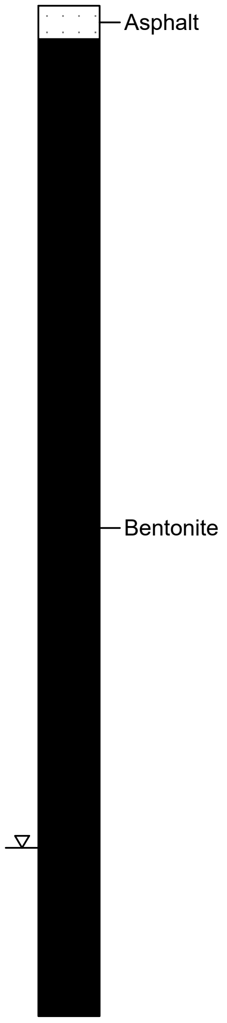
Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB27

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.1	▨			SAND: coarse-grained, dark brown, dry, rounded, poorly graded, thin bed; fine gravel; 100% recovery (0/0/85/15)
5		0.7	▨			100% recovery
		52.3	▨			damp; 100% recovery
					SP	
10		58.8	▨			100% recovery
		1.6	▨			wet; 100% recovery
15		0.2	■			100% recovery
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB28

(Page 1 of 1)

Date Drilled: : 10/14/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : N/A

Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▨ Preserved Sample

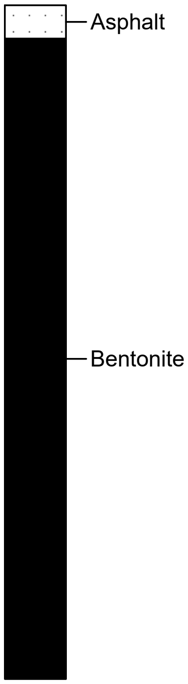
Water Levels
▼ After Completion
▽ During Drilling

Boring: EB28

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.3	▨		SP	SAND: coarse-grained, gray, dry, rounded, very poorly graded, thin bed; trace fine gravel; 100% recovery (0/0/95/5)
5		0.6	▨			100% recovery
		0.2	▨			damp; 100% recovery
10		0.6	▨			100% recovery
15						
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips



BORING LOG EB29

(Page 1 of 1)

Date Drilled: : 10/14/20
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 5' bgs
First GW Depth: : N/A

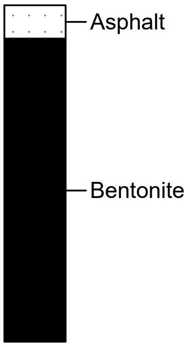
Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB29

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			☐			Borehole was not logged from 3 inches bgs to 2.5 feet bgs.
		0.1	▨ ■		SP	SAND: coarse-grained, brown, dry, poorly graded, thin bed; fine gravel; 100% recovery (0/0/90/10)
5		0.3	▨			refusal at 5' bgs; 100% recovery
10						
15						
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB30

(Page 1 of 1)

Date Drilled:	: 10/14/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: N/A

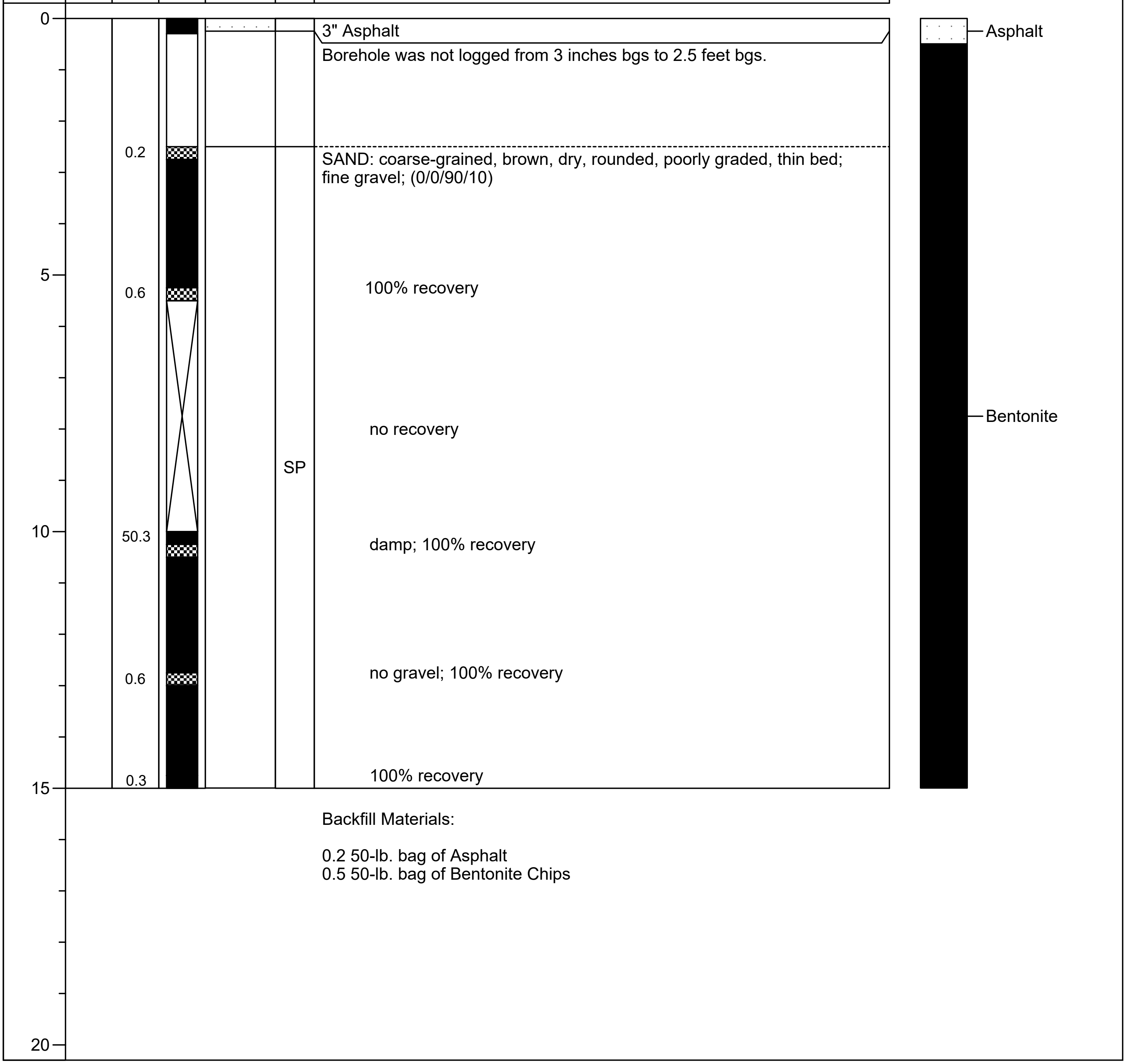
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Brett McLees
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB30

Depth (ft) | Blow Count | OVM/PID (ppmv) | Sample | Column | USCS | DESCRIPTION (%clay/silt/sand/gravel)



3" Asphalt

Borehole was not logged from 3 inches bgs to 2.5 feet bgs.

SAND: coarse-grained, brown, dry, rounded, poorly graded, thin bed; fine gravel; (0/0/90/10)

100% recovery

no recovery

damp; 100% recovery

no gravel; 100% recovery

100% recovery

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Cardno

BORING LOG EB31

(Page 1 of 1)

Date Drilled:	: 01/25/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 9.5' bgs
First GW Depth:	: N/A

Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

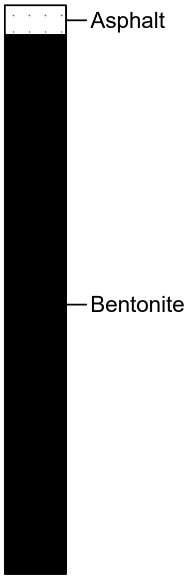
Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0						6" Asphalt
						Debris backfill
		0.0			SW	SAND with Gravel: fine- to coarse-grained, gray brown, moist, well graded; fine to coarse gravel, angular to subangular; 50% recovery (0/5/55/40)
5		0.1				50% recovery
						Wood debris; 100% recovery
		0.0			SP	SAND with Gravel: medium- to coarse-grained, brown, moist, poorly graded; fine to coarse gravel, subrounded; 75% recovery (0/10/70/20)
		18.1			SP	SAND: coarse-grained, gray, damp, poorly graded; 100% recovery (0/5/95/0)
10						refusal at 9.5' bgs; 60% recovery
15						
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Boring: EB31



Cardno

BORING LOG EB31A

(Page 1 of 1)

Date Drilled:	: 01/27/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 15' bgs

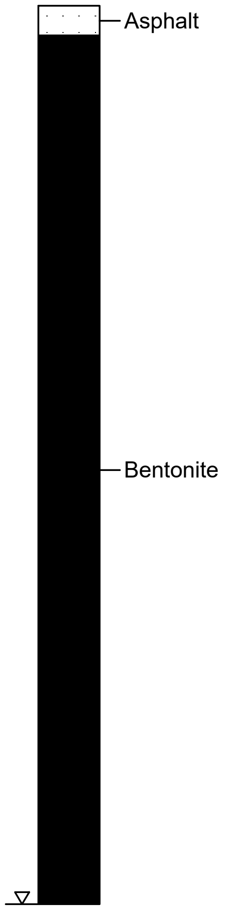
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB31A

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			6" Asphalt
			☐			Borehole was not logged from 6 inches bgs to 10 feet bgs.
5						
10			☒			
			■		SP	SAND: medium- to coarse-grained, gray, wet, poorly to moderately graded; fine gravel, angular to subangular; 40% recovery (0/5/90/5)
15		13.1	▨			▽
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Cardno

BORING LOG EB31B

(Page 1 of 1)

Date Drilled:	: 01/27/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 20' bgs
First GW Depth:	: 17.5' bgs

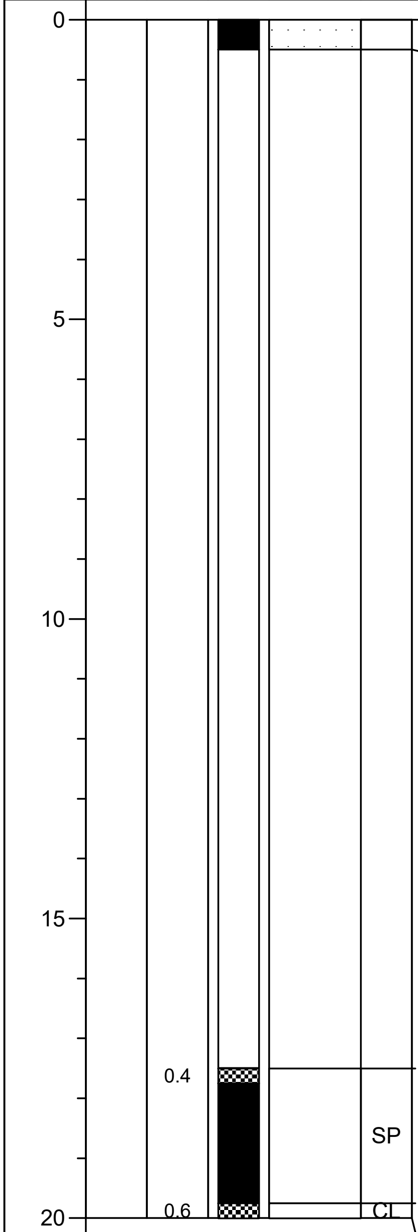
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

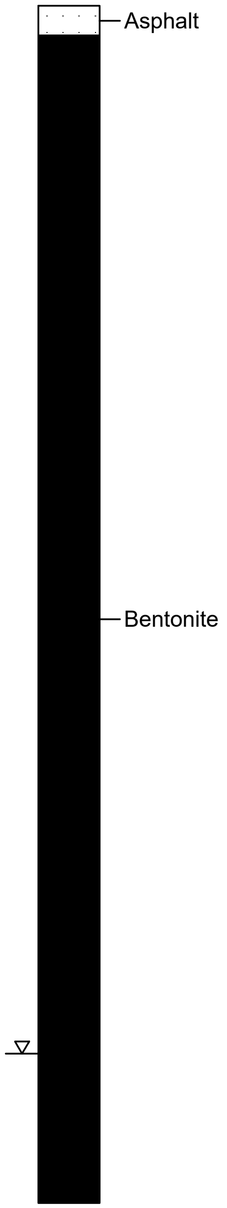
Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB31B

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0–0.5			■			6" Asphalt
0.5–17.5			☐			Borehole was not logged from 6 inches bgs to 17.5 feet bgs.
17.5–19.5		0.4	▩ ■		SP	SAND: medium- to coarse-grained, gray to dark gray, wet, poorly graded; fine gravel, subangular; 100% recovery (0/5/90/5)
19.5–20		0.6	▩		CL	CLAY: gray brown, moist, high plasticity; trace fine sand; 100% recovery (95/0/5/0)





Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB32

(Page 1 of 1)

Date Drilled:	: 01/25/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 12.5' bgs

Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition

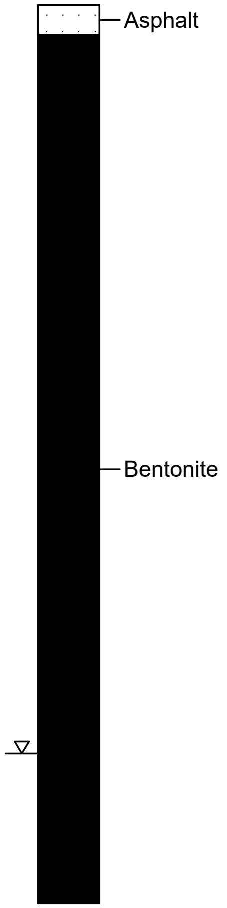
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels

- ▼ After Completion
- ▽ During Drilling

Boring: EB32

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0						6" Asphalt
						Borehole was not logged from 6 inches bgs to 2.5 feet bgs.
		0.0			GW SP	GRAVEL: fine to coarse, brown, dry, angular, well graded; fine- to medium-grained sand, moderately graded; trace silt; 100% recovery (0/5/10/85)
						SAND with Gravel: fine- to medium-grained, gray, dry, moderately graded; fine to coarse gravel, angular; 100% recovery (0/0/75/25)
5		0.0 0.0 0.0				Concrete debris 100% recovery
						Wood debris
10		99.8			GW	GRAVEL with Sand: fine to coarse gravel, moist, dark brown, subrounded, well graded; fine- to coarse-grained sand, well graded; 25% recovery (0/15/30/55) @10' bgs: black; 25% recovery
		7.7			SW	SAND: medium- to coarse-grained, dark brown to gray, wet, angular; trace fine gravel; 100% recovery (0/10/85/5) 100% recovery
15		0.7				
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Cardno®

BORING LOG EB32A

(Page 1 of 1)

Date Drilled:	: 01/27/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 20' bgs
First GW Depth:	: 10.5' bgs

Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition

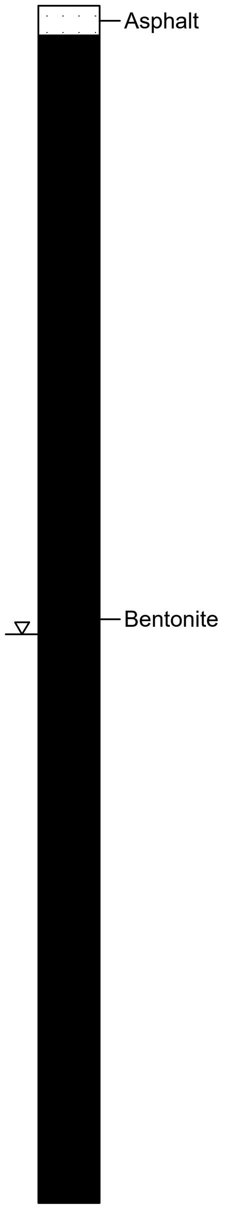
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels

- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			6" Asphalt
			■		GW	GRAVEL: fine to coarse, brown, dry, well graded, angular; fine- to medium-grained sand, moderately graded; trace silt; 100% recovery (0/5/10/85)
			■		SP	SAND: fine- to medium-grained, gray, dry, moderately graded; fine to coarse gravel, angular; 100% recovery
			■			Concrete debris
5		0.3	▨		SM	Silty SAND: fine- to medium-grained, brown, moist, moderately graded; trace fine gravel, angular, poorly graded; concrete debris present; 80% recovery (0/30/65/5)
			☒			
		0.6	▨		SW	SAND with Gravel: fine- to coarse-grained, brown, damp, well graded; fine to coarse gravel, angular, well graded; 40% recovery (0/5/65/30)
10		52.2	▨			dark brown; 80% recovery (0/15/55/30)
			■		SP	SAND: medium- to coarse-grained, gray, wet, poorly graded; trace fine gravel; 100% recovery (0/5/90/5)
			☐		SM	Silty SAND: medium- to coarse-grained, dark brown to olive brown, wet; trace fine gravel; 100% recovery (0/15/80/5) @13.5' bgs: gray
15		1.7	▨		SP	SAND: medium- to coarse-grained, gray, wet; trace fine gravel; 100% recovery (0/5/90/5)
		0.7	▨			100% recovery
			■			100% recovery
20			▨			

Boring: EB32A



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB33

(Page 1 of 1)

Date Drilled:	: 01/25/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 20' bgs
First GW Depth:	: 12.5' bgs

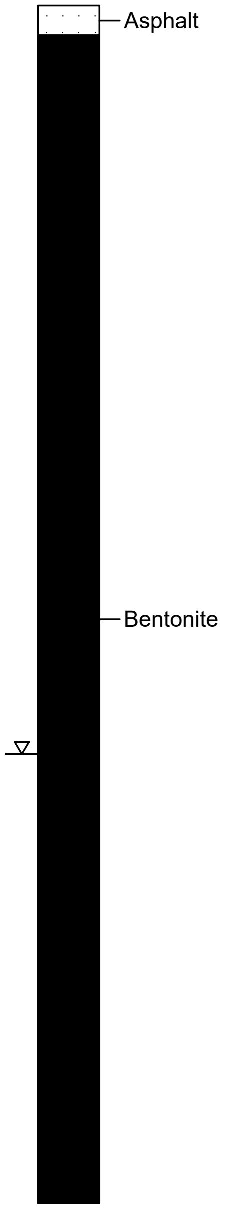
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			6" Asphalt
			■			Debris backfill
		0.3	☐		SW	SAND: medium- to coarse-grained, brown, dry, well graded; fine to coarse gravel, subangular to subrounded; 100% recovery (0/0/90/10)
5		7.2	▨		SP	SAND with Gravel: medium- to coarse-grained, gray, moist; fine to coarse gravel, angular, poorly graded; trace silt; 100% recovery (0/5/60/35)
		5.5	▨		SM	Silty SAND: fine-grained, moist, poorly graded; fine to coarse gravel, subangular, well graded; 100% recovery (0/20/70/10)
10		66.9	▨			NAPL observed; 100% recovery
		37.4	▨		SP	SAND: medium- to coarse-grained, dark brown, wet, poorly graded; trace fine gravel, angular; NAPL observed; 100% recovery (0/10/85/5)
15		1.7	▨		SW	SAND with Gravel: fine- to coarse-grained, black, wet, well graded; fine to coarse gravel, angular to subangular, well graded; NAPL observed; 100% recovery (0/10/55/35)
		9.5	▨			NAPL observed; 100% recovery
			■		SM	Silty SAND with Gravel: fine- to coarse-grained, black, wet, well graded; fine to coarse gravel, poorly graded; 100% recovery (0/20/50/30)
20		1.7	▨			

Boring: EB33



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB34

(Page 1 of 1)

Date Drilled:	: 01/25/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 20' bgs
First GW Depth:	: 10' bgs

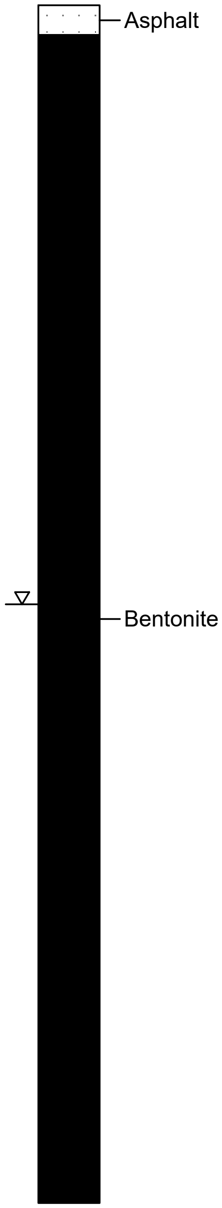
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB34

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■		6" Asphalt
			■		Debris backfill
		0.5	☐	SW	SAND with Gravel: fine- to coarse-grained, light brown, dry, well graded; fine to coarse gravel, subangular to angular, poorly graded; 100% recovery (0/5/65/30)
			■		Concrete debris; 100% recovery
5		1.0	☐	SW	SAND with Gravel: fine- to coarse-grained, light brown, dry, well graded; fine to coarse gravel, subangular to angular, poorly graded; 100% recovery (0/5/65/30)
		4.3	▩	SM	Silty SAND: fine- to medium-grained, black, moist, moderately graded; trace fine gravel, poorly graded; 100% recovery (0/15/80/5)
10		28.6	▩	SP	SAND with Gravel: fine- to medium-grained, black, wet, moderately graded; fine to coarse gravel, subrounded, moderately graded; 100% recovery (0/15/70/15)
		14.1	▩		dark brown; 100% recovery
15		0.7	▩		100% recovery
		7.2	▩	SP	SAND: medium- to coarse-grained, dark brown, wet, poorly to moderately graded; trace silt; 100% recovery (0/5/90/5)
					gray brown; 100% recovery
20		0.9	▩		



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB35

(Page 1 of 1)

Date Drilled:	: 01/25/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: N/A

Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

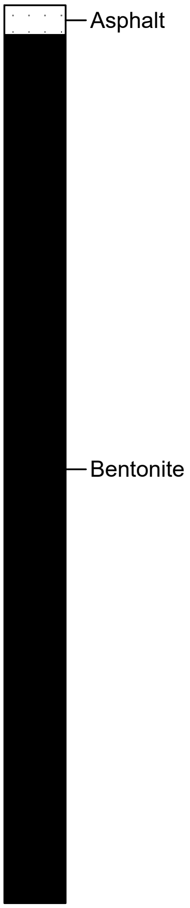
Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			6" Asphalt
			■			Debris backfill
		0.0	☐			SAND with Gravel: fine- to coarse grained, light brown, dry, well graded; fine to coarse gravel, subrounded, moderately graded; 100% recovery (0/5/60/35)
5		0.0	▨		SW	100% recovery
		0.0	▨			Silty SAND: fine- to medium-grained, black, moist, moderately graded; fine to coarse gravel, subrounded; 100% recovery (0/20/70/10)
10		0.3	▨		SM	100% recovery
		1.5	▨			fine-grained, dark brown, poorly graded; wood debris; 100% recovery (0/20/80/0)
15		0.9	▨		SP	SAND: medium- to coarse-grained, gray, damp, poorly to moderately graded; trace fine gravel; 100% recovery (0/5/90/5)
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Boring: EB35



BORING LOG EB36

(Page 1 of 1)

Date Drilled: : 01/26/21
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : 8.5' bgs

Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Paul Prevou
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▨ Preserved Sample

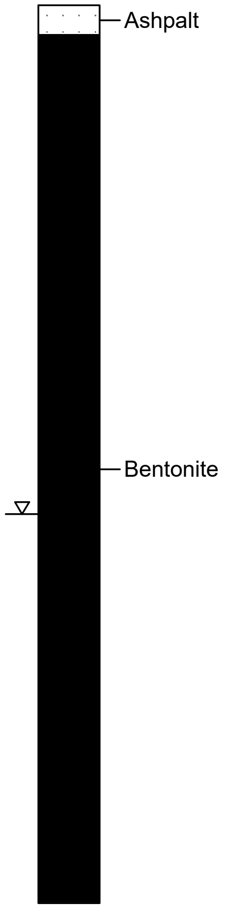
Water Levels
▼ After Completion
▽ During Drilling

Boring: EB36

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			6" Asphalt
			■		SP	SAND: fine- to medium-grained, gray, dry, poorly graded; (0/5/95/0)
		0.0	☐			100% recovery
5		0.4	▨			100% recovery
		0.3	▨			100% recvoery
			■			Wood debris, wet
10		1.0	▨		SW	Silty SAND: fine- to coarse-grained, gray to dark gray, wet, well graded; trace fine gravel, subrounded; 100% recovery (0/15/80/5)
		0.3	▨		SP	SAND: medium- to coarse-grained, gray, wet, poorly graded; trace fine gravel, angular; 100% recovery (0/5/90/5)
			■			Wood debris, 3" layer
15			☐		SP	SAND: medium- to coarse-grained, gray, wet, poorly graded; trace fine gravel, angular; 100% recovery (0/5/90/5)
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips



Cardno

BORING LOG EB37

(Page 1 of 1)

Date Drilled:	: 01/27/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 10' bgs

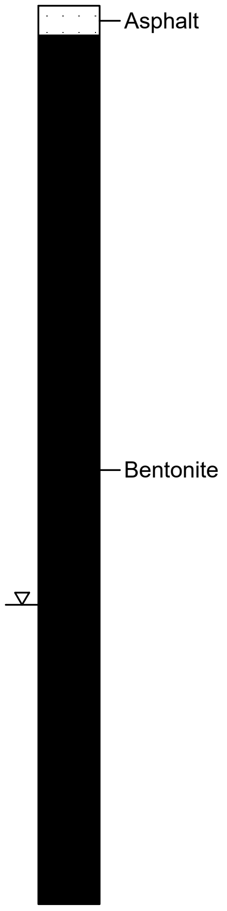
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB37

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			6" Asphalt
			☐			Borehole was not logged from 6 inches bgs to 2.5 feet bgs.
		0.0	■		SP	SAND: medium- to coarse-grained, gray, moist to dry, poorly graded; 100% recovery (0/5/95/0)
5		0.5	▨			dark brown; 100% recovery (0/15/85/0)
						Wood debris
		0.2	▨		SW	SAND: fine- to coarse-grained, gray, damp, well graded; 100% recovery (0/5/95/0)
10		0.2	▨			wet; 100% recovery
		0.3	▨			100% recovery
15		0.2				100% recovery
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Cardno

BORING LOG EB38

(Page 1 of 1)

Date Drilled:	: 01/27/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: N/A

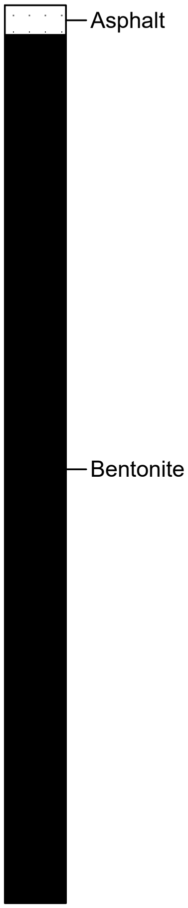
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB38

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			6" Asphalt
			☐			Borehole was not logged from 6 inches bgs to 2.5 feet bgs.
		2.7	■		SP	SAND: medium- to coarse-grained, gray, dry to damp, poorly graded; 100% recovery (0/5/95/0)
5		1.0	▩			100% recovery
		0.5	▩			dark gray; 100% recovery
10		0.3	▩			black and dark gray; organics and plant material present; 100% recovery (0/10/90/0)
		0.2	▩			gray to dark gray; no organics and plant material; 100% recovery
			■			Wood debris, 2" layer
			■		SP	SAND: medium- to coarse-grained, gray to dark gray, dry to damp, poorly graded; 100% recovery (0/10/90/0)
15		6.9	▩			
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG EB39

(Page 1 of 1)

Date Drilled:	: 01/27/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 20' bgs
First GW Depth:	: N/A

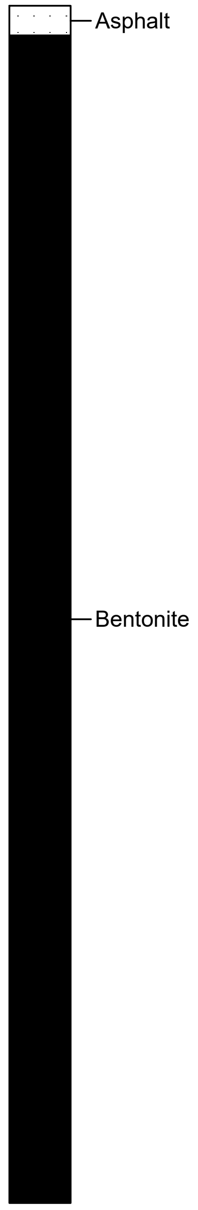
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB39

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0						6" Asphalt
						Borehole was not logged from 6 inches bgs to 2.5 feet bgs.
		4.2	▨			Concrete debris
					SP	SAND: medium- to coarse-grained, brown, dry to damp, poorly graded; 100% recovery (0/5/95/0)
						Wood debris, 2" layer
5		12.7	▨		SP	SAND: medium- to coarse-grained, gray, dry to damp, poorly graded; 100% recovery (0/10/90/0)
		8.4	▨			dark gray, organic material present; 100% recovery
						Wood debris with brown clay, medium plasticity; 100% recovery
10		3.7	▨		SP	SAND: medium- to coarse-grained, dark gray, dry to damp, poorly graded; 100% recovery (0/10/90/0)
		4.2	▨			Wood debris with dark brown clay, medium plasticity; 100% recovery
					SP	SAND: medium- to coarse-grained, gray, dry to damp, poorly graded; 100% recovery (0/10/90/0)
15		10.1	▨			dark gray; 100% recovery
		0.7	☐			100% recovery
						Wood debris with brown clay, medium plasticity; intermittent coarse-grained sand; 100% recovery
20		17.5	▨		SP	SAND: medium- to coarse-grained, dark gray, dry to damp, poorly graded; 100% recovery (0/10/90/0)



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Cardno

BORING LOG EB40

(Page 1 of 1)

Date Drilled:	: 01/26/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 7.5' bgs

Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition

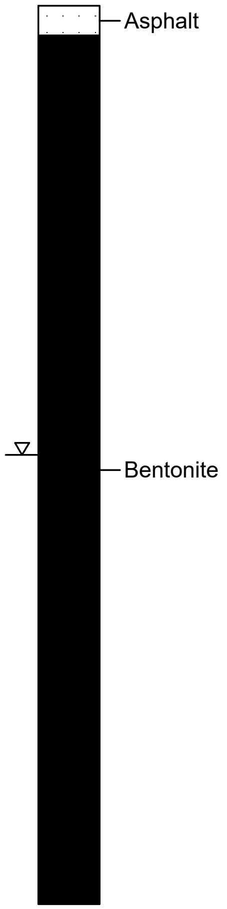
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels

- ▼ After Completion
- ▽ During Drilling

Boring: EB40

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			6" Asphalt
		0.2	■		GW	GRAVEL with Sand: fine to coarse, well graded, angular; fine- to coarse grained sand, brown, dry, well graded; 70% recovery (0/5/25/70)
5		3.0	■ ▨		SP	SAND: medium- to coarse-grained, gray, moist, poorly graded; trace fine to coarse gravel; (0/5/90/5) 100% recovery
10		0.3 0.5	■ ▨		SW	Silty SAND: fine- to medium-grained, gray to olive brown, wet, moderately graded; trace fine to coarse gravel; 80% recovery (0/25/70/5) clayey wood debris and plant roots; 100% recovery
			■		CL	CLAY: blue gray; 100% recovery (100/0/0/0)
		0.4	■ ▨			Wood debris; 100% recovery
15		0.0	■		SP	SAND: medium- to coarse-grained, dark gray, wet, poorly graded; trace fine gravel; (0/5/90/5) 100% recovery
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Cardno®

BORING LOG EB41

(Page 1 of 1)

Date Drilled:	: 01/27/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: N/A

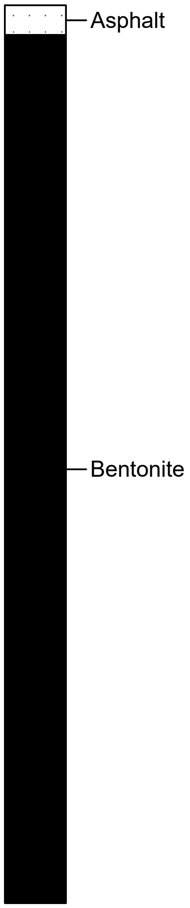
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: EB41

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			■		SW	SAND with Gravel: fine- to coarse-grained, brown, well graded; fine to coarse gravel, angular, well graded (0/5/55/40)
		0.4	☐		SW	SAND: fine- to coarse-grained, gray, moist, poorly graded; 100% recovery (0/5/95/0)
5		36.0	▨			gray to dark gray; 100% recovery
		27.5	▨			wood chips; 100% recovery (0/10/90/0)
			■			Wood debris in dark brown clay
			■		SP	SAND: fine- to coarse-grained, gray to dark gray, moist, poorly graded; 100% recovery (0/5/95/0)
10		5.8	▨			
		5.6	▨			100% recovery
			■			wood debris; 100% recovery (0/15/85/0)
15		1.9	☐			
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Cardno

BORING LOG SB1

(Page 1 of 1)

Date Drilled: : 01/26/21
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : 10' bgs

Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Paul Prevou
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

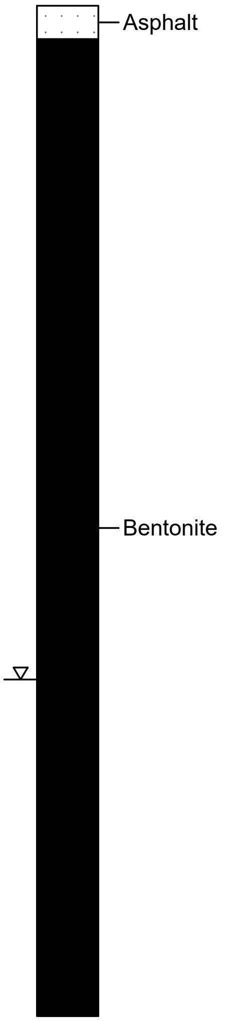
Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
			■			Debris backfill
		0.6	☐		SW	SAND with Gravel: fine- to coarse-grained, dark brown, moist, well graded; fine to coarse gravel, subrounded, well graded; 100% recovery (0/15/45/40)
5		0.1	▩			light brown, trace cobbles; 100% recovery
		0.4	▩		SM	Silty SAND with Gravel: fine- to coarse-grained, dark brown, moist, well graded; fine gravel to cobbles, subrounded, well graded; 50% recovery (0/20/40/40)
10		0.2	▩			fine- to medium-grained, gray/brown, wet; fine to coarse gravel, subrounded and subangular; 50% recovery (0/25/40/35)
		15.0	▩		SW	SAND with Gravel: fine- to coarse-grained, brown, wet, well graded; fine to coarse gravel, subangular and some subrounded; 100% recovery (0/10/60/30)
15		0.9	▩			medium- to coarse-grained, gray; fine to coarse gravel, poorly graded, subangular; 100% recovery (0/0/75/25)
20						

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Boring: SB1



BORING LOG SB2

(Page 1 of 1)

Date Drilled:	: 01/26/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 12.5' bgs

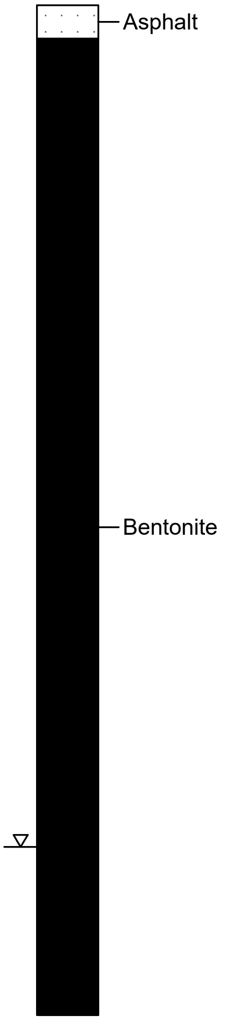
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			5" Asphalt
			■			Debris backfill
		0.0	☐			GRAVEL with Sand: fine to coarse gravel, subangular, well graded; fine- to coarse-grained sand, gray, dry, well graded; 100% recovery (0/5/40/55)
5		0.0	▨		GW	100% recovery
		0.3	▨		SM	Silty SAND with Gravel: fine- to medium-grained, olive brown, well graded; fine to coarse gravel, subrounded, poorly graded; 80% recovery (0/30/40/30)
10		0.2	▨		SC	Clayey SAND: fine- to medium-grained, light brown, moist; high plasticity; 100% recovery (50/0/50/0)
		0.4	▨		SW	▽ SAND with Gravel: fine- to coarse-grained, black, wet, well graded; fine to coarse gravel, subangular; 100% recovery (0/10/50/40)
15		0.2	▨		SP	SAND: fine- to medium-grained, gray, wet; trace fine gravel; 100% recovery (0/5/90/5)
20						

Boring: SB2



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG SB3

(Page 1 of 1)

Date Drilled:	: 01/26/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 20' bgs
First GW Depth:	: 10' bgs

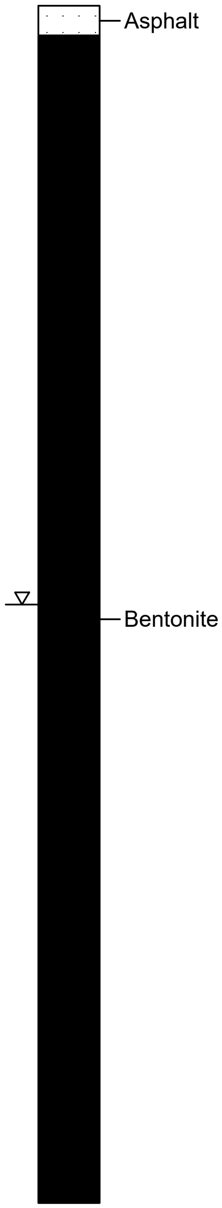
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■		4" Asphalt
			■		Debris backfill
			■	SW	SAND with Gravel: fine- to coarse-grained, light brown, dry, well graded; fine to coarse gravel, subrounded to subangular, moderately graded; 100% recovery (0/5/65/30)
		0.2	☐		
5		0.4	▨		black, moist; organics and wood present; 100% recovery (0/5/65/30)
		0.3	▨	SM	Silty SAND: fine- to medium-grained, dark brown, moist, moderate to poorly graded; 100% recovery (0/20/80/0)
			■		Wood debris
10 ▽		0.1	▨	CL	Clay lense, 2" thick
			■	SM	Silty SAND: fine-grained, olive brown, wet, poorly graded; 100% recovery (0/50/50/0)
		0.2	▨		100% recovery
15		0.4	▨		Wood debris, 2" layer
			■	SM	Silty SAND: fine-grained, olive brown, wet, poorly graded; 100% recovery (0/50/50/0)
		0.1	☐		100% recovery
20		0.1	▨		100% recovery

Boring: SB3



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

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BORING LOG SB4

(Page 1 of 1)

Date Drilled:	: 01/25/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 20' bgs
First GW Depth:	: 10' bgs

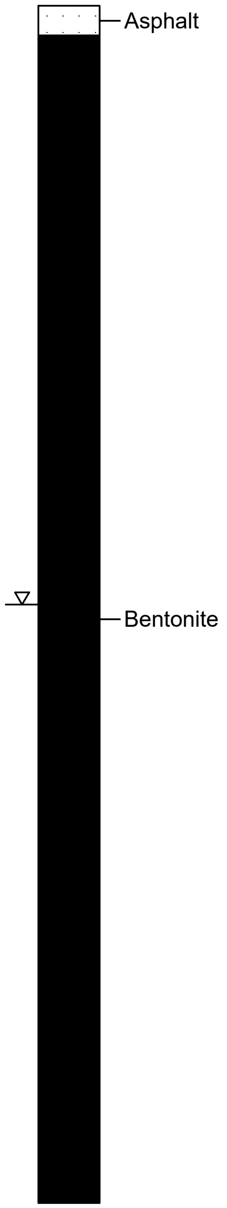
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: SB4

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			6" Asphalt
			■			Debris backfill
		0.0	☐		SW	SAND: fine- to coarse-grained, brown, dry; fine to coarse gravel, subangular; 80% recovery (0/5/85/10) wood debris
5		0.2	▩		SP	SAND: coarse-grained, gray, dry, poorly graded; trace fine gravel; 100% recovery (0/5/90/5)
		0.4	▩			
10		28.9	▩		SP	SAND with Gravel: fine- to medium-grained, brown, wet, poorly graded; fine to coarse gravel, poorly graded, subrounded; trace silt; 30% recovery (0/5/50/45)
		24.5	▩		SP	SAND: medium-grained, black, wet, poorly graded; 100% recovery (0/5/90/5)
15		14.6	▩			medium- to coarse-grained, trace medium gravel, subrounded; 100% recovery
		12.2	▩		SM	Silty SAND: medium- to coarse-grained, black, wet, moderate to poorly graded; trace fine gravel; 100% recovery (0/20/75/5)
20		9.6	▩		SP	SAND with Gravel: medium- to coarse-grained, gray, wet, moderately graded; fine to coarse gravel, poorly graded, subangular; 100% recovery (0/5/65/30)



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG SB5

(Page 1 of 1)

Date Drilled:	: 01/26/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 20' bgs
First GW Depth:	: 8' bgs

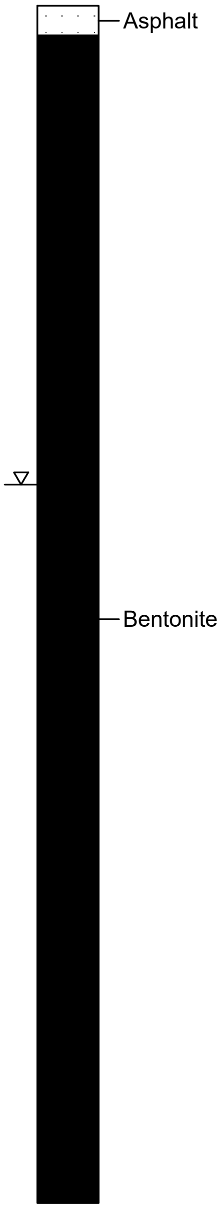
Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0						2" Asphalt Debris backfill
		0.4				SAND with Gravel: fine- to coarse-grained, light brown, dry, well graded; fine gravel, subangular, moderately graded; 100% recovery (0/5/60/35)
5		0.7	▨			100% recovery
		0.4	▨			100% recovery wet
					SW	
10		0.2	▨			dark brown; 100% recovery (0/10/60/30)
		0.2	▨			100% recovery (0/15/55/30)
15		0.1	▨		SM	Silty SAND with Gravel: fine- to coarse-grained, black, wet, well graded; fine gravel, subangular, moderately graded; 100% recovery (0/20/55/25)
		0.5	▨		SM	Silty SAND: fine-grained, black, damp, poorly graded; trace organic matter; 100% recovery (0/30/70/0)
20		0.0	▨		SP	SAND: medium- to coarse-grained, brown, damp, poorly graded; trace fine gravel; 100% recovery (0/5/90/5)

Boring: SB5



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

BORING LOG SB6

(Page 1 of 1)

Date Drilled: : 02/05/21
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Push Probe
Sampling Method: : Dual Tube
Borehole Diameter: : 3"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 15' bgs
First GW Depth: : 7.5' bgs

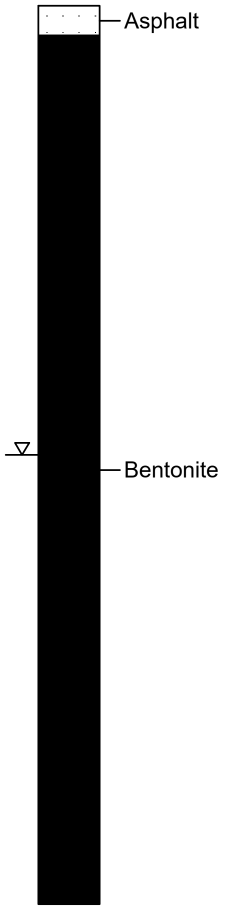
Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Paul Prevou
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Boring: SB6

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			5" Asphalt
			☐			Borehole was not logged from 6 inches bgs to 2.5 feet bgs.
		3.5	▨ ■		SW	SAND with Gravel: fine- to coarse-grained, black to dark brown, moist, moderately graded; fine to coarse gravel, rounded to subangular, well graded; 100% recovery (0/5/60/35)
5		0.3	▨ ■		SM	Silty SAND: very fine- to medium-grained, gray, moist; 100% recovery (0/30/70/0)
		0.1	▨ ■			fine- to coarse-grained, bimodal primarily coarse-grained, brown, wet, low plasticity; trace fine gravel; 100% recovery (0/20/75/5)
			■			Wood debris with brown clay, dry to moist, roots
10		0.1	▨ ■			
		0.0	▨ ■		SP	SAND: medium- to coarse-grained, gray, wet, poorly graded; 100% recovery (0/5/95/0)
15		0.0	▨		CL	CLAY with Sand: dark brown, moist, high plasticity; fine-grained sand, poorly graded; 100% recovery (85/0/15/0)
20						



Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips

Cardno

BORING LOG SB7

(Page 1 of 1)

Date Drilled:	: 02/05/21
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Push Probe
Sampling Method:	: Dual Tube
Borehole Diameter:	: 3"
Casing Diameter:	: N/A
Latitude	: N/A
Longitude	: N/A
Total Depth:	: 15' bgs
First GW Depth:	: 12.5' bgs

Project No.:	: 031447
Site:	: ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

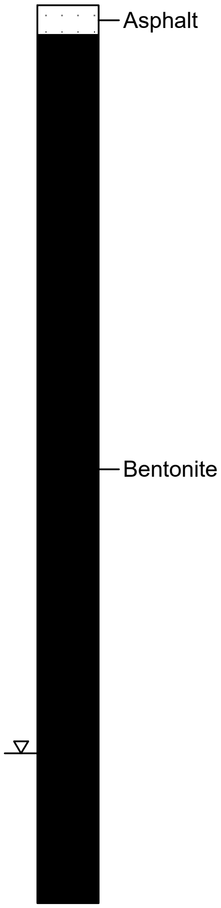
Water Levels
- ▼ After Completion
- ∇ During Drilling

Boring: SB7

Depth (ft)	Blow Count	OVM/PID (ppmv)	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0				5" Asphalt
				Borehole not logged from 5 inches bgs to 2.5 feet bgs.
		0.1	SW	SAND with Gravel: fine- to coarse-grained, black to dark brown, moist, moderately graded; fine to coarse gravel, subrounded to subangular, well to moderately graded; 100% recovery (0/5/60/35)
5		0.1	SP	SAND: fine- to medium-grained, brown, moist, poorly graded; trace fine gravel; 100% recovery (0/5/90/5)
		0.0	SW	SAND: fine- to coarse-grained, dark gray, moist, moderately graded; 100% recovery (0/5/95/0)
10		3.4		Wood debris in brown clay, roots, high plasticity 100% recovery
		0.2	SC	∇ Clayey SAND: fine- to medium-grained, dark brown, wet, poorly to moderately graded, medium plasticity; decayed plant material present; 100% recovery (40/0/60/0)
15		0.0	SP	SAND: medium- to coarse-grained, dark gray, wet, poorly to moderately graded; 100% recovery (0/10/90/0)
20				

Backfill Materials:

0.2 50-lb. bag of Asphalt
0.5 50-lb. bag of Bentonite Chips



Cardno

BORING LOG GB1

(Page 1 of 1)

Date Drilled: : 01/27/21
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Hollow-Stem Auger
Sampling Method: : Split Spoon
Borehole Diameter: : 8"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 31.5' bgs
First GW Depth: : 9' bgs

Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt
						Borehole was cleared to 5' bgs on 01/26/21 using air knife and hand tools. Borehole was not logged from 3 inches bgs to 5 feet bgs.
5	6 12 13		■			Fill: fine- to coarse-grained sand matrix, brown/gray, damp, rounded, well graded, thin bed; 80% wood debris; 100% recovery (0/0/20/0)
						cuttings saturated
10	9 14 14		■			gray, wet; 50% wood debris; 100% recovery (0/0/50/0)
15	6 8 4		■			100% recovery
20	1 2 3		■		CL	CLAY: brown (100/0/0/0)
						SAND: fine- to coarse-grained, gray, wet, rounded, thin bed; 100% recovery (0/0/100/0)
25	1 2 3		■		SW	100% recovery
30	3 4 5		■			100% recovery
35						
40						

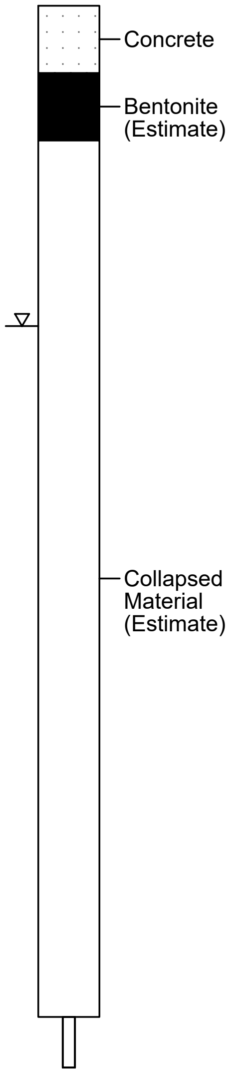
Geotechnical Information: Truck-mounted rig No. 113, Diedrich D-120, 140-pound Auto Hammer Certification complete on November 19, 2020.

Borehole collapsed during backfill activities due to high water table. Bottom of bentonite calulated via Cetco 3/8" Crumble standard volume.

Backfill Materials:

2 50-lb. bags of Cement
1 50-lb. bag of Bentonite Chips

Boring: GB1



Cardno

BORING LOG GB2

(Page 1 of 1)

Date Drilled: : 01/27/21
Drilling Co.: : Holocene Drilling, Inc.
Drilling Method: : Hollow-Stem Auger
Sampling Method: : Split Spoon
Borehole Diameter: : 8"
Casing Diameter: : N/A
Latitude : N/A
Longitude : N/A
Total Depth: : 31.5' bgs
First GW Depth: : 10' bgs

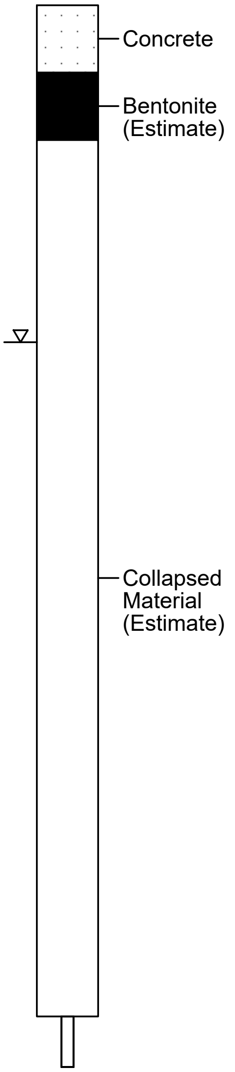
Project No.: : 031447
Site: : ExxonMobil ADC, 2717/2731 Federal Avenue, Everett, WA
Logged By: : Brett McLees
Reviewed By: : Keri Chappell, L.G. 2719
Signature: : Keri Chappell

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▩ Preserved Sample

Water Levels
▼ After Completion
▽ During Drilling

Boring: GB2

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0			■			3" Asphalt Borehole was cleared to 5' bgs on 01/26/21 using air knife and hand tools. Borehole was not logged from 3 inches bgs to 5 feet bgs.
5	2 5 5		■			SAND: fine- to coarse-grained, gray, damp, rounded; 100% recovery (0/0/100/0)
10	3 4 5		■			wet; 100% recovery
15	1 2 3		■			brown; trace silt; trace wood; 100% recovery (0/5/95/0)
					SW	
20	4 5 5		■			gray; 100% recovery
25	6 9 11		■			100% recovery
30	3 4 6		■			100% recovery
35						
40						



Geotechnical Information: Truck-mounted rig No. 113, Diedrich D-120, 140-pound Auto Hammer Certification complete on November 19, 2020.

Borehole collapsed during backfill activities due to high water table. Bottom of bentonite calulated via Cetco 3/8" Crumble standard volume.

Backfill Materials:

2 50-lb. bags of Cement
1 50-lb. bag of Bentonite Chips

ExxonMobil ADC

Cardno 03144702.R04

APPENDIX D
WASTE DOCUMENTATION

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

21031200861

NON-HAZARDOUS WASTE MANIFEST	1. Generator ID Number VSQG	2. Page 1 of 1	3. Emergency Response Phone 888-785-7225	**4. Waste Tracking Number** 279650/D341718

5. Generator's Name and Mailing Address
ExxonMobil Oil Corporation, c/o Cardno
801 Second Avenue Suite 1150
Seattle, WA 98104
Generator's Phone: 503-869-1196

Generator's Site Address (if different than mailing address)
ExxonMobil Oil Corporation
2717 Federal Ave
Everett, WA 98201

6. Transporter 1 Company Name
Advanced Chemical Transport Inc./DBA ACTenviro
U.S. EPA ID Number
CAR000070540

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
US Ecology Idaho Inc Site B
20400 Lemley Rd
Grandview, ID 83624
Facility's Phone: 208-834-2275
U.S. EPA ID Number
IDD073114654

9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.
1 Non-RCRA/Non-DOT Regulated Material Solid (SOIL CUTTINGS)	2	DM	750	P
2 Non-RCRA/Non-DOT Regulated Material Liquid (GROUNDWATER)	14	DM	7,000	P
3.				
4.				

13. Special Handling Instructions and Additional Information
Project Number 279650 Document#: D341718
1) 52930-0 EXU-A2-55
2) 000052916-0 EXU-A2-55

14. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.
Generator's/Offeror's Printed/Typed Name: Brett McLees on behalf of ExxonMobil
Signature: on behalf of ExxonMobil
Month 02 Day 19 Year 21

GENERATOR

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

INT'L

16. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Jody McKnight
Signature
Month 2 Day 19 Year 21
Transporter 2 Printed/Typed Name
Signature
Month Day Year

TRANSPORTER

17. Discrepancy
17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Hcm/ on hold 4·14·21
Manifest Reference Number:
17b. Alternate Facility (or Generator)
U.S. EPA ID Number
Facility's Phone:
17c. Signature of Alternate Facility (or Generator)
Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a
Printed/Typed Name: Savannah Richardson
Signature: SR
Month 3 Day 12 Year 21

DESIGNATED FACILITY

Printed in USA by GC Labels
1-800-997-6966

DESIGNATED FACILITY TO GENERATOR

Reorder Part# MANIFEST-C6NHW
913-897-6966

Cardno is an ASX-200 professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage, and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

Cardno Zero Harm

At Cardno, our primary concern is to develop and maintain safe and healthy conditions for anyone involved at our project worksites. We require full compliance with our Health and Safety Policy Manual and established work procedures and expect the same protocol from our subcontractors. We are committed to achieving our Zero Harm goal by continually improving our safety systems, education, and vigilance at the workplace and in the field. Safety is a Cardno core value and through strong leadership and active employee participation, we seek to implement and reinforce these leading actions on every job, every day.

www.cardno.com

Libby Environmental, Inc.
3322 South Bay Road NE • Olympia, WA 98506-2957

February 25, 2021

Robert Thompson
Cardno
801 Second Ave, Suite 700
Seattle, Washington 98104

Dear Mr. Thompson:

Please find enclosed the analytical data report for the Port of Everett Project located in Everett, Washington.

The results of the analyses are summarized in the attached tables. Applicable detection limits and QA/QC data are included. The sample(s) will be disposed of in 30 days unless we are contacted to arrange long term storage.

Libby Environmental, Inc. appreciates the opportunity to have provided analytical services for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Sherry L. Chilcutt
Senior Chemist
Libby Environmental, Inc.

Libby Environmental, Inc.

3322 South Bay Road NE
Olympia, WA 98506

Ph: 360-352-2110
Fax: 360-352-4154

Chain of Custody Record

mobile Lab

www.LibbyEnvironmental.com

Client: Cardno - Seattle		Date: 10/12/20	Page: 1 of 2
Address:		Project Manager:	
City:	State: Zip:	Project Name: ~~Mobil ADC~~ Port of Everett	
Phone:	Fax:	Location: Everett	City, State: WA
Client Project # 031447		Collector: Paul Prevoo	Date of Collection: 10/12/20
		Email: paul.prevoo@cardno.com; robert.thompson@cardno.com	

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals				Field Notes
1 S-2.5-EB5	2.5	0935	Soil			X				O										Silic gel cleanup
2 S-5-EB5	5	0940	Soil			X				X										
3 S-7.5-EB5	7.5	0945	Soil			X				X										
4 S-10-EB5	10	1000	Soil			X				X										
5 S-2.5-EB6	2.5	1020	S			X				X										
6 S-5-EB6	5	1025	S			X				X										
7 S-7.5-EB6	7.5	1030	S			X				X										
8 S-10-EB6	10	1035	S			X				X										
9 ~~S-5-EB7~~	~~5~~	~~1105~~	~~S~~			~~X~~				~~X~~										
10 ~~S-7.5-EB7~~	~~7.5~~	~~1110~~	~~S~~							~~X~~										
11 ~~S-10-EB7~~	~~10~~	~~1115~~	~~S~~			~~X~~				~~X~~										
12 S-5-EB4	5	1230	S			X				X										
13 S-7.5-EB4	7.5	1235	S			X				X										
14 S-10-EB4	10	1240	S			X				X										
15 S-12.5-EB4	12.5	1250	S			X				X										
16 S-15-EB4	15	1255	S			X				X										
17 S-5-EB3	5	1310	S			X				X										

Relinquished by:	Date / Time 10/12/2020 1540	Received by:	Date / Time 10/12/20 1540	**Sample Receipt**	Remarks: *Silic gel clean up on all samples ML
				Good Condition? Y N	
Relinquished by:	Date / Time	Received by:	Date / Time	Cooler Temp. °C	
				Sample Temp. °C	
Relinquished by:	Date / Time	Received by:	Date / Time	Total Number of Containers	TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.
3322 South Bay Road NE
Olympia, WA 98506
Ph: 360-352-2110
Fax: 360-352-4154
www.LibbyEnvironmental.com

Chain of Custody Record

Mobile Lab

Date: 10/12/20
Page: 2 of 2
Client: Cardno - Seattle
Project Manager:
Address:
Project Name: Port of Everett
City: State: Zip:
Location:
City, State: Everett WA
Phone: Fax:
Collector: Paul Prevoa
Date of Collection: 10/12/20
Client Project #
Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals				Field Notes
1 S-7.5-EB3	7.5	1315	S							Xo										No Gx
2 S-10-EB3	10	1320	S			X	~~X~~			Xo										
3 S-12.5-EB3	12.5	1325	S			X	~~X~~			Xo										
4 S-15-EB3	15	1330	S			X	~~X~~			Xo										
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				

Relinquished by:	Date / Time 10/12/2020 1540	Received by:	Date / Time 10/12/20 1540
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition?	Y	N
Cooler Temp.		°C
Sample Temp.		°C
Total Number of Containers		

Remarks:
ML

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: *In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.*

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

3322 South Bay Road NE
Olympia, WA 98506
Phone: (360) 352-2110
FAX: (360) 352-4154
Email: libbyenv@gmail.com

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201012-10
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	10/12/2020		96%	nd
S-2.5-EB5	10/12/2020	10/12/2020		96%	nd
S-5-EB5	10/12/2020	10/12/2020		95%	nd
S-7.5-EB5	10/12/2020	10/12/2020		96%	nd
S-10-EB5	10/12/2020	10/12/2020		97%	nd
S-5-EB6	10/12/2020	10/12/2020		97%	nd
S-10-EB6	10/12/2020	10/12/2020		95%	nd
S-10-EB6 Dup	N/A	10/12/2020		95%	nd
S-5-EB4	10/12/2020	10/12/2020		103%	18
S-7.5-EB4	10/12/2020	10/12/2020	10	93%	<100
S-10-EB4	10/12/2020	10/12/2020	10	97%	<100
S-12.5-EB4	10/12/2020	10/12/2020	5	100%	<50
S-15-EB4	10/12/2020	10/12/2020		96%	nd
S-15-EB4 Dup	N/A	10/12/2020		95%	nd
S-5-EB3	10/12/2020	10/12/2020		95%	nd
S-10-EB3	10/12/2020	10/12/2020	5	98%	<50
S-12.5-EB3	10/12/2020	10/12/2020	5	97%	<50
S-15-EB3	10/12/2020	10/12/2020		95%	nd
Practical Quantitation Limit					10

"<" Indicates elevated PQL due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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Olympia, WA 98506
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FAX: (360) 352-4154
Email: libbyenv@gmail.com

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201012-10
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil with Silica Gel Clean-up

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	10/12/2020		107	nd	nd
S-2.5-EB5	10/12/2020	10/12/2020		108	nd	nd
S-5-EB5	10/12/2020	10/12/2020		104	nd	nd
S-7.5-EB5	10/12/2020	10/12/2020		108	nd	nd
S-10-EB5	10/12/2020	10/12/2020		113	51	nd
S-2.5-EB6	10/12/2020	10/12/2020		104	nd	nd
S-5-EB6	10/12/2020	10/12/2020		110	nd	nd
S-5-EB6 Dup	N/A	10/12/2020		110	nd	nd
S-7.5-EB6	10/12/2020	10/12/2020		83	nd	nd
S-10-EB6	10/12/2020	10/12/2020		80	nd	nd
S-5-EB4	10/12/2020	10/12/2020		int	4700	nd
S-7.5-EB4	10/12/2020	10/13/2020	10	int	36000	nd
S-10-EB4	10/12/2020	10/12/2020		int	5500 E	nd
S-12.5-EB4	10/12/2020	10/12/2020		int	4400	nd
S-12.5-EB4 Dup	N/A	10/12/2020		int	3300	nd
S-15-EB4	10/12/2020	10/12/2020		80	nd	nd
S-5-EB3	10/12/2020	10/12/2020		90	nd	nd
S-7.5-EB3	10/12/2020	10/12/2020	10	int	43000	nd
S-10-EB3	10/12/2020	10/12/2020	5	int	15000	nd
S-12.5-EB3	10/12/2020	10/12/2020		113	188	nd
S-15-EB3	10/12/2020	10/12/2020		79	nd	nd
Practical Quantitation Limit					50	250

"E" Indicates reported result is an estimate because it exceeds the calibration range.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

3322 South Bay Road NE
Olympia, WA 98506
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FAX: (360) 352-4154
Email: libbyenv@gmail.com

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201012-10
Client Project # 031447

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Rv1 50 ppm	10/12/2020	48.3	97%	80-120%
Practical Quantitation Limit		10		

ANALYSES PERFORMED BY: Paul Burke

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201012-10
Client Project # 031447

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Nova Scotia FID 1 500 ppm	10/12/2020	533	107%	85-115%
CCV Nova Scotia FID 2 500 ppm	10/12/2020	438	88%	85-115%
CCV Nova Scotia FID 1 500 ppm	10/13/2020	572	114%	85-115%
CCV Nova Scotia FID 2 500 ppm	10/13/2020	548	110%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc. **Chain of Custody Record** www.LibbyEnvironmental.com

3322 South Bay Road NE
Olympia, WA 98506

Ph: 360-352-2110
Fax: 360-352-4154

olympia Lab

Date: 10/12/20 Page: 1 of 1

Client: Cardno

Project Manager:

Address:

Project Name: Port of Everett

City: State: Zip:

Location: Everett City, State: WA

Phone: Fax:

Collector: Paul Prevua Date of Collection: 10/12/20

Client Project # 031447

Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	cPAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals				*Std turn for All Field Notes
1 S-5-EB7	5	1105	S			X				X										
2 S-7.5-EB7	7.5	1110	S			X				X										
3 S-10-EB7	10	1115	S			X				X										
4 S-2.5-EB6	2.5	1030	S			X														Gx only
5 S-7.5-EB6	7.5	1020	S			X														Gx Only
6 S-2.5-EB4	2.5	1225	S			X				X										
7 S-2.5-EB3	2.5	1305	S			X				X										
8 S-7.5-EB3	7.5	1315	S			X														Gx only
9 S-2.5-EB11	2.5	1405	S			X				x										
10 S-5-EB11	5	1410	S			X				X										
11 S-7.5-EB11	7.5	1415	S			X				X										
12 S-10-EB11	10	1420	S			X				X										
13 S-12.5-EB11	12.5	1425	S			X				X										
14 S-15-EB11	15	1430	S			X				X										
15																				
16																				
17																				

Relinquished by:	Date / Time 10/12/2020 1540	Received by:	Date / Time 10/12/20 1540
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition? Y N

Cooler Temp. °C

Sample Temp. °C

Total Number of Containers

Remarks: *Silica gel on all Samples

TAT: 24HR 48HR [✓ 5-DAY]

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

3322 South Bay Road NE
Olympia, WA 98506
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Email: libbyenv@gmail.com

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201012-3
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	10/15/2020		89%	nd
Method Blank	N/A	10/14/2020		89%	nd
S-5-EB7	10/12/2020	10/15/2020		92%	nd
S-7.5-EB7	10/12/2020	10/15/2020		86%	nd
S-7.5-EB7 Dup	N/A	10/15/2020		83%	nd
S-10-EB7	10/12/2020	10/14/2020		105%	nd
S-2.5-EB6	10/12/2020	10/15/2020		98%	nd
S-7.5-EB6	10/12/2020	10/15/2020		100%	nd
S-2.5-EB4	10/12/2020	10/14/2020		105%	nd
S-2.5-EB3	10/12/2020	10/14/2020		93%	nd
S-2.5-EB3 Dup	N/A	10/14/2020		98%	nd
S-7.5-EB3	10/12/2020	10/15/2020	10	95%	<100
S-2.5-EB11	10/12/2020	10/14/2020		134%	nd
S-5-EB11	10/12/2020	10/15/2020	10	82%	<100
S-7.5-EB11	10/12/2020	10/15/2020	10	75%	<100
S-10-EB11	10/12/2020	10/15/2020	10	84%	<100
S-12.5-EB11	10/12/2020	10/15/2020		95%	nd
S-15-EB11	10/12/2020	10/15/2020		88%	nd
Practical Quantitation Limit					10

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.
"<" Indicates elevated PQL due to dilution.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Trifluorotoluene): 65% TO 135%

ANALYSES PERFORMED BY: Melissa Harrington

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201012-3
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil with Silica Gel Clean-up

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	10/13/2020		107	nd	nd
Method Blank	N/A	10/15/2020		125	nd	nd
Method Blank	N/A	10/16/2020		103	nd	nd
S-5-EB7	10/12/2020	10/13/2020		127	nd	nd
S-7.5-EB7	10/12/2020	10/13/2020		100	74	nd
S-10-EB7	10/12/2020	10/13/2020		134	nd	nd
S-2.5-EB4	10/12/2020	10/13/2020		121	nd	nd
S-2.5-EB3	10/12/2020	10/13/2020		94	nd	nd
S-2.5-EB11	10/12/2020	10/13/2020		135	nd	550
S-5-EB11	10/12/2020	10/15/2020		108	2400	nd
S-7.5-EB11	10/12/2020	10/16/2020	10	119	44000	2700
S-10-EB11	10/12/2020	10/16/2020	3	114	11000	1300
S-12.5-EB11	10/12/2020	10/15/2020		122	370	nd
S-12.5-EB11 Dup	N/A	10/15/2020		123	480	nd
S-15-EB11	10/12/2020	10/15/2020		125	nd	nd
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Kory Dixon and Jenny Anderson

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201013-10
Client Project # 031447

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Yahtzee PID 1 50 ppm	10/14/2020	46.6	93%	80-120%
CCV Yahtzee PID 1 50 ppm	10/15/2020	45.3	91%	80-120%
Practical Quantitation Limit		10		

ANALYSES PERFORMED BY: Melissa Harrington

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201013-10
Client Project # 031447

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Stella FID 1 500 ppm	10/13/2020	546	109%	85-115%
CCV Stella FID 2 500 ppm	10/13/2020	522	104%	85-115%
CCV Stella FID 3 500 ppm	10/13/2020	464	93%	85-115%
CCV Kilvan FID 1 500 ppm	10/15/2020	441	88%	85-115%
CCV Kilvan FID 1 500 ppm	10/16/2020	430	86%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Kory Dixon and Jenny Anderson

Libby Environmental, Inc.

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Mobile Lab
10/13/20

Chain of Custody Record

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Client:
Address:
City: State: Zip:
Phone: Fax:
Client Project # 031447

Date: 10/13/20 Page: 1 of 1
Project Manager: Bob Thompson
Project Name: Port of Everett
Location: City, State: Everett, WA
Collector: Paul PreVoa Date of Collection: 10/12 & 10/13
Email: robert.thompson@cardno.com, paul.prevoa@cardno.com

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	cPAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals				Field Notes
1 S-5-EB12	5	1440	S			X				X										~~Dx/Dx~~ Collected 10/12
2 S-7.5-EB12	7.5	1445	S							X										Dx/Dx only 10/12
3 S-10-EB12	10	1450	S			X				X										↓
4 S-~~12~~ 12.5-EB12	12.5	1455	S			X				X										
5 S-15-EB12	15	1500	S			X				X										
6 S-10-EB1 ✓	10	0855	S							X										Collected 10/13 Dx/Dx only
7 S-5-EB1 ✓	5	0845	S							X										Dx/Dx only
8 S-12.5-EB1 ✓	12.5	0900	S							X										Dx/Dx only
9 S-15-EB1 ✓	15	0905	S							X										Dx/Dx only
10 S-7.5-EB17	7.5	0935	S			X				X										
11 S-10-EB17	10	0940	S			X				X										
12 S-5-EB18	5	1020	S			X				X										
13 ~~S-2.5-EB19~~	~~2.5~~	~~1040~~	~~S~~																	
14 S-7.5-EB16	7.5	1255	S							X										Dx/Dx only
15 S-10-EB25	10	1515	S							X										DX/DX only
~~16 S-7.5-EB23~~	~~7.5~~	~~1835~~	~~S~~							~~X~~										~~Dx/Dx only~~
17																				

Relinquished by:	Date / Time 10/13/2020 1600	Received by:	Date / Time 10/13/20 1600
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition? Y N
Cooler Temp. °C
Sample Temp. °C
Total Number of Containers

Remarks:

ML

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201013-10
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	10/13/2020		99%	nd
S-5-EB12	10/12/2020	10/13/2020		100%	nd
S-10-EB12	10/12/2020	10/13/2020	10	99%	<100
S-12.5-EB12	10/12/2020	10/13/2020	10	99%	<100
S-15-EB12	10/12/2020	10/13/2020		99%	nd
S-15-EB12 Dup	N/A	10/13/2020		97%	nd
S-7.5-EB17	10/13/2020	10/13/2020		99%	11
S-10-EB17	10/13/2020	10/13/2020	5	97%	<50
S-5-EB18	10/13/2020	10/13/2020		96%	nd
Practical Quantitation Limit					10

"<" Indicates elevated PQL due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201013-10
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil with Silica Gel Clean-up

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	10/13/2020		81	nd	nd
S-5-EB12	10/12/2020	10/13/2020		int	160	nd
S-7.5-EB12	10/12/2020	10/13/2020		135	3600	nd
S-10-EB12	10/12/2020	10/13/2020	5	int	3000	nd
S-12.5-EB12	10/12/2020	10/13/2020		int	2000	nd
S-15-EB12	10/12/2020	10/13/2020		int	460	nd
S-15-EB12 Dup	N/A	10/13/2020		int	410	nd
S-10-EB1	10/13/2020	10/13/2020		int	16000 E	nd
S-5-EB1	10/13/2020	10/13/2020		100	nd	nd
S-12.5-EB1	10/13/2020	10/13/2020		int	3500	nd
S-15-EB1	10/13/2020	10/13/2020		95	nd	nd
S-7.5-EB17	10/13/2020	10/13/2020	20	int	33000	nd
S-10-EB17	10/13/2020	10/13/2020	5	int	2600	nd
S-5-EB18	10/13/2020	10/13/2020		120	450	210 J
S-5-EB18 Dup	N/A	10/13/2020		int	440	290
S-7.5-EB16	10/13/2020	10/13/2020	5	int	9700	3900
S-10-EB25	10/13/2020	10/13/2020		int	2400	860
Practical Quantitation Limit					50	250

"E" Indicates reported result is an estimate because it exceeds the calibration range.
"J" Indicates analyte was positively identified. Reported result is an estimate.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201013-10
Client Project # 031447

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Rv1 50 ppm	10/13/2020	58.7	117%	80-120%
Practical Quantitation Limit		10		

ANALYSES PERFORMED BY: Paul Burke

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Email: libbyenv@gmail.com

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201013-10
Client Project # 031447

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Nova Scotia FID 1 500 ppm	10/13/2020	572	114%	85-115%
CCV Nova Scotia FID 2 500 ppm	10/13/2020	548	110%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

3322 South Bay Road NE
Olympia, WA 98506

Ph: 360-352-2110 Mobile Lab
Fax: 360-352-4154

Client: Cardno
Address:
City: State: Zip:
Phone: Fax:
Client Project # 031447

Date: 10/14/20 Page: 1 of 1
Project Manager: Rob Thompson
Project Name: Port of Everett
Location: Port of Everett City, State: Everett, WA
Collector: Paul Prevoa Date of Collection: 10/13 & 10/14/20
Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals				Field Notes
1 S-7.5-EB23	7.5	1335	S							X										Dx only Collected 10/13
2 S-10-EB8	10	0810	S							X										Dx only collected 10/14
3 S-5-EB9	5	0835	S							X										Dx only
4 S-10-EB26	10	0905	S							X										Dx only
5 S-10-EB-23	10	1340	S							X										Dx only collected 10/13
6 S-7.5-EB27	7.5	0935	S							X										Dx only Collected 10/14
7 S-10-EB27	10	0940	S							X										Dx only
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				

Relinquished by:	Date / Time	Received by:	Date / Time
	10/14/2020 1510		10/14/20 1510

Sample Receipt

Good Condition?	Y	N
Cooler Temp.		°C
Sample Temp.		°C
Total Number of Containers		

Remarks:

ML

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-10
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil with Silica Gel Clean-up

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	10/14/2020		85	nd	nd
S-7.5-EB23	10/13/2020	10/14/2020		83	nd	nd
S-7.5-EB23 Dup	N/A	10/14/2020		85	nd	nd
S-10-EB8	10/14/2020	10/14/2020		int	1800	1300
S-5-EB9	10/14/2020	10/14/2020		int	2700	11000 E
S-10-EB26	10/14/2020	10/14/2020		int	1600	nd
S-10-EB23	10/13/2020	10/14/2020		int	4100	nd
S-7.5-EB27	10/14/2020	10/14/2020	20	int	10000	11000
S-10-EB27	10/14/2020	10/14/2020		int	9100 E	nd
Practical Quantitation Limit					50	250

"E" Indicates reported result is an estimate because it exceeds the calibration range.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-10
Client Project # 031447

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Nova Scotia FID 1 500 ppm	10/14/2020	570	114%	85-115%
CCV Nova Scotia FID 2 500 ppm	10/14/2020	572	114%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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Fax: 360-352-4154

Olympia Lab

Chain of Custody Record

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Date: 10/13/20
Page: 1 of 4

Client: Cardno
Address:
City: State: Zip:
Phone: Fax:
Client Project # 031449

Project Manager: Bob Thompson
Project Name: Port of Everett
Location: City, State: Everett WA
Collector: Paul Prevoa Date of Collection: 10/12 & 10/13
Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals				Field Notes
1 S-7.5-EB12	7.5	1445	S			X														Gx only collected 10/12
2 S-2.5-EB12	2.5	1435	S			X				X										" 10/12
3 S-2.5-EB2	2.5	0815	S			X				X										collected 10/13
4 S-5-EB2	5	0820	S			X				X										
5 S-10-EB2	10	0830	S			X				X										
6 S-2.5-EB1	2.5	0840	S			X				X										
7 S-5-EB1	5	0845	S			X														Gx only
8 S-10-EB1	10	0855	S			X														Gx only
9 S-12.5-EB1	12.5	0900	S			X														Gx only
10 S-15-EB1	15	0905	S			X														Gx only
11 S-2.5-EB17	2.5	0925	S			X				X										
12 S-5-EB17	5	0930	S			X				X										
13 S-12.5-EB17	12.5	0945	S			X				X										
14 S-15-EB17	15	0950	S			X				X										
15 S-2.5-EB19	2.5	1040	S			X				X										
16 S-5-EB19	5	1045	S			X				X										
17 S-7.5-EB19	7.5	1050	S			X				X										

Relinquished by	Date / Time	Received by	Date / Time
Paul P	10/13/2020 1600		10/13/20 1601
			10-14-20 1648

Sample Receipt

Good Condition?	Y N	
Cooler Temp	3.7 ~~16.5~~	°C
Sample Temp.	18.3	°C
Total Number of Containers		

Remarks:

TAT: 24HR 48HR [✓ 5-DAY]

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

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Olympia, WA 98506

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Fax: 360-352-4154

OLYMPIA LAB

Date: 10/13/20
Page: 2 of 4

Client: Cardno
Address:
City: State: Zip:
Phone: Fax:
Client Project # 031447

Project Manager: Bob Thompson
Project Name: Port of Everett
Location: Port of Everett
City, State: Everett, WA
Collector: Paul Prevoo
Date of Collection: 10/13/20
Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals			Field Notes
1 S-10-EB19	10	1055	S			X				X									Collected 10/13
2 S-12.5-EB19	12.5	1100	S			X				X									
3 S-15-EB19	15	1105	S			X				X									
4 S-2.5-~~EB19~~ EB21	2.5	1110	S			X				X									
5 S-5-EB21	5	1115	S			X				X									
6 S-7.5-EB21	7.5	1120	S			X				X									
7 S-10-EB21	10	1125	S			X				X									
8 S-12.5-EB21	12.5	1130	S			X				X									
9 S-15-EB21	15	1135	S			X				X									
10 S-2.5-EB16	2.5	1245	S			X				X									
11 S-5-EB16	5	1250	S			X				X									
12 S-7.5-EB16	7.5	1255	S			X													Gx only
13 S-10-EB16	10	1300	S			X				X									
14 S-2.5-EB20	2.5	1220	S			X				X									
15 S-5-EB20	5	1225	S			X				X									
16 S-7.5-EB20	7.5	1230	S			X				X									
17 S-10-EB20	10	1235	S			X				X									

Relinquished by:	Date / Time 10/13/2020 1600	Received by: 10/13/20	Date / Time 1600
Relinquished by:	Date / Time	Received by: Yvette Anderson	Date / Time 10-14-20 1648
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition? Y N
Temp. 3.7 [illegible] °C
Seals Intact? Y N N/A
Total Number of Containers

Remarks:

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

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Chain of Custody Record

OLYMPIA LAB

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Date: 10/13/20
Page: 3 of 4

Client: Cardno
Address:
City: State: Zip:
Phone: Fax:
Client Project # 031447

Project Manager: Bob Thompson
Project Name: Port of Everett
Location: Port of Everett City, State: Everett, WA
Collector: Paul Prevoa Date of Collection: 10/13/20
Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	cPAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals			Field Notes
1 S-12.5-EB16	12.5	1305	S			X				X									Collected 10/13/2020
2 S-2.5-EB23	2.5	1325	S			X				X									
3 S-5-EB23	5	1330	S			X				X									
4 S-7.5-EB23	7.5	1335	S			X													Gx only
5 S-10-EB23	10	1340	S			X													Gx only
6 S-12.5-EB23	12.5	1345	S			X				X									
7 S-5-EB22	5	1030	S			X				X									
8 S-2.5-EB24	2.5	1355	S			X				X									
9 S-5-EB24	5	1400	S			X				X									
10 S-7.5-EB24	7.5	1405	S			X				X									
11 S-10-EB24	10	1410	S			X				X									
12 S-12.5-EB24	12.5	1415	S			X				X									
13 S-2.5-EB25	2.5	1500	S			X				X									
14 S-5-EB25	5 ~~2.5~~	1505	S			X				X									
15 S-7.5-EB25	7.5	1510	S			X				X									
16 S-10-EB25	10	1515	S			X													Gx only
17 S-12.5-EB25	12.5	1520	S			X				X									

Relinquished by:	Date / Time 10/13/2020 1600	Received by:	Date / Time 10/13/20 1600
Relinquished by:	Date / Time	Received by:	Date / Time 10-14-20 1648
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition?	Y N
Temp.	3.7 ~~16.1~~ °C
Seals Intact?	Y N N/A
Total Number of Containers	

Remarks:

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

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Chain of Custody Record

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Date:

Page: 4 of 4

Client:

Project Manager:

Address:

Project Name:

City: State: Zip:

Location: City, State:

Phone: Fax:

Collector: Date of Collection:

Client Project #

Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals				Field Notes
1 S-15-EB25	15	1525	S			~~X~~				X										No Gx, Dx/Dx only
2																				↑ collected 10/13/2020
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				

Relinquished by: Paul	Date / Time 10/13/2020 1600	Received by:	Date / Time 10/13/20 1600
Relinquished by:	Date / Time	Received by:	Date / Time 10-14-20 1048
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition? Y N

Temp. 3.7 [illegible] °C

Seals Intact? Y N N/A

Total Number of Containers

Remarks:

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-5
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	10/16/2020		100%	nd
Method Blank	N/A	10/17/2020		107%	nd
S-7.5-EB12	10/12/2020	10/17/2020		77%	nd
S-2.5-EB12	10/12/2020	10/17/2020		101%	nd
S-2.5-EB2	10/13/2020	10/17/2020		100%	nd
S-5-EB2	10/13/2020	10/16/2020		86%	nd
S-10-EB2	10/13/2020	10/16/2020		85%	nd
S-2.5-EB1	10/13/2020	10/16/2020		81%	nd
S-5-EB1	10/13/2020	10/17/2020		106%	nd
S-10-EB1	10/13/2020	10/17/2020	10	112%	<100
S-10-EB1 Dup	N/A	10/17/2020	10	112%	<100
S-12.5-EB1	10/13/2020	10/17/2020	5	107%	<50
S-15-EB1	10/13/2020	10/17/2020		115%	nd
S-2.5-EB17	10/13/2020	10/16/2020		89%	nd
S-5-EB17	10/13/2020	10/16/2020		80%	nd
S-5-EB17 Dup	N/A	10/16/2020		87%	nd
S-12.5-EB17	10/13/2020	10/16/2020		87%	nd
S-15-EB17	10/13/2020	10/16/2020		93%	nd
S-15-EB17 Dup	N/A	10/16/2020		80%	nd
S-2.5-EB19	10/13/2020	10/16/2020		80%	nd
S-5-EB19	10/13/2020	10/16/2020	5	96%	<50
S-7.5-EB19	10/13/2020	10/16/2020	5	91%	<50
Practical Quantitation Limit					10

"<" PQL elevated due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Melissa Harrington & Sherry Chilcutt

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-5
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	10/16/2020		96%	nd
Method Blank	N/A	10/17/2020		96%	nd
S-10-EB19	10/13/2020	10/16/2020		89%	nd
S-12.5-EB19	10/13/2020	10/16/2020		91%	nd
S-15-EB19	10/13/2020	10/16/2020		86%	nd
S-2.5-EB21	10/13/2020	10/16/2020		78%	nd
S-5-EB21	10/13/2020	10/16/2020		82%	nd
S-7.5-EB21	10/13/2020	10/16/2020	5	72%	<50
S-10-EB21	10/13/2020	10/16/2020		72%	nd
S-12.5-EB21	10/13/2020	10/16/2020		94%	nd
S-15-EB21	10/13/2020	10/16/2020		95%	nd
S-2.5-EB16	10/13/2020	10/16/2020		93%	nd
S-5-EB16	10/13/2020	10/16/2020	10	95%	<100
S-7.5-EB16	10/13/2020	10/17/2020	10	115%	<100
S-10-EB16	10/13/2020	10/16/2020		95%	nd
S-2.5-EB20	10/13/2020	10/16/2020		96%	nd
S-2.5-EB20 Dup	N/A	10/16/2020		97%	nd
S-5-EB20	10/13/2020	10/17/2020		119%	nd
S-7.5-EB20	10/13/2020	10/16/2020		97%	nd
S-10-EB20	10/13/2020	10/16/2020		96%	nd
Practical Quantitation Limit					10

"<" PQL elevated due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke & Sherry Chilcutt

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-5
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	10/16/2020		96%	nd
Method Blank	N/A	10/17/2020		96%	nd
S-12.5-EB16	10/13/2020	10/16/2020		96%	nd
S-2.5-EB23	10/13/2020	10/16/2020		97%	nd
S-5-EB23	10/13/2020	10/16/2020		97%	nd
S-7.5-EB23	10/13/2020	10/17/2020		110%	nd
S-10-EB23	10/13/2020	10/17/2020		112%	nd
S-12.5-EB23	10/13/2020	10/16/2020		97%	nd
S-5-EB22	10/13/2020	10/17/2020		103%	nd
S-2.5-EB24	10/13/2020	10/17/2020		107%	nd
S-5-EB24	10/13/2020	10/17/2020	5	114%	<50
S-7.5-EB24	10/13/2020	10/17/2020		82%	nd
S-7.5-EB24 Dup	N/A	10/17/2020		113%	nd
S-10-EB24	10/13/2020	10/17/2020		92%	nd
S-12.5-EB24	10/13/2020	10/16/2020		96%	nd
S-2.5-EB25	10/13/2020	10/16/2020		94%	nd
S-5-EB25	10/13/2020	10/16/2020		92%	nd
S-7.5-EB25	10/13/2020	10/16/2020		95%	nd
S-10-EB25	10/13/2020	10/17/2020		102%	nd
S-12.5-EB25	10/13/2020	10/16/2020		94%	nd
S-12.5-EB25 Dup	N/A	10/16/2020		94%	nd
Practical Quantitation Limit					10

"<" PQL elevated due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke & Sherry Chilcutt

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-5
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil with Silica Gel Clean-up

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	10/15/2020		103	nd	nd
S-2.5-EB12	10/12/2020	10/15/2020		71	nd	nd
S-2.5-EB2	10/13/2020	10/15/2020		102	nd	nd
S-5-EB2	10/13/2020	10/15/2020		97	nd	nd
S-10-EB2	10/13/2020	10/15/2020		72	nd	nd
S-2.5-EB1	10/13/2020	10/15/2020		84	nd	nd
S-2.5-EB17	10/13/2020	10/15/2020		106	nd	nd
S-5-EB17	10/13/2020	10/15/2020		73	nd	nd
S-12.5-EB17	10/13/2020	10/15/2020		111	nd	nd
S-15-EB17	10/13/2020	10/15/2020		107	nd	nd
S-2.5-EB19	10/13/2020	10/15/2020		75	nd	nd
S-2.5-EB19 Dup	N/A	10/15/2020		115	nd	nd
S-5-EB19	10/13/2020	10/15/2020		int	1900	360
S-7.5-EB19	10/13/2020	10/15/2020		int	4500	760
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Sherry Chilcutt

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-5
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil with Silica Gel Clean-up

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	10/15/2020		103	nd	nd
Method Blank	N/A	10/16/2020		103	nd	nd
Method Blank	N/A	10/17/2020		107	nd	nd
S-10-EB19	10/13/2020	10/15/2020		116	nd	nd
S-12.5-EB19	10/13/2020	10/15/2020		106	nd	nd
S-15-EB19	10/13/2020	10/15/2020		76	nd	nd
S-2.5-EB21	10/13/2020	10/15/2020		111	nd	nd
S-5-EB21	10/13/2020	10/15/2020	10	int	8100	12000
S-7.5-EB21	10/13/2020	10/15/2020		int	3700	640
S-10-EB21	10/13/2020	10/15/2020		112	nd	nd
S-10-EB21 Dup	N/A	10/15/2020		84	nd	nd
S-12.5-EB21	10/13/2020	10/16/2020		99	nd	nd
S-15-EB21	10/13/2020	10/16/2020		100	nd	nd
S-2.5-EB16	10/13/2020	10/16/2020		112	nd	nd
S-5-EB16	10/13/2020	10/16/2020		117	4800	1100
S-10-EB16	10/13/2020	10/16/2020		97	170	nd
S-2.5-EB20	10/13/2020	10/16/2020		112	170	nd
S-5-EB20	10/13/2020	10/17/2020	10	111	8400	2200
S-7.5-EB20	10/13/2020	10/17/2020		107	180	nd
S-10-EB20	10/13/2020	10/17/2020		103	nd	nd
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Sherry Chilcutt & Jenny Anderson

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-5
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil with Silica Gel Clean-up

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	10/16/2020		85	nd	nd
S-12.5-EB16	10/13/2020	10/17/2020		104	nd	nd
S-12.5-EB16 Dup	N/A	10/17/2020		103	nd	nd
S-2.5-EB23	10/13/2020	10/17/2020		97	nd	nd
S-5-EB23	10/13/2020	10/17/2020		100	nd	nd
S-12.5-EB23	10/13/2020	10/17/2020		101	62	nd
S-5-EB22	10/13/2020	10/17/2020		101	nd	nd
S-2.5-EB24	10/13/2020	10/17/2020		101	nd	nd
S-5-EB24	10/13/2020	10/17/2020	2	100	nd	6300
S-7.5-EB24	10/13/2020	10/17/2020	2	116	8100	1200
S-10-EB24	10/13/2020	10/17/2020		109	2300	nd
S-12.5-EB24	10/13/2020	10/17/2020		100	nd	nd
S-2.5-EB25	10/13/2020	10/17/2020		117	nd	nd
S-2.5-EB25 Dup	N/A	10/17/2020		100	nd	nd
S-5-EB25	10/13/2020	10/16/2020		113	nd	nd
S-7.5-EB25	10/13/2020	10/16/2020		100	nd	nd
S-12.5-EB25	10/13/2020	10/16/2020		109	nd	nd
S-15-EB25	10/13/2020	10/16/2020		97	nd	nd
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke & Jenny Anderson

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-5
Client Project # 031447

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Yahtzee PID 1 50 ppm	10/16/2020	47.5	95%	80-120%
CCV RV1 50 ppm	10/16/2020	47.9	96%	80-120%
CCV RV1 50 ppm	10/17/2020	57.9	116%	80-120%
Practical Quantitation Limit		10		

ANALYSES PERFORMED BY: Melissa Harrington & Sherry Chilcutt & Paul Burke

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-5
Client Project # 031447

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Nova Scotia FID 1 500 ppm	10/16/2020	557	111%	85-115%
CCV Nova Scotia FID 2 500 ppm	10/16/2020	524	105%	85-115%
CCV Stella FID 1 500 ppm	10/15/2020	464	93%	85-115%
CCV Stella FID 2 500 ppm	10/15/2020	519	104%	85-115%
CCV Stella FID 3 500 ppm	10/15/2020	477	95%	85-115%
CCV Kilvan FID 1 500 ppm	10/17/2020	464	93%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Paul Burke & Jenny Anderson & Sherry Chilcutt

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Chain of Custody Record

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Date: 10/14/20
Page: 1 of 3

Client: Cardno
Address:
City: State: Zip:
Phone: Fax:
Client Project # 031447

Project Manager: Bob Thompson
Project Name: Port of Everett
Location: Port of Everett City, State: Everett, WA
Collector: Paul Prevoa Date of Collection: 10/14/20
Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals				Field Notes
1 S-2.5-EB8	2.5	0755	S			X				X										Collected 10/14/2020
2 S-5-EB8	5	0800	S			X				X										
3 S-7.5-EB8	7.5	0805	S			X				X										
4 S-10-EB8	10	0810	S			X														Gx only
5 S-12.5-EB8	12.5	0815	S			X				X										
6 S-2.5-EB9	2.5	0830	S			X				X										
7 S-5-EB9	5	0835	S			X														Gx only
8 S-7.5-EB9	7.5	0840	S			X				X										
9 S-10-EB9	10	0845	S			X				X										
10 S-2.5-EB26	2.5	0850	S			X				X										
11 S-5-EB26	5	0855	S			X				X										
12 S-10-EB26	10	0905	S			X														Gx only
13 S-12.5-EB26	12.5	0910	S			X				X										
14 S-2.5-EB27	2.5	0925	S			X				X										
15 S-5-EB27	5	0930	S			X				X										
16 S-7.5-EB27	7.5	0935	S			X														Gx only
17 S-10-EB27	10	0940	S			X														Gx only

Relinquished by:	Date / Time 10/14/2020 1500	Received by: Paul Burk	Date / Time 10/14/20 1500
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition?	Y N
Cooler Temp.	°C
Sample Temp.	°C
Total Number of Containers	

Remarks:

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

Chain of Custody Record

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OLYMPIA LAB

Date: 10/14/20
Page: 2 of 3

Client: CARDNO
Address:
City:
State:
Zip:
Phone:
Fax:
Client Project # 031447

Project Manager: Bob Thompson
Project Name: Port of Everett
Location:
City, State: Everett, WA
Collector: Paul PreVoa
Date of Collection: 10/14/20
Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals			Field Notes
1	S-12.5-EB27	12.5	0945	S			X				X									Collected 10/14
2	S-2.5-EB28	2.5	1010	S			X				X									
3	S-5-EB28	5	1015	S			X				X									
4	S-7.5-EB28	7.5	1020	S			X				X									
5	S-10-EB28	10	1025	S			X				X									
6	S-2.5-EB29	2.5	1035	S			X				X									
7	S-5-EB29	5	1040	S			X				X									
8	S-2.5-EB13	2.5	1125	S			X				X									
9	S-5-EB13	5	1130	S			X				X									
10	S-7.5-EB13	7.5	1135	S			X				X									
11	S-10-EB13	10	1140	S			X				X									
12	S-12.5-EB13	12.5	1145	S			X				X									
13	S-15-EB13	15	1150	S			X				X									
14	~~S-14~~ S-2.5-EB14	2.5	1310	S			X				X									
15	S-7.5-EB14	7.5	1320	S			X				X									
16	S-10-EB14	10	1325	S			X				X									
17	S-12.5-EB14	12.5	1330	S			X				X									

Relinquished by:	Date / Time	Received by:	Date / Time
	10/14/2020 1500		10/14/20 1510
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition?	Y N
Cooler Temp.	°C
Sample Temp.	°C
Total Number of Containers	

Remarks:

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

Chain of Custody Record

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Olympia, WA 98506

Ph: 360-352-2110
Fax: 360-352-4154

OLYMPIA LAB

Date:

Page: 3 of 3

Client:

Project Manager:

Address:

Project Name:

City: State: Zip:

Location: City, State:

Phone: Fax:

Collector: Date of Collection:

Client Project #

Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals				Field Notes
1 S-2.5-EB15	2.5	1220	S			X				X										Collected 10/14
2 S-5-EB15	5	1225	S			X				X										↓
3 S-7.5-EB15	7.5	1230	S			X				X										↓
4 S-10-EB15	10	1240	S			X				X										↓
5 S-12.5-EB15	12.5	1245	S			X				X										↓
6 S-2.5-EB10	2.5	1335	S			X				X										↓
7 S-5-EB10	5	1340	S			X				X										↓
8 S-7.5-EB10	7.5	1345	S			X				X										↓
9 S-10-EB10	10	1350	S			X				X										↓
10 S-12.5-EB10	12.5	1355	S			X				X										↓
11 S-15-EB10	15	1400	S			X				X										↓
12 S-2.5-EB30	2.5	1405	S			X				X										↓
13 S-5-EB30	5	1410	S			X				X										↓
14 S-10-EB30	10	1420	S			X				X										↓
15 S-12.5-EB30	12.5	1425	S			X				X										↓
16																				
17																				

Relinquished by:	Date / Time	Received by:	Date / Time
	10/14/2020 1500		10/14/20 1546
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition? Y N

Cooler Temp. °C

Sample Temp. °C

Total Number of Containers

Remarks:

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201015-3
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	10/14/2020		97%	nd
Method Blank	N/A	10/15/2020		95%	nd
Method Blank	N/A	10/16/2020		110%	nd
S-2.5-EB8	10/14/2020	10/14/2020		98%	nd
S-5-EB8	10/14/2020	10/14/2020		106%	nd
S-7.5-EB8	10/14/2020	10/16/2020	5	90%	nd
S-10-EB8	10/14/2020	10/14/2020	2	95%	<20
S-12.5-EB8	10/14/2020	10/14/2020		95%	nd
S-2.5-EB9	10/14/2020	10/14/2020		98%	nd
S-5-EB9	10/14/2020	10/14/2020	5	98%	<50
S-7.5-EB9	10/14/2020	10/15/2020		94%	nd
S-10-EB9	10/14/2020	10/15/2020		95%	nd
S-2.5-EB26	10/14/2020	10/14/2020		97%	nd
S-2.5-EB26 Dup	N/A	10/14/2020		96%	nd
S-5-EB26	10/14/2020	10/16/2020		102%	nd
S-10-EB26	10/14/2020	10/14/2020	2	98%	<20
S-12.5-EB26	10/14/2020	10/14/2020		93%	nd
S-2.5-EB27	10/14/2020	10/14/2020		97%	nd
S-5-EB27	10/14/2020	10/16/2020		100%	nd
S-7.5-EB27	10/14/2020	10/14/2020	10	97%	<100
S-10-EB27	10/14/2020	10/14/2020	10	95%	<100
S-10-EB27 Dup	N/A	10/14/2020	10	97%	<100
Practical Quantitation Limit					10

"nd" Indicates not detected at the listed detection limits.
“<” PQL elevated due to dilution.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Sherry Chilcutt

Libby Environmental, Inc.

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201015-3
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	10/14/2020		97%	nd
Method Blank	N/A	10/15/2020		95%	nd
Method Blank	N/A	10/16/2020		110%	nd
S-12.5-EB27	10/14/2020	10/14/2020		95%	nd
S-12.5-EB27 Dup	N/A	10/14/2020		95%	nd
S-2.5-EB28	10/14/2020	10/14/2020		96%	nd
S-5-EB28	10/14/2020	10/15/2020		93%	nd
S-7.5-EB28	10/14/2020	10/15/2020		94%	nd
S-10-EB28	10/14/2020	10/16/2020	5	98%	<50
S-2.5-EB29	10/14/2020	10/14/2020		95%	nd
S-5-EB29	10/14/2020	10/16/2020		66%	nd
S-2.5-EB13	10/14/2020	10/14/2020		96%	nd
S-5-EB13	10/14/2020	10/16/2020	5	105%	<50
S-7.5-EB13	10/14/2020	10/16/2020	5	85%	190
S-7.5-EB13 Dup	N/A	10/16/2020	5	112%	230
S-10-EB13	10/14/2020	10/16/2020		116%	nd
S-12.5-EB13	10/14/2020	10/14/2020		95%	nd
S-15-EB13	10/14/2020	10/16/2020		114%	nd
S-2.5-EB14	10/14/2020	10/14/2020		96%	nd
S-7.5-EB-14	10/14/2020	10/16/2020		116%	nd
S-10-EB14	10/14/2020	10/16/2020		90%	nd
S-12.5-EB14	10/14/2020	10/14/2020		96%	nd
Practical Quantitation Limit					10

"nd" Indicates not detected at the listed detection limits.
“<” PQL elevated due to dilution.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Sherry Chilcutt

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201015-3
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	10/14/2020		95%	nd
Method Blank	N/A	10/15/2020		95%	nd
Method Blank	N/A	10/16/2020		110%	nd
S-2.5-EB15	10/14/2020	10/16/2020		96%	nd
S-5-EB15	10/14/2020	10/16/2020		104%	nd
S-7.5-EB15	10/14/2020	10/14/2020		101%	19
S-10-EB15	10/14/2020	10/14/2020		107%	nd
S-12.5-EB15	10/14/2020	10/14/2020		95%	nd
S-2.5-EB10	10/14/2020	10/14/2020		96%	nd
S-5-EB10	10/14/2020	10/14/2020		95%	nd
S-5-EB10 Dup	N/A	10/14/2020		97%	nd
S-7.5-EB10	10/14/2020	10/16/2020		97%	nd
S-7.5-EB10 Dup	N/A	10/16/2020	5	103%	<50
S-10-EB10	10/14/2020	10/16/2020	5	103%	nd
S-12.5-EB10	10/14/2020	10/15/2020		95%	nd
S-15-EB10	10/14/2020	10/16/2020		113%	nd
S-2.5-EB30	10/14/2020	10/15/2020		96%	nd
S-5-EB30	10/14/2020	10/15/2020		97%	nd
S-10-EB30	10/14/2020	10/17/2020	10	113%	<100
S-12.5-EB30	10/14/2020	10/15/2020		96%	nd
S-12.5-EB30 Dup	N/A	10/15/2020		97%	nd
Practical Quantitation Limit					10

"nd" Indicates not detected at the listed detection limits.
“<” PQL elevated due to dilution.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke & Sherry Chilcutt

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201015-3
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil with Silica Gel Clean-up

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	10/16/2020		82	nd	nd
Method Blank	N/A	10/18/2020		95	nd	nd
S-2.5-EB8	10/14/2020	10/16/2020		79	nd	nd
S-5-EB8	10/14/2020	10/16/2020		int	2600	4300
S-7.5-EB8	10/14/2020	10/16/2020	5	int	7400	13000
S-12.5-EB8	10/14/2020	10/16/2020		117	nd	nd
S-2.5-EB-9	10/14/2020	10/18/2020		109	nd	nd
S-7.5-EB9	10/14/2020	10/16/2020		107	nd	nd
S-7.5-EB9 Dup	N/A	10/16/2020		97	nd	nd
S-10-EB9	10/14/2020	10/16/2020		110	nd	nd
S-2.5-EB26	10/14/2020	10/16/2020		99	nd	nd
S-5-EB26	10/14/2020	10/16/2020		105	76	nd
S-12.5-EB26	10/14/2020	10/16/2020		100	nd	nd
S-2.5-EB27	10/14/2020	10/16/2020		108	nd	nd
S-5-EB27	10/14/2020	10/16/2020		103	nd	nd
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201015-3
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil with Silica Gel Clean-up

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	10/16/2020		103	nd	nd
Method Blank	N/A	10/17/2020		105	nd	nd
S-12.5-EB27	10/14/2020	10/17/2020		102	nd	nd
S-2.5-EB28	10/14/2020	10/17/2020		110	nd	nd
S-5-EB28	10/14/2020	10/17/2020		100	nd	nd
S-7.5-EB28	10/14/2020	10/16/2020		105	nd	nd
S-7.5-EB28 Dup	N/A	10/16/2020		98	nd	nd
S-10-EB28	10/14/2020	10/16/2020		83	nd	nd
S-2.5-EB29	10/14/2020	10/16/2020		123	nd	nd
S-5-EB29	10/14/2020	10/16/2020		116	nd	nd
S-2.5-EB13	10/14/2020	10/16/2020		88	nd	nd
S-5-EB13	10/14/2020	10/16/2020		int	1400	1800
S-7.5-EB13	10/14/2020	10/16/2020	10	int	11000	1800
S-10-EB13	10/14/2020	10/16/2020		int	320	nd
S-12.5-EB13	10/14/2020	10/16/2020		116	nd	nd
S-15-EB13	10/14/2020	10/16/2020		124	nd	nd
S-2.5-EB14	10/14/2020	10/16/2020		85	nd	nd
S-2.5-EB14 Dup	N/A	10/16/2020		83	nd	nd
S-7.5-EB-14	10/14/2020	10/16/2020	10	int	5000	6900
S-10-EB14	10/14/2020	10/16/2020	10	int	4100	1500
S-12.5-EB14	10/14/2020	10/16/2020		114	nd	nd
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Jenny Anderson

Libby Environmental, Inc.

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201015-3
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil with Silica Gel Clean-up

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	10/16/2020		76	nd	nd
S-2.5-EB15	10/14/2020	10/16/2020		82	nd	nd
S-5-EB15	10/14/2020	10/16/2020	2	127	1100	2000
S-7.5-EB15	10/14/2020	10/16/2020	2	85	2200	260
S-10-EB15	10/14/2020	10/16/2020		117	nd	nd
S-12.5-EB15	10/14/2020	10/16/2020		83	nd	nd
S-2.5-EB10	10/14/2020	10/18/2020		104	nd	nd
S-5-EB10	10/14/2020	10/16/2020		117	nd	nd
S-5-EB10 Dup	N/A	10/16/2020		118	nd	nd
S-7.5-EB10	10/14/2020	10/16/2020	3	int	12000	nd
S-10-EB10	10/14/2020	10/16/2020		int	4300	nd
S-12.5-EB10	10/14/2020	10/16/2020		117	nd	nd
S-15-EB10	10/14/2020	10/16/2020		123	nd	nd
S-2.5-EB30	10/14/2020	10/16/2020		78	nd	nd
S-5-EB30	10/14/2020	10/16/2020		107	nd	560
S-10-EB30	10/14/2020	10/16/2020	10	int	39000	nd
S-12.5-EB30	10/14/2020	10/16/2020		75	nd	nd
S-12.5-EB30 Dup	N/A	10/16/2020		69	nd	nd
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Kodey Eley & Jenny Anderson

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-5
Client Project # 031447

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV RV1 50 ppm	10/14/2020	57.2	114%	80-120%
CCV RV1 50 ppm	10/15/2020	52.1	104%	80-120%
CCV RV1 50 ppm	10/17/2020	57.9	116%	80-120%
CCV Marvin 50 ppm	10/16/2020	57.9	116%	80-120%
Practical Quantitation Limit		10		

ANALYSES PERFORMED BY: Paul Burke & Sherry Chilcutt

Libby Environmental, Inc.

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L201014-5
Client Project # 031447

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Sam FID 1 500 ppm	10/16/2020	437	87%	85-115%
CCV Sam FID 2 500 ppm	10/16/2020	519	104%	85-115%
CCV Stella FID 1 500 ppm	10/16/2020	512	102%	85-115%
CCV Stella FID 2 500 ppm	10/16/2020	567	113%	85-115%
CCV Stella FID 3 500 ppm	10/16/2020	503	101%	85-115%
CCV Stella FID 1 500 ppm	10/18/2020	458	92%	85-115%
CCV Stella FID 2 500 ppm	10/18/2020	532	106%	85-115%
CCV Stella FID 3 500 ppm	10/18/2020	478	96%	85-115%
CCV Elmer FID 1 500 ppm	10/16/2020	511	102%	85-115%
CCV Elmer FID 2 500 ppm	10/16/2020	549	110%	85-115%
CCV Nova Scotia FID 1 500 ppr	10/16/2020	557	111%	85-115%
CCV Nova Scotia FID 2 500 ppr	10/16/2020	524	105%	85-115%
CCV Kilvan FID 1 500 ppm	10/17/2020	514	103%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Kodey Eley & Jenny Anderson & Paul Burke

Libby Environmental, Inc.
3322 South Bay Road NE • Olympia, WA 98506-2957

February 18, 2021

Robert Thompson
Cardno
801 Second Ave, Suite 700
Seattle, Washington 98104

Dear Mr. Thompson:

Please find enclosed the analytical data report for the Port of Everett Project located in Everett, Washington.

The results of the analyses are summarized in the attached tables. Applicable detection limits and QA/QC data are included. The sample(s) will be disposed of in 30 days unless we are contacted to arrange long term storage.

Libby Environmental, Inc. appreciates the opportunity to have provided analytical services for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Sherry L. Chilcutt
Senior Chemist
Libby Environmental, Inc.

Phone (360) 352-2110 • Fax (360) 352-4154 • libbyenv@gmail.com

Libby Environmental, Inc. ~~[illegible]~~ **Chain of Custody Record** www.LibbyEnvironmental.com

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Date: 1/25/21
Page: 1 of 1

Client: Cardno Mobile Lab
Address:
City: State: Zip:
Phone: Fax:
Client Project # 031447

Project Manager:
Project Name:
Location: Port of Everett City, State: Everett WA
Collector: Cameron Penner-Ash Date of Collection: 1/25/21
Email:

S-9.5-EB31

	Sample Number	Depth	Time	Sample Type	Container Type	VOA 8021B	VOA 8021B BTEX Only	VOA 8260	SEMI VOL 8270	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx Ext.	PAH 8270	PCB's 8082	MTCA 5 Metals				Field Notes ~~See Remarks!~~
1	~~S-EB31-9.5~~	9.5	0935	S	2 VOAs 1 Jar						X		X							
2	S-15-EB33	15	1035	S	2 VOAS 1 Jar						X		X							
3	S-12.5-EB33	12.5	1030	S	2 Soil VOAs 1 Jar						X		X							
4	S-10-EB34	10	1210	S	Same						X		X							
5	S-12.5-EB34	12.5	1215	S	Same						X		X							
6	S-12.5-SB4	12.5	1430	S	Same						X		X							
7	S-15-SB4	15	1435	S	Same						X		X							
8	S-17.5-SB4	17.5	1500	S	Same						X		X							
9	S-20-SB4	20	1505	S	Same						X		X							
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				

Relinquished by:	Date / Time 1/25/21 1522 ~~1523~~ CPA	Received by:	Date / Time 1/25/21 1522
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt:

Good Condition?	
Cold?	
Seals Intact?	
Total Number of Containers	

Remarks: ~~Gx to be analyzed at fix base - std~~

ML

TAT: 24HR 48HR [✓ 5-DAY]

LEGAL ACTION CLAUSE: *In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.*

Distribution: White - Lab, Yellow - File, Pink - [✓ Originator]

Libby Environmental, Inc.

Chain of Custody Record

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Fix Base Lab

Date: 1/25/21

Page: 1 of 2

Client: Cardno

Address:

City: State: Zip:

Phone: Fax:

Client Project # 031447

Project Manager:

Project Name: Port of Everett

Location: Port of Everett

City, State: Everett, WA

Collector: Cameron Penner-Ash

Date of Collection: 1/25/21

Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOA 8021B	VOA 8021B BTEX Only	VOA 8260	SEMI VOL 8270	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx Ext.	PAH 8270	PCB's 8082	MTCA 5 Metals				Field Notes
~~1 S-12.5-EB32~~	~~12.5~~	~~1000~~	~~S~~	~~2 vocs~~						~~X~~		~~X~~	Moved to COC				1/26/21		Ran Gx in field - 1/25/21
2 ~~S-12.5~~																			
~~3 S-12.5-EB33~~	~~12.5~~	~~1040~~	~~S~~	~~1 Jar 2 vocs~~						~~X~~		~~X~~							Moved to COC 1/27/21
~~4 S-20-EB33~~	~~20~~	~~1045~~	~~S~~	~~1 Jar 2 vocs~~						~~X~~		~~X~~							Moved to COC 1/27/21
5 S-7.5-EB31	7.5	0930	S	1 Jar 2 vocs						X		X							
6 S-5-EB31	5	0925	S	1 Jar 2 vocs						X		X							
~~7 S-10-EB32~~	~~10~~	~~0955~~	~~S~~	~~Same~~						~~X~~		~~X~~							Moved to COC 1/26/21
8 S-5-EB33	5	1015	S	Same						X		X							
9 S-~~10~~ 7.5-EB33	7.5	1020	S	Same						X		X							
10 S-10-EB33	10	1025	S	Same						X		X							
11 S-7.5-EB34	7.5	1205	S	Same						X		X							
12 S-15-EB34	15	1220	S	Same						X		X							
13 S-17.5-EB34	17.5	1225	S	Same						X		X							
14 S-20-EB34	20	1230	S	Same						X		X							
15 S-5-EB35	5	1335	S	Same						X		X							
16 S-7.5-EB35	7.5	1340	S	Same						X		X							
17 S-10-EB35	10	1345	S	Same						X		X							

Relinquished by:	Date / Time	Received by:	Date / Time
	1/25/21 1524		1/25/21 1524
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt:

Good Condition?	
Cold?	
Seals Intact?	
Total Number of Containers	

Remarks:

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

Chain of Custody Record

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Fix Base Lab

Date: 1/25/21

Page: 2 of 2

Client: Cardno

Address:

City: State: Zip:

Phone: Fax:

Client Project # 031447

Project Manager:

Project Name: Port of Everett

Location: Port of Everett City, State: Everett, WA

Collector: Cameron Penner-Ash Date of Collection: 1/25/21

Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOA 8021B	VOA 8021B BTEX Only	VOA 8260	SEMI VOL 8270	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx Ext.	PAH 8270	PCB's 8082	MTCA 5 Metals				Field Notes
1	S-12.5-EB35	12.5	1350	S	2 VOAs 1 Jar						X		X							
2	S-15-EB35	15	1355	S	Same						X		X							
3	S-5-SB4	5	1400	S	Same						X		X							
4	S-7.5-SB4	7.5	1405	S	Same						X		X							
5	S-10-SB4	10	1410	S	Same						X		X							
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				

Relinquished by:	Date / Time	Received by:	Date / Time
	1/25/21 1523		1/25/21 1523

Sample Receipt:

Good Condition?	
Cold?	
Seals Intact?	
Total Number of Containers	

Remarks:

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210125-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	1/25/2021		85	nd
S-9.5-EB31	1/25/2021	1/25/2021	10	81	<100
S-15-EB33	1/25/2021	1/25/2021		70	nd
S-12.5-EB33	1/25/2021	1/25/2021	100	90	<1000
S-10-EB34	1/25/2021	1/25/2021		88	nd
S-12.5-EB34	1/25/2021	1/25/2021		93	nd
S-12.5-SB4	1/25/2021	1/25/2021	5	79	<50
S-15-SB4	1/25/2021	1/25/2021		95	nd
S-15-SB4 Dup	1/25/2021	1/25/2021		95	nd
S-17.5-SB4	1/25/2021	1/25/2021		92	nd
S-20-SB4	1/25/2021	1/25/2021	2	86	<20
Practical Quantitation Limit					10

"<" Indicates elevated PQL due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210125-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	1/25/2021	100	nd	nd
S-9.5-EB31	1/25/2021	1/25/2021	int	3400	nd
S-9.5-EB31 Dup	1/25/2021	1/25/2021	int	3500	nd
S-15-EB33	1/25/2021	1/25/2021	117	150	nd
S-12.5-EB33	1/25/2021	1/25/2021	int	21000 E	nd
S-10-EB34	1/25/2021	1/25/2021	int	2100	nd
S-12.5-EB34	1/25/2021	1/25/2021	int	1600	760
S-12.5-SB4	1/25/2021	1/25/2021	int	1700	nd
S-15-SB4	1/25/2021	1/25/2021	84	56	nd
S-17.5-SB4	1/25/2021	1/25/2021	94	nd	nd
S-20-SB4	1/25/2021	1/25/2021	int	610	nd
Practical Quantitation Limit				50	250

"E" Indicates reported value is an estimate because it exceeds the calibration range.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210125-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	1/28/2021		91	nd
Method Blank	N/A	1/29/2021		134	nd
S-7.5-EB31	1/25/2021	1/29/2021		115	nd
S-5-EB31	1/25/2021	1/29/2021		122	nd
S-5-EB33	1/25/2021	1/29/2021		122	nd
S-7.5-EB33	1/25/2021	1/29/2021		107	nd
S-10-EB33	1/25/2021	1/29/2021	8	126	<40
S-7.5-EB34	1/25/2021	1/28/2021		91	nd
S-15-EB34	1/25/2021	1/28/2021		68	nd
S-17.5-EB34	1/25/2021	1/28/2021		92	nd
S-20-EB34	1/25/2021	1/28/2021		66	nd
S-5-EB35	1/25/2021	1/28/2021		82	nd
S-7.5-EB35	1/25/2021	1/28/2021		89	nd
S-10-EB35	1/25/2021	1/29/2021		129	nd
Practical Quantitation Limit					10

"<" Indicates elevated PQL due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210125-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
S-12.5-EB35	1/25/2021	1/29/2021	3	111	<15
S-12.5-EB35 Dup	1/25/2021	1/29/2021	3	115	<15
S-15-EB35	1/25/2021	1/29/2021		120	nd
S-5-SB4	1/25/2021	1/28/2021		91	nd
S-5-SB4 Dup	1/25/2021	1/28/2021		90	nd
S-7.5-SB4	1/25/2021	1/28/2021		91	nd
S-10-SB4	1/25/2021	1/28/2021		77	nd
S-10-SB4 Dup	1/25/2021	1/28/2021		97	nd
Practical Quantitation Limit					10

"<" Indicates elevated PQL due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Toluene-d8): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210125-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	2/1/2021		100	nd	nd
Method Blank	N/A	1/29/2021		102	nd	nd
Method Blank	N/A	1/28/2021		101	nd	nd
S-7.5-EB31	1/25/2021	1/29/2021		89	nd	nd
S-7.5-EB31 Dup	1/25/2021	1/29/2021		89	nd	nd
S-5-EB31	1/25/2021	1/29/2021		122	nd	nd
S-5-EB33	1/25/2021	1/29/2021		114	nd	nd
S-7.5-EB33	1/25/2021	2/1/2021		101	nd	nd
S-7.5-EB33 Dup	1/25/2021	2/1/2021		101	nd	nd
S-10-EB33	1/25/2021	2/1/2021	10	98	28000	1580
S-7.5-EB34	1/25/2021	1/29/2021		106	nd	nd
S-15-EB34	1/25/2021	1/29/2021		105	nd	nd
S-17.5-EB34	1/25/2021	1/29/2021		74	nd	nd
S-20-EB34	1/25/2021	1/29/2021		118	nd	nd
S-5-EB35	1/25/2021	1/28/2021		84	nd	nd
S-7.5-EB35	1/25/2021	1/29/2021		89	nd	nd
S-10-EB35	1/25/2021	1/29/2021		120	nd	nd
S-10-EB35 Dup	1/25/2021	1/29/2021		119	nd	nd
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Jenny Anderson

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210125-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
S-12.5-EB35	1/25/2021	2/1/2021		104	520	430
S-15-EB35	1/25/2021	1/29/2021		113	nd	nd
S-5-SB4	1/25/2021	1/29/2021		86	nd	nd
S-7.5-SB4	1/25/2021	1/29/2021		105	nd	nd
S-10-SB4	1/25/2021	1/29/2021		int	3900	nd
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Jenny Anderson

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210125-50
Client Project # 031447

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Yahtzee PID 1 50 ppm	1/25/2021	56.9	114%	80-120%
Practical Quantitation Limit		10		

ANALYSES PERFORMED BY: Paul Burke

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Yahtzee PID 1 50 ppm	1/28/2021	59.7	119%	80-120%
CCV Yahtzee PID 1 50 ppm	1/29/2021	58.6	117%	80-120%
Practical Quantitation Limit		10		

ANALYSES PERFORMED BY: Paul Burke

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210125-50
Client Project # 031447

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Maru FID 1 500 ppm	1/25/2021	505	101%	85-115%
CCV Maru FID 2 500 ppm	1/25/2021	557	111%	85-115%
CCV Elmer FID 1 500 ppm	1/25/2021	547	109%	85-115%
CCV Elmer FID 2 500 ppm	1/25/2021	558	112%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Paul Burke

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Stella FID 1 500 ppm	1/28/2021	516	103%	85-115%
CCV Stella FID 2 500 ppm	1/28/2021	503	101%	85-115%
CCV Stella FID 3 500 ppm	1/28/2021	430	86%	85-115%
CCV Stella FID 1 500 ppm	1/29/2021	542	108%	85-115%
CCV Stella FID 2 500 ppm	1/29/2021	472	94%	85-115%
CCV Stella FID 3 500 ppm	1/29/2021	449	90%	85-115%
CCV Kilvan FID 1 500 ppm	2/1/2021	433	87%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Jenny Anderson

Libby Environmental, Inc.

Chain of Custody Record

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Date: 1/26/21
Page: 1 of 2

Client: Cardno
Address:
City: State: Zip:
Phone: Fax:
Client Project # 031441

Project Manager:
Project Name: Port of Everett
Location: Port of Everett City, State: Everett, WA
Collector: Cameron Penner-Ash Date of Collection: 1/26/21
Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOA 8021B	VOA 8021B BTEX Only	VOA 8260	SEMI VOL 8270	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx Ext.	PAH 8270	PCB's 8082	MTCA 5 Metals				Field Notes
1	S-5-EB36	5	0830	S	1 Jar 2 VOAs						X		X							
2	S-7.5EB36	7.5	0835	S	Same						X		X							
3	S-10-EB36	10	0840	S	Same						X		X							mobile Lab
4	S-12.5-EB36	12.5	0845	S	Same						X		X							
5	S-5-SB1	5	0915	S	Same						X		X							
6	S-7.5-SB1	7.5	0920	S	Same						X		X							
7	S-10-SB1	10	0925	S	Same						X		X							Mobile Lab
8	S-12.5-SB1	12.5	0930	S	Same						X		X							mobile lab
9	S-15-SB1	15	0935	S	Same						X		X							mobile Lab
10	S-5-SB2	5	0940	S	Same						X		X							
11	S-7.5-SB2	7.5	0945	S	Same						X		X							
12	S-10-SB2	10	0950	S	Same						X		X							Mobile Lab
13	S-12.5-SB2	12.5	0955	S	Same						X		X							Mobile Lab
14	S-15-SB2	15	1005	S	Same						X		X							
15	S-5-SB3	5	1010	S	Same						X		X							
16	S-7.5-SB3	7.5	1015	S	Same						X		X							
17	S-10-SB3	10	1020	S	Same						X		X							Mobile Lab

Relinquished by:	Date / Time	Received by:	Date / Time
	1/26/21 1452		1/26/21 1452

Sample Receipt:

Good Condition?	
Cold?	
Seals Intact?	
Total Number of Containers	

Remarks:

ML

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

Chain of Custody Record

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Date: 1/26/21

Page: 2 of 2

Client: Cardno

Project Manager:

Address:

Project Name: Port of Everett

City: State: Zip:

Location: Port of Everett

City, State: Everett, WA

Phone: Fax:

Collector: Cameron Pennes-Ash

Date of Collection: 1/26/21

Client Project # 031447

Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOA 8021B	VOA 8021B BTEX Only	VOA 8260	SEMI VOL 8270	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx Ext.	PAH 8270	PCB's 8082	MTCA 5 Metals				Field Notes
1	S-12.5-SB3	12.5	1025	S	2 VOA 1 Jar						X		X							Mobile Lab
2	S-15-SB3	15	1030	S	Same						X		X							
3	S-20-SB3	20	1035	S	Same						X		X							
4	S-5-SB5	5	1105	S	Same						X		X							
5	S-10-SB5	10	1115	S	Same						X		X							
6	S-7.5-SB5	7.5	1110	S	Same						X		X							
7	S-12.5-SB5	12.5	1120	S	Same						X		X							
8	S-15-SB5	15	1125	S	Same						X		X							Mobile lab
9	S-17.5-SB5	17.5	1130	S	Same						X		X							Mobile lab
10	S-20-SB5	20	1135	S	Same						X		X							
11	S-5-EB40	5	1245	S	Same						X		X							
12	S-7.5-EB40	7.5	1250	S	Same						X		X							Mobile Lab
13	S-10-EB40	10	1255	S	Same						X		X							
14	S-12.5-EB40	12.5	1300	S	Same						X		X							
15	S-10-EB32	10	9:55	S	Same						X		X							Collected 1/25/21 Mob
16	S-12.5-EB32	12.5	10:00	S	Same						X		X							" " Mobi
17																				

Relinquished by:	Date / Time	Received by:	Date / Time
	1/26/21 1452		1/26/21 1452

Sample Receipt:

Good Condition?

Cold?

Seals Intact?

Total Number of Containers

Remarks: Removed S-10-EB32 & S-12.5-EB32 From COC 1/25/21 and Put on this COC, PB ML

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE. In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab Yellow - File Pink - Originator

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210126-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	1/25/2021	85	nd
Method Blank	N/A	1/26/2021	83	nd
S-10-EB36	1/26/2021	1/26/2021	78	nd
S-10-EB36 Dup	1/26/2021	1/26/2021	79	nd
S-10-SB1	1/26/2021	1/26/2021	72	nd
S-12.5-SB1	1/26/2021	1/26/2021	84	nd
S-15-SB1	1/26/2021	1/26/2021	73	nd
S-10-SB2	1/26/2021	1/26/2021	75	nd
S-12.5-SB2	1/26/2021	1/26/2021	74	nd
S-10-SB3	1/26/2021	1/26/2021	92	nd
Practical Quantitation Limit				10

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Trifluorotoluene): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210126-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Gasoline (mg/kg)
S-12.5-SB3	1/26/2021	1/26/2021	69	nd
S-15-SB5	1/26/2021	1/26/2021	86	nd
S-17.5-SB5	1/26/2021	1/26/2021	91	nd
S-17.5-SB5 Dup	1/26/2021	1/26/2021	90	nd
S-7.5-EB40	1/26/2021	1/26/2021	71	nd
S-10-EB32	1/25/2021	1/26/2021	85	nd
S-12.5-EB32	1/25/2021	1/25/2021	79	nd
Practical Quantitation Limit				10

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Trifluorotoluene): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210126-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	1/25/2021	100	nd	nd
Method Blank	N/A	1/26/2021	79	nd	nd
S-10-EB36	1/26/2021	1/26/2021	91	nd	nd
S-10-EB36 Dup	1/26/2021	1/26/2021	90	nd	nd
S-10-SB1	1/26/2021	1/26/2021	91	nd	nd
S-12.5-SB1	1/26/2021	1/26/2021	91	nd	nd
S-15-SB1	1/26/2021	1/26/2021	83	nd	nd
S-10-SB2	1/26/2021	1/26/2021	96	nd	nd
S-12.5-SB2	1/26/2021	1/26/2021	82	nd	nd
S-10-SB3	1/26/2021	1/26/2021	116	130	680
Practical Quantitation Limit				50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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Phone: (360) 352-2110
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Email: libbyenv@gmail.com

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210126-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
S-12.5-SB3	1/26/2021	1/26/2021	90	nd	nd
S-15-SB5	1/26/2021	1/26/2021	108	82	580
S-17.5-SB5	1/26/2021	1/26/2021	93	nd	nd
S-7.5-EB40	1/26/2021	1/26/2021	91	nd	nd
S-10-EB32	1/25/2021	1/25/2021	int	6200	nd
S-12.5-EB32	1/25/2021	1/25/2021	int	410	nd
S-12.5-EB32 Dup	1/25/2021	1/25/2021	int	380	nd
Practical Quantitation Limit				50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210126-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	1/28/2021	91	nd
Method Blank	N/A	1/29/2021	134	nd
S-5-EB36	1/26/2021	1/28/2021	100	nd
S-7.5-EB36	1/26/2021	1/28/2021	83	nd
S-12.5-EB36	1/26/2021	1/28/2021	109	nd
S-5-SB1	1/26/2021	1/29/2021	114	nd
S-7.5-SB1	1/26/2021	1/29/2021	111	nd
S-7.5-SB1 Dup	1/26/2021	1/29/2021	122	nd
S-5-SB2	1/26/2021	1/28/2021	103	nd
S-7.5-SB2	1/26/2021	1/28/2021	108	nd
S-15-SB2	1/26/2021	1/28/2021	110	nd
S-5-SB3	1/26/2021	1/30/2021	88	nd
S-7.5-SB3	1/26/2021	1/29/2021	76	nd
Practical Quantitation Limit				10

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Trifluorotoluene): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210126-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Gasoline (mg/kg)
S-15-SB3	1/26/2021	1/29/2021	128	nd
S-20-SB3	1/26/2021	1/29/2021	126	nd
S-5-SB5	1/26/2021	1/29/2021	125	nd
S-10-SB5	1/26/2021	1/30/2021	96	nd
S-7.5-SB5	1/26/2021	1/30/2021	102	nd
S-12.5-SB5	1/26/2021	1/30/2021	68	nd
S-12.5-SB5 Dup	1/26/2021	1/30/2021	87	nd
S-20-SB5	1/26/2021	1/30/2021	74	nd
S-5-EB40	1/26/2021	1/30/2021	79	nd
S-10-EB40	1/26/2021	1/30/2021	79	nd
S-12.5-EB40	1/26/2021	1/30/2021	112	nd
Practical Quantitation Limit				10

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Trifluorotoluene): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210126-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	2/1/2021	100	nd	nd
Method Blank	N/A	1/29/2021	102	nd	nd
Method Blank	N/A	1/28/2021	102	nd	nd
S-5-EB36	1/26/2021	1/29/2021	104	nd	nd
S-5-EB36 Dup	1/26/2021	1/29/2021	102	nd	nd
S-7.5-EB36	1/26/2021	1/29/2021	104	nd	nd
S-12.5-EB36	1/26/2021	1/28/2021	103	nd	nd
S-5-SB1	1/26/2021	1/29/2021	103	nd	nd
S-7.5-SB1	1/26/2021	2/1/2021	103	110	660
S-5-SB2	1/26/2021	2/1/2021	100	nd	790
S-7.5-SB2	1/26/2021	1/29/2021	101	nd	nd
S-15-SB2	1/26/2021	1/29/2021	98	nd	nd
S-5-SB3	1/26/2021	2/1/2021	98	440	2200
S-7.5-SB3	1/26/2021	2/1/2021	103	nd	nd
Practical Quantitation Limit				50	250

"nd" Indicates not detected at the listed detection limits.
"*" Indicates Product in light diesel range.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Jenny Anderson

Libby Environmental, Inc.

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210126-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
S-15-SB3	1/26/2021	1/29/2021	94	nd	nd
S-20-SB3	1/26/2021	1/29/2021	96	nd	nd
S-20-SB3 Dup	1/26/2021	1/29/2021	98	nd	nd
S-5-SB5	1/26/2021	1/29/2021	91	nd	1630
S-10-SB5	1/26/2021	1/29/2021	94	nd	760
S-7.5-SB5	1/26/2021	1/29/2021	96	nd	nd
S-12.5-SB5	1/26/2021	1/29/2021	93	nd	nd
S-20-SB5	1/26/2021	1/29/2021	99	nd	nd
S-5-EB40	1/26/2021	1/29/2021	107	490 *	nd
S-10-EB40	1/26/2021	1/29/2021	102	nd	nd
S-12.5-EB40	1/26/2021	1/29/2021	96	nd	nd
Practical Quantitation Limit				50	250

"nd" Indicates not detected at the listed detection limits.
"*" Indicates Product in light diesel range.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Jenny Anderson

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210126-50
Client Project # 031447

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Yahtzee PID 1 50 ppm	1/26/2021	53.3	107%	80-120%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Paul Burke

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Yahtzee PID 1 50 ppm	1/28/2021	59.7	119%	80-120%
CCV Yahtzee PID 1 50 ppm	1/29/2021	58.6	117%	80-120%
CCV Yahtzee PID 1 50 ppm	1/30/2021	52.1	104%	80-120%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Paul Burke

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210126-50
Client Project # 031447

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Maru FID 1 500 ppm	1/26/2021	521	104%	85-115%
CCV Maru FID 2 500 ppm	1/26/2021	556	111%	85-115%
CCV Elmer FID 1 500 ppm	1/26/2021	570	114%	85-115%
CCV Elmer FID 2 500 ppm	1/26/2021	531	106%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Paul Burke

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Stella FID 1 500 ppm	1/28/2021	516	103%	85-115%
CCV Stella FID 2 500 ppm	1/28/2021	503	101%	85-115%
CCV Stella FID 3 500 ppm	1/28/2021	430	86%	85-115%
CCV Stella FID 1 500 ppm	1/29/2021	542	108%	85-115%
CCV Stella FID 2 500 ppm	1/29/2021	472	94%	85-115%
CCV Stella FID 3 500 ppm	1/29/2021	449	90%	85-115%
CCV Kilvan FID 1 500 ppm	2/1/2021	433	87%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Jenny Anderson

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

4139 Libby Road NE
Olympia, WA 98506

Ph: 360-352-2110
Fax: 360-352-4154

Date: 1/27/21
Page: 1 of 2

Client: Cardno
Address:
City: State: Zip:
Phone: Fax:
Client Project # 031447

Project Manager:
Project Name: Port of Everett
Location: Port of Everett City, State: Everett, WA
Collector: Cameron Fames-Ash Date of Collection: 1/27/21
Email:

*see Remarks

	Sample Number	Depth	Time	Sample Type	Container Type	VOA 8021B	VOA 8021B BTEX Only	VOA 8260	SEMI VOL 8270	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx Ext.	PAH 8270	PCB's 8082	MTCA 5 Metals				Field Notes
1	S-10-EB32	10	9:55	S	4oz Jar						~~X~~		X						Mobile	Rerun-collected 1/25
2	S-12.5-EB32	12.5	1000	S	same						~~X~~		X						Mobile	" "
3	S-15-EB31A	15	0845	S	Same						X		X							collected 1/27/21 Mobile
4	S-7.5EB37	7.5	1025	S	Same						X		X							Mobil Lab
5	S-10-EB37	10	1030	S	Same						X		X							Mobil Lab
6	S-7.5EB38	7.5	1050	S	Same						X		X							Mobil Lab
7	S-10-EB38	10	1055	S	Same						X		X							Mobil lab
8	S-15-EB38	15	1105	S	Same						X		X							Mobil lab
9	S-7.5-EB39	7.5	1115	S	Same						X		X							Mobil lab
10	S-10-EB39	10	1120	S	Same						X		X							Mobil lab
11	S-15-EB39	15	1130	S	Same						X		X							Mobil lab
12	S-5-EB39	5	1110	S	Same						X		X							
13	S-12.5 EB37	12.5	1035	S	Same						X		X							
14	S-2.5-EB39	2.5	1105	S	Same						X		X							
15	S-12.5-EB39	12.5	1125	S	Same						X		X							
16	S-5-EB38	5	1045	S	Same						X		X							
17	S-2.5-EB38	2.5	1040	S	Same						X		X							

Relinquished by:	Date / Time	Received by:	Date / Time
	1/27/21 1600		1/27/21 1600
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt:

Good Condition?	
Cold?	
Seals Intact?	
Total Number of Containers	

Remarks: Samples NOT marked "Mobi Lab" will be analyzed a Libby Std turnaround

TAT: 24HR 48HR [✓ 5-DAY]

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

4139 Libby Road NE
Olympia, WA 98506

Ph: 360-352-2110
Fax: 360-352-4154

Date: 1/27/21

Page: 2 of 2

Client: Cardno

Address:

City: State: Zip:

Phone: Fax:

Client Project # 031447

Project Manager:

Project Name: Port of Everett

Location: Port of Everett

City, State: Everett, WA

Collector:

Date of Collection: 1/27/21

Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOA 8021B	VOA 8021B BTEX Only	VOA 8260	SEMI VOL 8270	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx Ext.	PAH 8270	PCB's 8082	MTCA 5 Metals				Field Notes * See Remarks
1	S-12.5-EB38	12.5	1100	S	3 VOA 1 Jar						X		X							
2	S-5-EB37	5	1020	S	Same						X		X							
3	S-20-EB39	20	1140	S	Same						X		X							Mobil Lab
4	S-20-EB33	20	1045	S	Same						X		✓	(Moved from 1/25)						collected 1/25-Mobile
5	S-17.5-EB33	12.5	1040	S	Same						X		X	Moved From 1/25						" " "
6	S-17.5-EB31B	17.5	1430	S	Same						X		X							Mobil lab
7	S-20-EB31B	20	1435	S	Same						X		X							Mobil Lab
8	S-5-EB32A	5	1450	S	Same						X		X							
9	S-7.5-EB32A	7.5	1455	S	Same						X		X							
10	S-10-EB32A	10	1500	S	Same						X		X							
11	S-15-EB32A	15	1510	S	Same						X		X							
12	S-17.5-EB32A	17.5	1515	S	Same						X		X							Mobil lab
13	S-20-EB32A	20	1520	S	Same						X		X							
14	S-5-EB41	5	1525	S	Same						X		X							
15	S-7.5EB41	7.5	1530	S	Same						X		X							
16	S-10-EB41	10	1535	S	Same						X		X							
17	S-12.5-EB41	125	1540	S	Same						X		X							

Relinquished by:	Date / Time	Received by:	Date / Time
	1/27/21 1600		1/27/21 1600
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt:

Good Condition?	
Cold?	
Seals Intact?	
Total Number of Containers	

Remarks: Samples not Marked "Mobile Lab" will be analyzed at Libby w/ Std turn.

TAT: 24HR 48HR [✓ 5-DAY]

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210127-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	1/27/2021		88	nd
S-15-EB31A	1/27/2021	1/27/2021	10	75	<100
S-7.5-EB37	1/27/2021	1/27/2021		76	nd
S-7.5-EB37 Dup	1/27/2021	1/27/2021		69	nd
S-10-EB37	1/27/2021	1/27/2021		84	nd
S-7.5-EB38	1/27/2021	1/27/2021		88	nd
S-10-EB38	1/27/2021	1/27/2021		83	nd
S-15-EB38	1/27/2021	1/27/2021		82	nd
S-7.5-EB39	1/27/2021	1/27/2021	5	82	<50
S-10-EB39	1/27/2021	1/27/2021		94	nd
S-15-EB39	1/27/2021	1/27/2021		79	nd
Practical Quantitation Limit					10

"<" Indicates elevated PQL due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Trifluorotoluene): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210127-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
S-20-EB39	1/27/2021	1/27/2021		81	nd
S-20-EB39 Dup	1/27/2021	1/27/2021		76	nd
S-20-EB33	1/25/2021	1/27/2021		85	nd
S-17.5-EB33	1/25/2021	1/27/2021		83	nd
S-17.5-EB31B	1/27/2021	1/27/2021		66	nd
S-20-EB31B	1/27/2021	1/27/2021		89	nd
S-17.5-EB32A	1/27/2021	1/27/2021		91	nd
Practical Quantitation Limit					10

"<" Indicates elevated PQL due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Trifluorotoluene): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210127-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	1/27/2021	93	nd	nd
S-10-EB32	1/25/2021	1/27/2021	int	4700	nd
S-12.5-EB32	1/25/2021	1/27/2021	int	340	nd
S-12.5-EB32 Dup	1/25/2021	1/27/2021	int	430	nd
S-15-EB31A	1/27/2021	1/27/2021	int	7000 E	nd
S-7.5-EB37	1/27/2021	1/27/2021	103	nd	nd
S-10-EB37	1/27/2021	1/27/2021	103	nd	nd
S-7.5-EB38	1/27/2021	1/27/2021	92	nd	nd
S-10-EB38	1/27/2021	1/27/2021	98	nd	nd
S-10-EB38 Dup	1/27/2021	1/27/2021	103	nd	nd
S-15-EB38	1/27/2021	1/27/2021	101	nd	nd
S-7.5-EB39	1/27/2021	1/27/2021	int	2200	nd
S-10-EB39	1/27/2021	1/27/2021	95	nd	nd
S-10-EB39 Dup	1/27/2021	1/27/2021	98	nd	nd
S-15-EB39	1/27/2021	1/27/2021	97	nd	nd
Practical Quantitation Limit				50	250

"E" Indicates reported value is an estimate because it exceeds the calibration range.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210127-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
S-20-EB39	1/27/2021	1/27/2021	97	nd	nd
S-20-EB33	1/25/2021	1/27/2021	102	nd	310
S-17.5-EB33	1/25/2021	1/27/2021	104	63	nd
S-17.5-EB31B	1/27/2021	1/27/2021	108	nd	nd
S-20-EB31B	1/27/2021	1/27/2021	96	nd	nd
S-17.5-EB32A	1/27/2021	1/27/2021	115	nd	nd
Practical Quantitation Limit				50	250

"E" Indicates reported value is an estimate because it exceeds the calibration range.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210127-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	N/A	1/29/2021		133	nd
Method Blank	N/A	1/30/2021		119	nd
S-5-EB39	1/27/2021	1/30/2021		113	nd
S-12.5-EB37	1/27/2021	1/29/2021		99	nd
S-2.5-EB39	1/27/2021	1/30/2021		110	nd
S-12.5-EB39	1/27/2021	1/29/2021		79	nd
S-5-EB38	1/27/2021	1/29/2021		99	nd
S-2.5-EB38	1/27/2021	1/29/2021		104	nd
Practical Quantitation Limit					10

"<" Indicates elevated PQL due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Trifluorotoluene): 65% TO 135%

ANALYSES PERFORMED BY: Melissa Harrington

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210127-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Gasoline (mg/kg)
S-12.5-EB38	1/27/2021	1/30/2021		119	nd
S-5-EB37	1/27/2021	1/29/2021		84	nd
S-5-EB32A	1/27/2021	1/29/2021		130	nd
S-7.5-EB32A	1/27/2021	1/29/2021	5	98	<25
S-10-EB32A	1/27/2021	1/30/2021		109	nd
S-15-EB32A	1/27/2021	1/30/2021		103	nd
S-15-EB32A Dup	1/27/2021	1/30/2021		110	nd
S-20-EB32A	1/27/2021	1/29/2021		99	nd
S-5-EB41	1/27/2021	1/30/2021	3	65	<15
S-7.5-EB41	1/27/2021	1/30/2021		96	nd
S-10-EB41	1/27/2021	1/30/2021		130	nd
S-12.5-EB41	1/27/2021	1/29/2021		102	nd
S-12.5-EB41 Dup	1/27/2021	1/29/2021		72	nd
Practical Quantitation Limit					10

"<" Indicates elevated PQL due to dilution.
"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Trifluorotoluene): 65% TO 135%

ANALYSES PERFORMED BY: Melissa Harrington

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210127-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	N/A	1/28/2021		72	nd	nd
Method Blank	N/A	1/29/2021		94	nd	nd
Method Blank	N/A	2/1/2021		86	nd	nd
Method Blank	N/A	2/2/2021		106	nd	nd
Method Blank	N/A	2/3/2021		106	nd	nd
S-5-EB39	1/27/2021	2/1/2021	2	109	5600	nd
S-5-EB39	1/27/2021	2/3/2021		int	4500	nd
S-12.5-EB37	1/27/2021	1/29/2021		99	nd	nd
S-2.5-EB39	1/27/2021	2/1/2021		105	2200	nd
S-12.5-EB39	1/27/2021	1/29/2021		98	nd	nd
S-5-EB38	1/27/2021	1/29/2021		97	nd	nd
S-2.5-EB38	1/27/2021	2/1/2021		105	nd	490
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Jenny Anderson

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Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Dilution	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
S-12.5-EB38	1/27/2021	1/29/2021		97	nd	nd
S-5-EB37	1/27/2021	1/29/2021		98	nd	nd
S-5-EB32A	1/27/2021	1/29/2021		98	56	nd
S-7.5-EB32A	1/27/2021	2/1/2021		109	2040	290
S-7.5-EB32A Dup	1/27/2021	2/1/2021		106	2300	340
S-10-EB32A	1/27/2021	2/2/2021	2	95	6100	nd
S-15-EB32A	1/27/2021	1/29/2021		96	nd	nd
S-20-EB32A	1/27/2021	1/29/2021		98	nd	nd
S-5-EB41	1/27/2021	2/2/2021	2	97	9300	6700
S-7.5-EB41	1/27/2021	2/1/2021		107	630	310
S-10-EB41	1/27/2021	1/29/2021		99	nd	nd
S-12.5-EB41	1/27/2021	1/29/2021		97	nd	nd
Practical Quantitation Limit					50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Jenny Anderson

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210127-50
Client Project # 031447

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Yahtzee PID 1 50 ppm	1/27/2021	56.9	114%	80-120%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Paul Burke

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Yahtzee PID 1 50 ppm	1/29/2021	58.6	117%	80-120%
CCV Yahtzee PID 1 50 ppm	1/30/2021	51.0	102%	80-120%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Melissa Harrington

PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210127-50
Client Project # 031447

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Maru FID 1 500 ppm	1/27/2021	505	101%	85-115%
CCV Maru FID 2 500 ppm	1/27/2021	557	111%	85-115%
CCV Elmer FID 1 500 ppm	1/27/2021	547	109%	85-115%
CCV Elmer FID 2 500 ppm	1/27/2021	558	112%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Paul Burke

CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Stella FID 1 500 ppm	1/28/2021	516	103%	85-115%
CCV Stella FID 2 500 ppm	1/28/2021	503	101%	85-115%
CCV Stella FID 3 500 ppm	1/28/2021	430	86%	85-115%
CCV Stella FID 1 500 ppm	1/29/2021	542	108%	85-115%
CCV Stella FID 2 500 ppm	1/29/2021	472	94%	85-115%
CCV Stella FID 3 500 ppm	1/29/2021	449	90%	85-115%
CCV Kilvan FID 1 500 ppm	1/29/2021	520	104%	85-115%
CCV Kilvan FID 1 500 ppm	2/1/2021	433	87%	85-115%
CCV Kilvan FID 1 500 ppm	2/2/2021	425	85%	85-115%
CCV Stella FID 2 500 ppm	2/3/2021	439	88%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Jenny Anderson

Libby Environmental, Inc. **Chain of Custody Record** www.LibbyEnvironmental.com

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Date: 2/5/21 Page: 1 of 1

Client: Cardno
Address:
City: State: Zip:
Phone: Fax:
Client Project # 031447

Project Manager: Bobby Thompson
Project Name: Port of Everett
Location: City, State: Everett, Wa
Collector: Date of Collection: 2/5/21
Email:

Sample Number	Depth	Time	Sample Type	Container Type	VOA 8021B	VOA 8021B BTEX Only	VOA 8260	SEMI VOL 8270	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx Ext. w/ Silica Gel	PAH 8270	PCB's 8082	MTCA 5 Metals				Field Notes
1 S-2.5-SB6		905	Soil	Jar/2xVOA						X		X							
2 S-5-SB6		0910								X		X							
3 S-7.5-SB6		0915								X		X							
4 S-10-SB6		0920								X		X							
5 S-125-SB6		0925								X		X							
6 S-15-SB6		0930								X		X							
7 S-5-SB7		0945								X		X							
# 8 ~~S~~ S-7.5-SB7		0950								X		X							
9 S-10-SB7		0955								X		X							
10 S-12.5-SB7		1000								X		X							
11 S-15-SB7		1005								X		X							
12																			
13																			
14																			
15																			
16																			
17																			

Relinquished by:	Date / Time	Received by:	Date / Time 2/5/21
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt:

Good Condition?	Y
Cold?	Y
Seals Intact?	Y
Total Number of Containers	

Remarks:

ML

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a court of law.

Distribution: White - Lab, Yellow - File, Pink - Originator

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210205-50
Client Project # 031447

Analyses of Gasoline (NWTPH-Gx) in Soil

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Gasoline (mg/kg)
Method Blank	2/5/2021	2/5/2021	86	nd
S-2.5-SB6	2/5/2021	2/5/2021	66	nd
S-5-SB6	2/5/2021	2/5/2021	97	nd
S-7.5-SB6	2/5/2021	2/5/2021	97	nd
S-10-SB6	2/5/2021	2/5/2021	91	nd
S-12.5-SB6	2/5/2021	2/5/2021	82	nd
S-12.5-SB6 Dup	2/5/2021	2/5/2021	67	nd
S-15-SB6	2/5/2021	2/5/2021	86	nd
S-15-SB6 Dup	2/5/2021	2/5/2021	73	nd
S-5-SB7	2/5/2021	2/5/2021	67	nd
S-7.5-SB7	2/5/2021	2/5/2021	97	nd
S-10-SB7	2/5/2021	2/5/2021	79	nd
S-12.5-SB7	2/5/2021	2/5/2021	91	nd
S-15-SB7	2/5/2021	2/5/2021	88	nd
Practical Quantitation Limit				10

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Trifluorotoluene): 65% TO 135%

ANALYSES PERFORMED BY: Kodey Eley

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PORT OF EVERETT PROJECT
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Everett, Washington
Libby Project # L210205-50
Client Project # 031447

Analyses of Diesel & Oil (NWTPH-Dx/Dx Extended) in Soil w/ Silica Gel Cleanup

Sample Number	Date Collected	Date Analyzed	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	2/5/2021	2/5/2021	132	nd	nd
S-2.5-SB6	2/5/2021	2/5/2021	int	2800	nd
S-5-SB6	2/5/2021	2/5/2021	98	57	nd
S-7.5-SB6	2/5/2021	2/5/2021	94	nd	nd
S-10-SB6	2/5/2021	2/5/2021	89	nd	nd
S-12.5-SB6	2/5/2021	2/5/2021	95	nd	nd
S-12.5-SB6 Dup	2/5/2021	2/5/2021	94	nd	nd
S-15-SB6	2/5/2021	2/5/2021	88	nd	nd
S-15-SB6 Dup	2/5/2021	2/5/2021	81	nd	nd
S-5-SB7	2/5/2021	2/5/2021	83	nd	nd
S-7.5-SB7	2/5/2021	2/5/2021	98	nd	nd
S-10-SB7	2/5/2021	2/5/2021	83	nd	nd
S-12.5-SB7	2/5/2021	2/5/2021	91	nd	nd
S-15-SB7	2/5/2021	2/5/2021	88	nd	nd
Practical Quantitation Limit				50	250

"nd" Indicates not detected at the listed detection limits.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (2-F Biphenyl): 65% TO 135%

ANALYSES PERFORMED BY: Kodey Eley

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210205-50
Client Project # 031447

CCV Gasoline by NWTPH-Gx in Soil

Sample Number	Date Analyzed	Gasoline (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Yahtzee PID 1 50 ppm	2/5/2021	54.5	109%	80-120%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Kodey Eley

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PORT OF EVERETT PROJECT
Cardno
Everett, Washington
Libby Project # L210205-50
Client Project # 031447

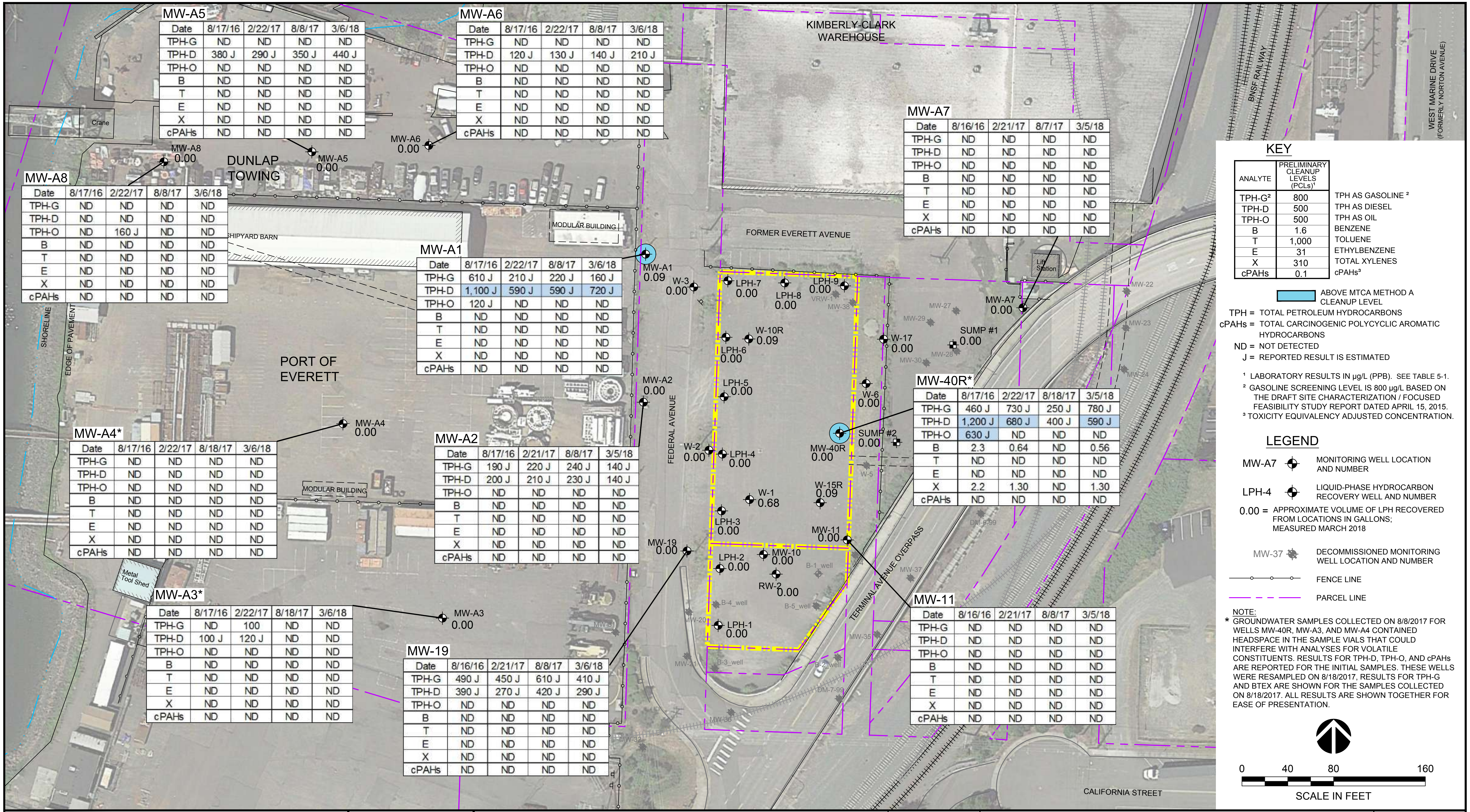
CCV Diesel by NWTPH-Dx in Soil

Sample Number	Date Analyzed	Diesel (mg/kg)	CCV Recovery (%)	CCV Recovery Limits (%)
CCV Elmer FID 1 500 ppm	2/5/2021	502	100%	85-115%
CCV Elmer FID 2 500 ppm	2/5/2021	534	107%	85-115%
Practical Quantitation Limit		50		

ANALYSES PERFORMED BY: Kodey Eley

APPENDIX G

GROUNDWATER SAMPLE ANALYSIS MAP, MARCH 5-6, 2018



MW-A5

Date	8/17/16	2/22/17	8/8/17	3/6/18
TPH-G	ND	ND	ND	ND
TPH-D	380 J	290 J	350 J	440 J
TPH-O	ND	ND	ND	ND
B	ND	ND	ND	ND
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	ND	ND	ND	ND
cPAHs	ND	ND	ND	ND

MW-A6

Date	8/17/16	2/22/17	8/8/17	3/6/18
TPH-G	ND	ND	ND	ND
TPH-D	120 J	130 J	140 J	210 J
TPH-O	ND	ND	ND	ND
B	ND	ND	ND	ND
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	ND	ND	ND	ND
cPAHs	ND	ND	ND	ND

MW-A8

Date	8/17/16	2/22/17	8/8/17	3/6/18
TPH-G	ND	ND	ND	ND
TPH-D	ND	ND	ND	ND
TPH-O	ND	160 J	ND	ND
B	ND	ND	ND	ND
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	ND	ND	ND	ND
cPAHs	ND	ND	ND	ND

MW-A1

Date	8/17/16	2/22/17	8/8/17	3/6/18
TPH-G	610 J	210 J	220 J	160 J
TPH-D	1,100 J	590 J	590 J	720 J
TPH-O	120 J	ND	ND	ND
B	ND	ND	ND	ND
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	ND	ND	ND	ND
cPAHs	ND	ND	ND	ND

MW-A7

Date	8/16/16	2/21/17	8/7/17	3/5/18
TPH-G	ND	ND	ND	ND
TPH-D	ND	ND	ND	ND
TPH-O	ND	ND	ND	ND
B	ND	ND	ND	ND
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	ND	ND	ND	ND
cPAHs	ND	ND	ND	ND

MW-40R*

Date	8/17/16	2/22/17	8/18/17	3/5/18
TPH-G	460 J	730 J	250 J	780 J
TPH-D	1,200 J	680 J	400 J	590 J
TPH-O	630 J	ND	ND	ND
B	2.3	0.64	ND	0.56
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	2.2	1.30	ND	1.30
cPAHs	ND	ND	ND	ND

MW-A4*

Date	8/17/16	2/22/17	8/18/17	3/6/18
TPH-G	ND	ND	ND	ND
TPH-D	ND	ND	ND	ND
TPH-O	ND	ND	ND	ND
B	ND	ND	ND	ND
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	ND	ND	ND	ND
cPAHs	ND	ND	ND	ND

MW-A2

Date	8/17/16	2/21/17	8/8/17	3/5/18
TPH-G	190 J	220 J	240 J	140 J
TPH-D	200 J	210 J	230 J	140 J
TPH-O	ND	ND	ND	ND
B	ND	ND	ND	ND
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	ND	ND	ND	ND
cPAHs	ND	ND	ND	ND

MW-A3*

Date	8/17/16	2/22/17	8/18/17	3/6/18
TPH-G	ND	100	ND	ND
TPH-D	100 J	120 J	ND	ND
TPH-O	ND	ND	ND	ND
B	ND	ND	ND	ND
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	ND	ND	ND	ND
cPAHs	ND	ND	ND	ND

MW-19

Date	8/16/16	2/21/17	8/8/17	3/6/18
TPH-G	490 J	450 J	610 J	410 J
TPH-D	390 J	270 J	420 J	290 J
TPH-O	ND	ND	ND	ND
B	ND	ND	ND	ND
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	ND	ND	ND	ND
cPAHs	ND	ND	ND	ND

MW-11

Date	8/16/16	2/21/17	8/8/17	3/5/18
TPH-G	ND	ND	ND	ND
TPH-D	ND	ND	ND	ND
TPH-O	ND	ND	ND	ND
B	ND	ND	ND	ND
T	ND	ND	ND	ND
E	ND	ND	ND	ND
X	ND	ND	ND	ND
cPAHs	ND	ND	ND	ND

KEY

ANALYTE	PRELIMINARY CLEANUP LEVELS (PCLs)[1]	
TPH-G[2]	800	TPH AS GASOLINE [2]
TPH-D	500	TPH AS DIESEL
TPH-O	500	TPH AS OIL
B	1.6	BENZENE
T	1,000	TOLUENE
E	31	ETHYLBENZENE
X	310	TOTAL XYLENES
cPAHs	0.1	cPAHs[3]

🟦 ABOVE MTCA METHOD A CLEANUP LEVEL

TPH = TOTAL PETROLEUM HYDROCARBONS
cPAHs = TOTAL CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS
ND = NOT DETECTED
J = REPORTED RESULT IS ESTIMATED

[1] LABORATORY RESULTS IN µg/L (PPB). SEE TABLE 5-1.
[2] GASOLINE SCREENING LEVEL IS 800 µg/L BASED ON THE DRAFT SITE CHARACTERIZATION / FOCUSED FEASIBILITY STUDY REPORT DATED APRIL 15, 2015.
[3] TOXICITY EQUIVALENCY ADJUSTED CONCENTRATION.

LEGEND

MW-A7 ⊕	MONITORING WELL LOCATION AND NUMBER
LPH-4 ⊕	LIQUID-PHASE HYDROCARBON RECOVERY WELL AND NUMBER
0.00 =	APPROXIMATE VOLUME OF LPH RECOVERED FROM LOCATIONS IN GALLONS; MEASURED MARCH 2018
MW-37 ⊗	DECOMMISSIONED MONITORING WELL LOCATION AND NUMBER
—o—o—o—	FENCE LINE
— — —	PARCEL LINE

NOTE:
* GROUNDWATER SAMPLES COLLECTED ON 8/8/2017 FOR WELLS MW-40R, MW-A3, AND MW-A4 CONTAINED HEADSPACE IN THE SAMPLE VIALS THAT COULD INTERFERE WITH ANALYSES FOR VOLATILE CONSTITUENTS. RESULTS FOR TPH-D, TPH-O, AND cPAHs ARE REPORTED FOR THE INITIAL SAMPLES. THESE WELLS WERE RESAMPLED ON 8/18/2017, RESULTS FOR TPH-G AND BTEX ARE SHOWN FOR THE SAMPLES COLLECTED ON 8/18/2017. ALL RESULTS ARE SHOWN TOGETHER FOR EASE OF PRESENTATION.

0 40 80 160
SCALE IN FEET

wood.

CLIENT:
EXXONMOBIL
AMERICAN DISTRIBUTING CO.

Wood Environment &
Infrastructure Solutions, Inc.
600 University Street, Suite 600
Seattle, WA, U.S.A. 98101

DWN BY:	APS
CHK'D BY:	LV
DATUM:	NAD 83 N FT
PROJECTION:	WASP
SCALE:	AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
GROUNDWATER SAMPLE ANALYSIS MAP
MARCH 5-6, 2018

DATE:	JULY 2018
PROJECT NO:	6103180009
REV. NO.:	
FIGURE No.	F-1

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_4552\EXM-GWData-Contours-Mar2018_042618.dwg – FigF-1_Mar2018 (2) – Jul. 05, 2018 4:03pm – adam.stenberg

APPENDIX H

SIMPLIFIED TERRESTRIAL ECOLOGICAL EVALUATION

Washington State Department of Ecology
Toxics Cleanup Program

Table 749-1

Simplified Terrestrial Ecological Evaluation-Exposure Analysis Procedure

Estimate the area of contiguous (connected) undeveloped land on the site or within 500 feet of any area of the site to the nearest 1/2 acre (1/4 acre if the area is less than 0.5 acre).	
1) From the table below, find the number of points corresponding to the area and enter this number in the field to the right.	
Area (acres) — Points 0.25 or less — 4 0.5 — 5 1.0 — 6 1.5 — 7 2.0 — 8 2.5 — 9 3.0 — 10 3.5 — 11 4.0 or more — 12	8
2) Is this an industrial or commercial property? If yes, enter a score of 3. If no, enter a score of 1	3
3)[a] Enter a score in the box to the right for the habitat quality of the site, using the following rating system[b]. High=1, Intermediate=2, Low=3	3
4) Is the undeveloped land likely to attract wildlife? If yes, enter a score of 1 in the box to the right. If no, enter a score of 2.[c]	2
5) Are there any of the following soil contaminants present: Chlorinated dioxins/furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene? If yes, enter a score of 1 in the box to the right. If no, enter a score of 4.	4
6) Add the numbers in the boxes on lines 2-5 and enter this number in the box to the right. If this number is larger than the number in the box on line 1, the simplified evaluation may be ended.	12

Notes for Table 749-1

[a] It is expected that this habitat evaluation will be undertaken by an experienced field biologist. If this is not the case, enter a conservative score of (1) for questions 3 and 4.

[b] **Habitat rating system.** Rate the quality of the habitat as high, intermediate or low based on your professional judgment as a field biologist. The following are suggested factors to consider in making this evaluation:

> **Low:** Early successional vegetative stands; vegetation predominantly noxious, nonnative, exotic plant species or weeds. Areas severely disturbed by human activity, including intensively cultivated croplands. Areas isolated from other habitat used by wildlife.

High: Area is ecologically significant for one or more of the following reasons: Late-successional native plant communities present; relatively high species diversity; used by an uncommon or rare species; priority habitat (as defined by the Washington Department of fish and Wildlife); part of a larger area of habitat where size or fragmentation may be important for the retention of some species.

Intermediate: Area does not rate as either high or low.

[c] Indicate "yes" if the area attracts wildlife or is likely to do so. Examples: Birds frequently visit the area to feed; evidence of high use b mammals (tracks, scat, etc.); habitat "island" in an industrial area; unusual features of an area that make it important for feeding animals; heavy use during seasonal migrations.

[Area Calculation Aid] [Aerial Photo with Area Designations] [TEE Table 749-1] [Index of Tables]

[Exclusions Main] [TEE Definitions] [Simplified or Site-Specific?] [Simplified Ecological Evaluation] [Site-Specific Ecological Evaluation] [WAC 173-340-7493]

[TEE Home]

APPENDIX I

FRIEDMAN AND BRUYA, INC., REPORT

January 21, 2015

Project 6103150009

Mr. Chung Yee
Washington State Department of Ecology
Headquarters
Toxics Cleanup Program
P.O. Box 47600
Olympia, Washington 98504-7600

Subject: **Change in Project Laboratory**
ExxonMobil/ADC Property, Ecology Site ID 2728
2717/2731 Federal Avenue, Everett, Washington
Ecology Agreed Order DE-6184

Dear Mr. Yee:

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), has prepared this letter on behalf of ExxonMobil Oil Corporation (ExxonMobil) and American Distributing Company (ADC) for the ExxonMobil/ADC Site located at 2717/2731 Federal Avenue in Everett, Washington (the Site). The purpose of this letter is to inform the Washington Department of Ecology (Ecology) that the project laboratory used for analysis of Site samples is being changed from TestAmerica Inc. (TestAmerica) to Eurofins Calscience Environmental Laboratories, located in Garden Grove, California (Eurofins). Both analytical laboratories are accredited by Ecology for the soil and groundwater analyses performed for the Site. This document details discrepancies that were recently identified in analytical results obtained for groundwater samples analyzed for total petroleum hydrocarbons (TPH) in the diesel range (TPH-D) by TestAmerica. These TPH-D analytical discrepancies and the results of a comparative study of TPH analytical results reported by TestAmerica and Eurofins are presented and discussed below. An independent evaluation of analytical results from both TestAmerica and Eurofins was also performed by an Ecology-accredited third-party analytical laboratory, Friedman & Bruya, Inc. (Friedman & Bruya), of Seattle, Washington. The results of that independent evaluation are included with this letter as Attachment A.

Starting in January 2015, soil, groundwater, and waste samples collected from the Site will be analyzed by Eurofins Calscience Environmental Laboratories, located in Garden Grove, California. Samples will no longer be submitted to TestAmerica for analysis.

1.0 BACKGROUND

TestAmerica has been the project laboratory for analysis of soil and groundwater samples collected at the Site since 2006. Semiannual groundwater monitoring results for individual wells reported by TestAmerica have been consistent during this time (AMEC, 2014).Results from TestAmerica over the past several years of monitoring using Method NWTPH-Dx with silica gel treatment (SGT) have consistently shown elevated levels for TPH-D in several wells, as noted by the summary of semiannual monitoring data for TPH presented in Table 1. The monitoring well locations are shown on the attached Figure 1. Elevated TPH-D levels have been consistently reported for downgradient wells

MW-A1, MW-A2, MW-A3, MW-A4, MW-A5, and MW-A6, and for the wells located near the source areas (MW-19 and MW-40R). Elevated levels of TPH in the motor oil range (TPH-O) were also reported for some wells during several semiannual sampling events. Table 1 summarizes TPH-D and TPH-O results reported by TestAmerica using Method NWTPH-Dx with SGT for semiannual groundwater monitoring samples collected from these eight wells since 2009.

As part of our work to prepare the Site Characterization/Focused Feasibility Study (SC/FFS) for the Site, samples were collected from downgradient monitoring wells MW-A5 and MW-A6 in May 2014 for analysis of extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH) using Ecology methods NWTPH-EPH and NWTPH-VPH. The groundwater samples were submitted to TestAmerica for these analyses. Monitoring wells MW-A5 and MW-A6 were selected for EPH/VPH testing because they are downgradient from the source area on the ExxonMobil/ADC property and because of the relatively high TPH-D and TPH-O concentrations that had been reported for these wells during previous sampling events. The TPH-D concentrations had consistently been in the range of 1,000–3,000 micrograms per liter (µg/L) in MW-A5 since 2010 and in MW-A6 since 2011 (Table 1).

The EPH/VPH results reported by TestAmerica for the May 2014 groundwater samples wells showed results that were generally below the laboratory reporting limits for the various petroleum hydrocarbon fractions. These EPH/VPH results were entered into the Ecology MTCATPH11.1 spreadsheet to calculate the site-specific cleanup levels. The output from the MTCATPH11.1 spreadsheet indicated that the groundwater TPH levels in these wells were below the MTCA Method A cleanup level and approximately one order of magnitude less than the historic TPH-D results shown in Table 1 for wells MW-A5 and MW-A6. Due to these inconsistent results, ExxonMobil and ADC felt it was warranted to collect additional data to assess TPH concentrations in these wells and to explain the discrepancy in analytical results for EPH/VPH versus TPH-D.

The purpose of the comparative laboratory assessment presented here was to ascertain the reason for the discrepancy in results for petroleum hydrocarbons obtained by TestAmerica using Method NWTPH-Dx with SGT versus Methods NWTPH-EPH and NWTPH-VPH. The study design and results are described below.

2.0 COMPARATIVE EVALUATION DESIGN

A multi-faceted approach was implemented to evaluate the cause of discrepancy in TPH results. The approach comprised the following elements:

- An additional round of groundwater samples were collected from monitoring wells MW-A5 and MW-A6 in June 2014 for analyses.
- The samples collected in June 2014 were split in the field, and the split samples were submitted to two separate, Ecology-accredited laboratories (TestAmerica and Eurofins) for analysis of TPH-D, TPH-O, EPH, VPH, polycyclic aromatic hydrocarbons (PAHs), and selected volatile organic compounds (VOCs).
- Results of the June 2014 split sampling were evaluated for variation between the two laboratories.

- Split samples were collected during the scheduled semiannual sampling event in August 2014 from the full network of monitoring wells included in the semiannual sampling program. These split samples were submitted to TestAmerica and Eurofins for analysis of the semiannual monitoring parameters, which include TPH in the gasoline range (TPH-G), TPH-D, TPH-O, PAHs, and selected VOCs.
- Additional rounds of split samples were collected monthly from wells MW-A2, MW-A4, MW-A5, MW-A6, and MW-40R from September through December 2014. These split samples were also submitted to TestAmerica and Eurofins for analysis of TPH-D, TPH-O, PAHs, and selected VOCs. Starting with the September 2014 sampling event, analyses using method NWTPH-Dx were conducted both with and without SGT.
- A third, independent, Ecology-accredited laboratory (Friedman & Bruya) was retained to evaluate the analytical results obtained by the two laboratories for the split samples collected in June, August, and September 2014. Friedman & Bruya also reviewed the standard operating procedures (SOPs) used by the two laboratories for TPH analyses.
- Statistical analysis was conducted on the laboratory analytical results from the split samples to characterize the differences in analytical results reported by the two laboratories.

The wells sampled and analyzed for the comparative evaluation are summarized in Table 2. Additional details on the sampling program are described below.

2.1 Sampling and Analysis

Samples were collected and analyzed as described in Table 2. The samples were split in the field and analyzed by two Ecology-accredited laboratories: TestAmerica and Eurofins. The groundwater samples were collected in accordance with the routine groundwater sampling protocols that have been used at the Site.

Field Duplicates

Field duplicates were collected at monitoring wells MW-A5 and MW-A6 in June 2014. These field duplicate samples were not split; the duplicate was submitted only to the normal project laboratory, TestAmerica. Field duplicates were collected from monitoring well MW-A2 during the sampling events conducted in August through December, and these field duplicates were also split and submitted to both laboratories. All of the field duplicates were submitted with blind sample IDs.

Analytical Methods

The analyses conducted and the analytical methods used are summarized in Table 2. Silica gel treatment (SGT) of groundwater samples has been conducted routinely for Site samples since February 2008; the data shown in Table 1 reflect results that include SGT as part of the analytical method. As noted above, as part of this evaluation, both laboratories analyzed several rounds of samples for TPH both with and without SGT.

Data Evaluation Methods

Laboratory data were subjected to statistical testing using open source R applications. Laboratory results and the natural logarithm (base *e)* of the results for TPH-D were tested for a normal distribution using the Shapiro-Wilk normality test (*W* statistic). Based on the results of this test, the data were found to be log-normally distributed, and the natural logarithm of the values for TPH-D from the two laboratories were then evaluated using a paired *t*-test to determine if the differences in results produced from the two test laboratories were statistically significant. Analytical results were also compared by calculating the relative percent difference (RPD) in results between the two laboratories; the RPD was calculated for each data pair by dividing the difference between the two results by the average of the results and expressing the result as percent. Results were included in the statistical analyses only when the analyte was detected at both laboratories.

3.0 RESULTS

Results from the comparative evaluation study described above are presented on Tables 3, 4, and 5:

- Table 3: EPH and VPH results for June 19; 2014
- Table 4: TPH-G, TPH-D, and TPH-O results; and
- Table 5: PAHs and VOCs results.

The complete analytical data reports are included in Attachment B.

3.1 Results of the June 2014 Split Samples

Split samples collected in June 2014 from MW-A5 and MW-A6 were analyzed for EPH, VPH, PAHs, and both TPH-D and TPH-O using the SGT procedure.

- The results from the EPH/VPH analyses (Table 3) confirmed the low TPH concentrations reported by TestAmerica for the May 2014 EPH/VPH analyses. Results for EPH and VPH from the two laboratories were in generally good agreement, indicating that TPH concentrations were below cleanup levels.
- Results for TPH-D analyses (which included routine SGT) and TPH-O showed widely varying results between the two laboratories (Table 4). Results reported by TestAmerica were greater by factors of up to 9 for MW-A5 and 25 for MW-A6. Moreover, the results for duplicate samples reported by TestAmerica varied greatly (3,360 and 272 µg/L for MW-A5 and 3,270 and 2,550 µg/L for MW-A6).
- Results for VOCs and PAHs were very similar between the two labs. Most individual PAH compounds were not detected in either laboratory, although Eurofins analyzed for only a selected suite of compounds. TestAmerica reported higher concentrations of acenaphthene than Eurofins, but the reported concentrations were low. VOCs were not detected by either laboratory. The consistency of the results for EPH/VPH, VOCs, and PAHs indicates that all samples analyzed were representative of the same medium.

3.2 Results of Monthly Split Samples

Results for TPH-G, PAHs, and VOCs reported by the two laboratories for the monthly split samples generally show good agreement between the two laboratories (Tables 4 and 5). TPH-G was not reported in most samples analyzed, and when detected was present at low concentrations. Very few PAH compounds were detected above the reporting limit. When detected, individual PAHs were most often detected in the corresponding samples by both laboratories. In the few instances when PAHs were detected at only one lab, concentrations were very low and generally near or below the reporting limit specified by the other laboratory. Few VOC detections were reported and generally only at very low concentrations near or below the practical quantitation limit (PQL). Importantly, when individual PAH or VOC constituents were detected, they were often detected by both laboratories, confirming that the split samples represent the same medium.

As found in the June sampling event, the TPH-D and THP-O results in the August through December 2014 sampling vary widely between the two laboratories, in many cases by an order of magnitude or more (Table 4). The results for TPH-D presented in Table 4 show that the results reported by Eurofins were consistently lower than results reported by TestAmerica. These differences are noted for results with and without SGT, but the differences are more pronounced for samples analyzed using SGT.

3.3 Third-Party Review by Friedman & Bruya, Inc.

Freidman & Bruya, Inc. (Friedman & Bruya), was retained as an independent third party with expertise in TPH analytical methods. For both TestAmerica and Eurofins, Friedman & Bruya reviewed the analytical laboratory reports, chromatograms from TPH analyses, and standard analytical procedures for extraction, silica gel treatment, and TPH analysis. They were asked to provide an opinion on the nature and causes of the discrepancy in TPH results obtained by the two test laboratories (TestAmerica and Eurofins). Friedman & Bruya is an environmental laboratory located in Seattle, Washington, and is accredited by Ecology to perform analyses using the analytical methods used for this investigation. The independent review provided by Freidman & Bruya is included as Attachment A.

Friedman & Bruya provided the following findings:

- TPH-D results reported by Eurofins after SGT were much lower than results reported by TestAmerica for the corresponding samples.
- The low levels of EPH in comparison to TPH reported by both laboratories suggest that the much of the organic material present in the groundwater samples analyzed by both laboratories is polar.
- These high levels of polar compounds in samples are interfering with the TPH analyses.
- Both laboratories reported higher test results for TPH-D following SGT than for EPH, suggesting that the SGT procedures used by both laboratories are inadequate for removing polar compound interference from these samples.
- The discrepancy in results from both laboratories between EPH and TPH-D with SGT suggest that the column SGT method used in the EPH analysis is more effective than the

shake SGT method that is used by both laboratories for TPH-D analysis for removing polar compound interference.

- The low results reported for the EPH/VPH analyses show that very low concentrations of TPH were present in the groundwater samples tested for EPH/VPH.
- SGT of groundwater samples from the Site is appropriate because of the high concentrations of polar compounds in the groundwater, which is the source of the high TPH concentrations historically reported by TestAmerica.
- The TPH-D results following SGT reported by Eurofins more closely resemble the results of the EPH/VPH results reported by both laboratories.

As noted in the Friedman & Bruya report, SGT is needed to remove interference caused by polar compounds in Site groundwater. The prescribed SGT method specified in the NWTPH-Dx analytical procedure is a shake method and the SGT method prescribed for NWTPH-EPH analysis is a column method. Friedman & Bruya conclude that the column SGT method used in EPH analysis was more effective in removing polar compound interference for this Site, and thus, the low TPH results from EPH analysis observed in the May and June samples are representative of Site conditions.

3.4 Data Quality Review

The TestAmerica and Eurofins data packages were reviewed for data quality by Amec Foster Wheeler. This review was conducted in accordance with procedures used routinely for the Site. The data quality review memoranda are included as Attachment B. In general, TestAmerica data shows trends of a higher frequency of out of compliance laboratory quality control samples which can bias the environmental samples either high or low and indicates the laboratory has difficulty performing the requested analyses. In comparison, the Eurofins data review did not identify out of compliance laboratory quality control samples; however, two samples were qualified due to incomparable field duplicate results.

Results for analyses on samples collected at wells MW-A4 and MW-A5 on November 20, 2014, were rejected due to an error on the part of the shipping company; these samples were received by one of the project laboratories several days after the samples had been collected and at a temperature exceeding the maximum temperature established under project quality control criteria. These wells were resampled on December 5, 2014, so that true split samples were analyzed for comparison. Results from December 5, 2014, are reported and evaluated here.

3.5 Statistical Analysis of Laboratory Results

Statistical analysis was performed by Amec Foster Wheeler to assess differences in results reported by the two laboratories. Statistical testing included direct comparison of results from the two laboratories using RPD, testing for distribution normality using the Shapiro-Wilk test, and comparison of results from the two laboratories using the paired t-test. Results from these tests are presented below. Details for the Shapiro-Wilk testing and the paired t-test are included in Attachment C.

RPD was calculated for results reported by both laboratories that are at least five times greater than the reporting limit. The resulting RPDs are presented in Table 6. An RPD of 30 percent is often used as a generally acceptable RPD for groundwater field duplicate samples; therefore, this value can be used as a guideline for comparing results from the two labs.

The RPDs listed in Table 6 for analytical results other than TPH-D and TPH-O are mostly acceptable. The RPD data in Table 6 show that results from the two laboratories for TPH-G and VOCs (benzene and total xylenes) were in very good agreement. For PAH analyses, results for 40 of the 69 individual results (i.e., 58 percent) were within the 30 percent criterion for field duplicate samples. For the 26 TPH-D results, RPDs were within the 30 percent criterion for only 3 sets of results, and RPDs ranged from 48 percent to 183 percent for the remaining 88 percent of the paired results (Table 6).

Table 7 presents a statistical summary of the RPD values in Table 6. The data in Table 7 show that the average RPD for TPH-G, VOCs, and PAHs were below or very near the 30 percent field duplicate criterion, whereas the average RPD for TPH-D was 95 percent. The RPD results for TPH-G, VOCs, and PAHs indicate that the split samples analyzed at the two laboratories were valid field duplicates. The RPD results for TPH-D and TPH-O indicate that the analyses for the two labs were in very poor agreement for these analytes.

Additional statistical testing was conducted to evaluate the significance of the differences in results for TPH-D following SGT reported by the two laboratories. The raw input data and statistical output from the statistical analysis run are presented in Attachment C.

The Shapiro-Wilk normality test showed the TPH-D results from both laboratories to be log-normally distributed (W = 0.94 and 0.94 and p = 0.090 and 0.14 for TestAmerica and Eurofins, respectively) (see Attachment C). Based on these results, both data sets were log-transformed for further statistical testing. The log-transformed laboratory results for TPH-D from the two laboratories were then subjected to a paired *t*-test to assess the statistical significance of the differences. The paired t-test indicated that the differences between the two sets of results were highly significant (*t*-value = 7.3; $p = 7.5 \times 10^{-8}$), with a mean difference of 1.32 in the natural logarithm of the reported data (corresponding to a factor of approximately 3.7. In other words, results from TestAmerica were on average approximately 3.7 times higher than results reported by Eurofins for the same split sample. The t-test results indicate that the two sets of TPH-D results are statistically distinct and independent sets of data.

4.0 DISCUSSION

Ecology guidance specifies that SGT should be used in cases where high levels of naturally occurring organic matter are present (Ecology 2011). As shown by results of the EPH analyses in comparison with TPH-D results without SGT, large quantities of polar organic compounds are the reason that elevated levels of TPH-D has historically been reported by TestAmerica in many samples from groundwater monitoring wells at the Site, including the downgradient wells. The potential for polar compounds unrelated to petroleum to be present in Site groundwater, especially downgradient of the ExxonMobil/ADC property, is consistent with the history of this area. The Site was originally developed on the shoreline of Port Gardner Bay, which originally consisted of lowlands, as evidenced by the peat deposits present beneath the Site east of Federal Avenue. In addition, historic fire insurance maps prepared by Sanborn indicate the on-property areas east of Federal Avenue were a marsh prior to development.

The area west of Federal Avenue was subsequently filled to create the current shoreline. Precise sources of fill material are unknown, but likely included dredge spoils, natural wood debris from historic log-rafting and storage along the Port Gardner Bay shoreline, peat, and other material potentially containing high levels of organic material. These sources, as well as the native marsh and nearshore mud flat deposits, would be expected to contribute large amounts of natural organic matter that contributes to the presence of significant concentrations of polar organic material in Site groundwater.

5.0 CONCLUSIONS

Based on the results from the comparative evaluation of laboratory results reported by TestAmerica and Eurofins and the independent review by Friedman & Bruya, the following conclusions are made:

- Results of analyses of split samples reported by TestAmerica and Eurofins showed good agreement for TPH-G, PAHs, VOCs, and EPH/VPH, indicating that the split samples are representative of the medium being addressed (i.e., groundwater at the ExxonMobil/ADC Site) and that the split samples are valid field duplicates.
- Results reported by TestAmerica for TPH-D analyses were routinely greater than results obtained by Eurofins for the same split sample. Based on statistical analysis of the results for TPH-D with SGT, TestAmerica reported results that were on average approximately 4 times greater than results reported by Eurofins.
- Groundwater samples from many of the Site monitoring wells contain high concentrations of polar organic compounds that interfere with TPH-D analyses. SGT is appropriate for removal of the interfering compounds as part of TPH-D analyses.
- TPH-D results for both labs showed a significant discrepancy relative to results for EPH, with TPH-D results greater than EPH results. Friedman & Bruya attributed this difference to more effective removal of polar compounds by the column SGT method employed for the EPH analyses compared with the shake method used by the two laboratories for TPH-D analyses. Friedman & Bruya concluded that EPH method results are more representative of TPH-D concentrations in groundwater at the Site.
- The shake SGT method employed by TestAmerica and Eurofins for TPH-D analyses achieved partial removal of polar compounds that interfere with TPH-D analyses; the SGT procedure employed by Eurofins appears to remove more of the interfering polar compounds than the procedure used by TestAmerica, as their TPH-D results were consistently lower.
- TPH-D results reported by Eurofins are more representative of the actual hydrocarbon content of samples, as based on results from EPH testing by both laboratories. The TPH-D results in downgradient MWs-A4, A5, and A6 are below MTCA Method A cleanup levels.
- Friedman & Bruya recommended the use of the column SGT procedure for analyses of TPH samples for this Site based on the high concentrations of polar compounds that are interfering with the TPH-D analyses.

- Results from the comparative evaluation suggest that TestAmerica had consistently been reporting inappropriately high TPH results for the downgradient monitoring wells due to interference by polar compounds present in Site groundwater.

6.0 CLOSURE

Based on the results of this evaluation and the recommendations provided by Friedman & Bruya, future laboratory testing for the ExxonMobil/ADC Site will be conducted by Eurofins. Results from Eurofins for TPH-D more closely matched results of EPH analyses, which is the more representative indicator for the presence of hydrocarbons at the Site. Eurofins is accredited by Ecology for all of the analytical methods used for the semiannual sampling events.

Sincerely yours,
Amec Foster Wheeler Environment & Infrastructure, Inc.

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Enclosures:
Table 1 – Selected Historical Analytical Results for Total Petroleum Hydrocarbons
Table 2 – Comparative Study Schedule
Table 3 – Results for EPH/VPH Analyses June 2014
Table 4 – Analytical Results for TPH in Split Groundwater Samples
Table 5 – Analytical Results for PAHs and VOCs in Split Groundwater Samples
Table 6 – Relative Percent Differences in Results between Laboratories
Table 7 – Summary Statistics for Relative Percent Differences in Results between Laboratories
Figure 1 – Monitoring Well Network
Attachment A – Friedman & Bruya Assessment
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Attachment C – Statistical Data Input and Program Output

TABLES

TABLE 1

SELECTED HISTORICAL ANALYTICAL RESULTS FOR TOTAL PETROLEUM HYDROCARBONS [1, 2]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Well ID	Date Sampled	TPH-Diesel (µg/L)	TPH-Oil (µg/L)
MTCA Method A CUL [3]		500	500
MW-19	3/1/2010	**854**	**585**
	3/1/2010 (dup.)	**824**	**563**
	8/18/2010	346 J	137 J
	8/18/2010 (dup.)	**508 J**	323 J
	11/18/2010	488	172
	2/17/2011	**570 J**	128 N
	5/18/2011	274 NJ	26.2 NJ
	11/29/2011	**621**	250 U
	2/22/2012	**512**	250 U
	8/29/2012	**543**	148
	2/21/2013	354	111
	8/22/2013	341	76.8 J
	2/25/2014	239	**571**
	8/27/2014	409	94.3 U
MW-40R	3/1/2010	**3,790**	**1,270**
	8/18/2010	**4,390**	**1,620**
	11/18/2010	**1,970**	413
	2/17/2011	**2,030 J**	**638 N**
	5/18/2011	**1,540 NJ**	208 NJ
	11/29/2011	**1,720**	248 U
	2/22/2012	**1,690**	295
	8/29/2012	**3,780 J**	**1,100 J**
	2/21/2013	**792 J**	113 J
	8/22/2013	**4,010**	**1,040**
	2/25/2014	**1,550**	203
	8/27/2014	**1,610 J**	276 J
MW-A1	2/25/2010	**3,390**	**545**
	8/18/2010	**2,200**	276
	11/18/2010	**2,140**	95.2 U
	2/18/2011	**3,260**	**529 N**
	5/18/2011	**2,350 J**	144 J
	11/28/2011	**15,600**	4,900 U
	2/21/2012	**4,530**	**847**
	8/29/2012	**2,190**	424
	2/21/2013	**802**	103
	8/27/2014	**1,240**	124
MW-A2	2/26/2010	**2,400**	499
	8/18/2010	**1,720**	233
	11/17/2010	**2,010**	97.1 U
	11/17/2010 (dup.)	**1,880**	95.2 U
	2/17/2011	**1,720 J**	421 N
	5/19/2011	**1,540**	468
	11/28/2011	**1,520**	243 U
	8/29/2012	**965**	133
	2/21/2013	**782**	118
	8/22/2013	**826**	93.9 J
	2/25/2014	**730**	94.3 U
	8/27/2014	**565**	95.7 UJ
	8/27/2014 (dup.)	**602**	94.8 U
MW-A3	8/18/2010	335	226
	11/18/2010	417	96.2 U
	2/17/2011	**791**	220 N
	5/19/2011	404 NJ	29.6 NJ
	11/29/2011	**643**	248 U
	2/22/2012	**826**	240 U
	8/29/2012	365	100 U
	2/21/2013	**655**	146
	8/22/2013	**864**	341
	2/25/2014	365	94.3 U
	8/26/2014	**906**	442
MW-A4	8/18/2010	483	**516**
	11/17/2010	**585**	396
	2/17/2011	**667**	**515 N**
	5/19/2011	416 NJ	215 NJ
	11/29/2011	**592**	288
	2/22/2012	**580**	**525**
	8/29/2012	**635**	356
	2/21/2013	**708**	472
	8/22/2013	**732**	343
	2/25/2014	590	223
	8/26/2014	360	94.3 U

TABLE 1

SELECTED HISTORICAL ANALYTICAL RESULTS FOR TOTAL PETROLEUM HYDROCARBONS [1, 2]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Well ID	Date Sampled	TPH-Diesel (µg/L)	TPH-Oil (µg/L)	Well ID	Date Sampled	TPH-Diesel (µg/L)	TPH-Oil (µg/L)
MTCA Method A CUL [3]		**500**	**500**	**MTCA Method A CUL [3]**		**500**	**500**
MW-A5	8/18/2010	**2,070**	288	MW-A6	8/18/2010	**513**	145
	11/17/2010	**1,250 J**	98.0 U		11/17/2010	**796**	94.3 J
	2/17/2011	**2,800**	**523 N**		2/17/2011	**1,500**	273 N
	5/19/2011	**1,970**	195		5/19/2011	**1,370**	224
	11/28/2011	**1,880**	243		11/29/2011	**1,560**	245 U
	2/21/2012	**2,480**	250 U		2/21/2012	**1,960**	493
	8/29/2012	**2,830**	**514**		8/29/2012	**2,020**	357
	2/21/2013	**2,930**	380		2/21/2013	**2,740**	**598**
	8/22/2013	**3,670**	**555**		8/22/2013	**2,800**	**612**
	2/25/2014	**2,480**	200		2/25/2014	**2,840**	208
	8/26/2014	**2,160**	95.2 U		8/26/2014	**2,430**	174

Notes

1. Data qualifier flags are as follows:
   J = The result is an approximation.
   U = Analyte not detected at or above the reporting limit indicated.
   UJ = Analyte was not detected above the reporting limit. Indicated value is estimated reporting limit.
   N = presumptively identified due to spectral match issues.
   NJ = presumptively identified due to spectral match issues.
2. All analtyical results by TestAmerica.
3. MTCA Method A Cleanup Level, TPH-Diesel = 500 µg/L, MTCA Method A Cleanup Level, TPH-Oil = 500 µg/L

Bold indicates that the result is greater than MTCA Method A cleanup level.

Abbreviations

µg/L = microgram per liter
CUL = cleanup level
MTCA = Model Toxics Control Act
TPH = total petroleum hydrocarbons

TABLE 2

COMPARATIVE STUDY SCHEDULE[1]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Sampling Schedule	Wells Sampled	Analyses[2]
June 2014	MA-A1[3] MW-A2[3] MW-A4[3] MW-A5 MW-A6	EPH VPH TPH-D (C_{10}-C_{24}) w/SGT TPH-D (C_{10}-C_{24}) no/SGT (Eurofins only) TPH-O (C_{24}-C_{40}) w/SGT PAHs Select VOCs
August 2014 (Semiannual Monitoring)	MW-A1 MW-A2 MW-A3 MW-A4 MW-A5 MW-A6 MW-A7 MW-A8 MW-11 MW-19 MW-40R	TPH-G (C_6-C_{12}) TPH-D (C_{10}-C_{24}) w/SGT TPH-O (C_{24}-C_{40}) w/SGT PAHs Select VOCs
September 2014 October 2014 November 2014 December 2014	MW-A2 MW-A4 MW-A5 MW-A6 MW-40R	TPH-G (C_6-C_{12}) TPH-D (C_{10}-C_{24}) no/SGT TPH-D (C_{10}-C_{24}) w/SGT TPH-O (C_{24}-C_{40}) no/SGT TPH-O (C_{24}-C_{40}) w/SGT PAHs Select VOCs

Notes:

1. Samples were split in the field for analysis at both TestAmerica and Eurofins, except as noted.
2. EPH analyzed by Method NWTPH-EPH.
   VPH analyzed by Method NWTPH-VPH.
   TPH-D and TPH-O analyzed by Method NWTPH-Dx with (w/SGT) or without (no SGT) silica gel treatment.
   TPH-G analyzed by Method NWTPH-Gx.
   PAHs analyzed by EPA Method 8270D (Eurofins uses 8270C) with select ion monitoring.
   VOCs analyzed by EPA Method 8260B.
3. Analyzed only by TestAmerica and only for EPH/VPH.

Abbreviations:

EPA = U.S. Environmental Protection Agency
EPH = extractable petroleum hydrocarbons
PAHs = polycyclic aromatic hydrocarbons
SGT = silica gel treatment
TPH-G = total petroleum hydrocarbons in the gasoline range
TPH-D = total petroleum hydrocarbons in the diesel range
TPH-O = total petroleum hydrocarbons in the oil range
VOCs = volatile organic compounds
VPH = volatile petroleum hydrocarbons

TABLE 3

RESULTS FOR EPH/VPH ANALYSES, JUNE 2014[1]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Well ID	MW-A1	MW-A2	MW-A4	MW-A5 2			MW-A6		
Analytical Lab	TA	TA	TA	TA[2]		EU	TA [2]		EU
EPH (µg/L)									
C8-C10 Aliphatics	19.2 U	18.9 UR	19.2 UR	18.9 UR	19 UR	50 U	18.9 UR	18.7 UR	50 U
C8-C10 Aromatics	48.1 U	47.2 UJ	48.1 U	47.2 U	47.6 U	50 U	47.2 U	46.7 U	50 U
C10-C12 Aliphatics	9.62 U	17.4 J	9.62 UR	9.43 UR	9.52 UR	50 U	9.43 UR	9.35 UR	50 U
C10-C12 Aromatics	14.1	15.1 J	9.62 UJ	9.43 UJ	9.81 J	50 U	9.43 U	9.35 U	50 U
C12-C16 Aliphatics	28.8 U	28.5	28.8 U	28.3 U	28.6 U	50 U	28.3 U	28 U	50 U
C12-C16 Aromatics	75.6	37.7 UJ	38.5 U	37.7 U	38.1 U	50 U	37.7 U	37.4 U	50 U
C16-C21 Aliphatics	48.1 U	47.2 U	48.1 U	47.2 U	47.6 U	50 U	47.2 U	46.7 U	50 U
C16-C21 Aromatics	98.2	47.2 UJ	48.1 U	47.2 U	47.6 U	2.8	47.2 U	46.7 U	50 U
C21-C34 Aliphatics	48.1 U	47.2 U	48.1 U	47.2 U	47.6 U	50 U	47.2 U	68.5	50 U
C21-C34 Aromatics	48.1 U	47.2 UJ	48.1 U	47.2 U	47.6 U	16	47.2 U	46.7 U	50 U
VPH (µg/L)									
C5-C6 aliphatics (adjusted)	50 U	50 U	50 U	50 U	50 U	10 U	50 U	50 U	10 U
C6-C8 aliphatic (adjusted)	50 U	50 U	50 U	50 U	50 U	15 U	50 U	50 U	15 U
C8-C10 aliphatic (adjusted)	50 U	50 U	50 U	50 U	50 U	25 U	50 U	50 U	25 U
C8-C10 Aromatics	50 U	50 U	50 U	50 U	50 U	25 U	50 U	50 U	25 U
C10-C12 aliphatic (adjusted)	50 U	50 U	50 U	50 U	50 U	15 U	50 U	50 U	15 U
C10-C12 Aromatics	50 U	50 U	50 U	50 U	50 U	7.3	50 U	50 U	3.0
C12-C13 Aromatics	50 U	50 U	50 U	50 U	50 U	4.4	50 U	50 U	2.2

Notes:

1. Data qualifiers are as follows:
    J = The result is an approximation.
    U = Analyte not detected at or above the reporting limit indicated.
    UJ = Analyte was not detected above the reporting limit. Indicated value is estimated reporting limit.
    UR = Analyte was not detected at or above the reporting limit shown, but the result was rejected due to quality control issues.
2. The two results shown represent a primary and field duplicate sample.

Abbreviations:

µg/L = micrograms per liter
EPH = Extractable petroleum hydrocarbons
EU = Eurofins Calscience, Garden Grove, California
TA = TestAmerica, Nashville, Tennessee
VPH = Volatile petroleum hydrocarbons

TABLE 4

ANALYTICAL RESULTS FOR TPH IN SPLIT GROUNDWATER SAMPLES [1]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

all results in milligrams per liter (mg/L)

Well ID	MW-A1			MW-A2																				
Date Sampled	**6/19/2014**	**8/27/2014**		**6/19/2014**	**8/27/2014**				**9/30/2014**				**10/29/2014**				**11/19/2014**				**12/18/2014**			
Analytical Lab	**TA**	**TA**	**EU**	**TA**	**TA[2]**		**EU[2]**		**TA[2]**		**EU[2]**		**TA[2]**		**EU[2]**		**TA[2]**		**EU[2]**		**TA[2]**		**EU[2]**	
TPH-G (C6-C12)	--	100 U	630	--	100 U	100 U	130	120	100 U	500 U	130	140	156	160	180	180	146	100 U	150	160	178	165	140	160
TPH-D (C10-C24) no/SG	--	--	--	--	--	--	--	--	1,050	834	1200	350	1,190 J	3,000 J	500	550	938	999	220	300	849 J	952 J	320	340
TPH-D (C10-C24) w/SG	1,460	1,240	590	881	565	602	220	220	594 J	313 J	590 J	170 J	678 J	1,140 J	360	380	345 J	393	190	240	430 J	805 J	260	280
TPH-O (C24-C40) no/SG	--	--	--	--	--	--	--	--	168	181	320	100 U	305 J	784 J	100 U	100 U	197 J	284 J	100 U	100 U	158 J	164 J	100 U	100 U
TPH-O (C24-C40) w/SG	146	124	100 U	111	95.7 UJ	94.8 U	100 U	100 U	95.7 U	94.3 U	190	100 U	94.3 U	141	100 U	100 U	93.9 UJ	100 U	100 U	100 U	95.2 UJ	218 J	100 U	100 U

Well ID	MW-A3		MW-A4											MW-A5								
Date Sampled	**8/26/2014**		**6/19/2014**	**8/26/2014**		**9/30/2014**		**10/29/2014**		**12/5/2014**		**12/18/2014**		**6/19/2014**			**8/26/2014**		**9/30/2014**		**10/29/2014**	
Analytical Lab	**TA**	**EU**	**TA**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA[2]**		**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**
TPH-G (C6-C12)	100 U	56 J	--	100 U	100 U	500 UJ	100 U	100 U	100 U	100 U	100 U	500 UJ	100 U	--	--	--	100 U	100 U	100 U	100 U	100 U	100 U
TPH-D (C10-C24) no/SG	--	--	--	--	--	768	86 J	1,340	210	849	100 U	281	100 U	--	--	590	--	--	155 J	310	4,500	790
TPH-D (C10-C24) w/SG	906	120	851	360	100 U	413	100 U	298	120	385	100 U	242	100 U	3,360	272 R	360	2,160	300	2,940	140	2,360	380
TPH-O (C24-C40) no/SG	--	--	--	--	--	469	100 U	839	100 U	663	100 U	106	100 U	--	--	--	--	--	94.3 UR	100 U	778	100 U
TPH-O (C24-C40) w/SG	442	100 U	374	94.3 U	100 U	112	100 U	95.7 U	100 U	146	100 U	98.8	100 U	333	93.9 UR	100 U	95.2 U	100 U	230	100 U	156	100 U

Well ID	MW-A5				MW-A6															MW-A7		MW-A8	
Date Sampled	**12/5/2014**		**12/17/2014**		**6/19/2014**			**8/26/2014**		**9/30/2014**		**10/29/2014**		**11/20/2014**		**12/17/2014**		**8/27/2014**		**8/26/2014**	
Analytical Lab	**TA**	**EU**	**TA**	**EU**	**TA[2]**		**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**
TPH-G (C6-C12)	100 U	100 U	100 U	100 U	--	--	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U	100 U
TPH-D (C10-C24) no/SG	3,060	440	3,560 J	460	--	--	340	--	--	243 J	130	3,770	420	3,040	120	2,770 J	250	--	--	--	--
TPH-D (C10-C24) w/SG	2,090 J	170	2,810	230	3,270	2,550	130	2,430	100 U	3,150	100 U	1,730	190	1,080	100 U	2470	110	94.3 U	100 U	93.9 U	100 U
TPH-O (C24-C40) no/SG	669	100 U	612 J	100 U	--	--	--	--	--	94.3 UR	100 U	561	100 U	468	100 U	383 J	100 U	--	--	--	--
TPH-O (C24-C40) w/SG	184 J	100 U	274	100 U	272	230	100 U	174	100 U	159	100 U	94.8 U	100 U	100 U	100 U	168	100 U	94.3 U	100 U	93.9 U	100 U

Well ID	MW-11		MW-19		MW-40R									
Date Sampled	**8/27/2014**		**8/27/2014**		**8/27/2014**		**9/30/2014**		**10/29/2014**		**11/19/2014**		**12/17/2014**	
Analytical Lab	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**
TPH-G (C6-C12)	100 U	100 U	208	190	500 U	460	500 U	480	562	460	640	500	559	460
TPH-D (C10-C24) no/SG	--	--	--	--	--	--	2,080 J	1,000	1,290	1,200	1,290	750	2,040 J	770
TPH-D (C10-C24) w/SG	96.2 U	100 U	409	190	1,610 J	690	1,540 J	540	637	730	733 J	590	1610	550
TPH-O (C24-C40) no/SG	--	--	--	--	--	--	500 J	100 U	351	160	444	200	644 J	100
TPH-O (C24-C40) w/SG	96.2 U	100 U	94.3 U	100 U	276 J	97 J	165 J	100 U	95.2 U	100 U	115 J	94	345	100 U

Notes:

1. Data qualifiers are as follows:
   J = The result is an approximation.
   U = not detected at or above the laboratory reporting limit shown.
   UJ = not detected at or above value shown, which is the estimated reporting limit.
   R = result is rejected due to surrogate non-compliance.
   UR = Analyte was not detected at or above the reporting limit shown, but the result was rejected due to quality control issues.
2. The two results shown represent a primary and field duplicate sample.

Abbreviations:

-- = not analyzed
EU = Eurofins Calscience, Garden Grove, California
TA = TestAmerica, Nashville, Tennessee

TPH = total petroleum hydrocarbons
TPG-D = total petroleum hydrocarbons diesel range
TPH-G = total petroleum hydrocarbons gasoline range
TPH-O = total petroleum hydrocarbons motor oil

TABLE 5

ANALYTICAL RESULTS FOR PAHs AND VOCs IN SPLIT GROUNDWATER SAMPLES[1]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Well ID	MW-A1			MW-A2																
Date Sampled	6/19/2014	8/27/2014		6/19/2014	8/27/2014				9/30/2014				10/29/2014				11/20/2014			
Analytical Lab	TA	TA	EU	TA	TA[2]		EU[2]		TA[2]		EU[2]		TA[2]		EU[2]		TA[2]		EU[2]	
PAHs (µg/L)																				
1-Methylnaphthalene	0.0948 U	1.06	0.51	0.0948 U	0.0943 U	0.0943 U	0.075 J	0.061 J	0.0966	0.1	0.084 J	0.095 U	0.508	0.533	1.6	2.1	0.259	0.267	0.28	0.27
2-Methylnaphthalene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.0943 U	0.0943 U	0.096 U	0.096 U
Acenaphthene	0.102	0.515	0.50	0.397	0.455	0.468	0.44	0.37	0.441	0.444	0.45	0.35	0.476	0.482	0.61	0.69	0.589	0.531	0.61	0.48
Acenaphthylene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.104	0.0943 U	0.11	0.099
Anthracene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.032	0.035	0.0943 U	0.0943 U	0.029	0.027
Benz[a]anthracene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.0943 U	0.0943 U	0.096 U	0.096 U
Benzo(a)pyrene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.0943 U	0.0943 U	0.096 U	0.096 U
Benzo(b)fluoranthene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.0943 U	0.0943 U	0.096 U	0.096 U
Benzo(g,h,i)perylene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.0943 U	0.0943 U	0.096 U	0.096 U
Benzo(k)fluoranthene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.0943 U	0.0943 U	0.096 U	0.096 U
Chrysene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.0943 U	0.0943 U	0.096 U	0.096 U
Dibenzo(a,h)anthracene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.0943 U	0.0943 U	0.096 U	0.096 U
Fluoranthene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.0943 U	0.0943 U	0.096 U	0.096 U
Fluorene	0.168	0.449	0.47	0.439	0.443	0.492	0.42	0.34	0.425	0.443	0.37	0.31	0.529	0.560	1.0	1.2	0.763	0.644	0.94	0.80
Indeno(1,2,3-cd)pyrene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.096 U	0.095 U	0.0943 U	0.0943 U	0.096 U	0.096 U
Naphthalene	0.0948 U	0.0952 U	0.096 U	0.135	0.219	0.238	0.095 U	0.097 U	0.191	0.197	0.097 U	0.095 U	0.136	0.162	0.096 U	0.095 U	0.164	0.183	0.21	0.20
Phenanthrene	0.0948 U	0.0952 U	0.096 U	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.058	0.099	0.0943 U	0.0943 U	0.027	0.096 U
Pyrene	0.0948 U	0.0952 U	0.14	0.0948 U	0.0943 U	0.0943 U	0.095 U	0.097 U	0.0952 U	0.0948 U	0.097 U	0.095 U	0.0948 U	0.0943 U	0.022	0.022	0.0943 U	0.0943 U	0.096 U	0.096 U
VOCs (µg/L)																				
1,2-Dichloroethane	0.5 U	--	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	0.5 U	0.5 U	0.50 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.50 U	0.50 U
Ethylbenzene	0.5 U	0.5 U	1.0 U	0.5 U	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	0.5 U	1.0 U	1.0 U
Hexane	0.5 U	--	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl t-butyl ether	0.5 U	0.5 U	1.0 U	0.5 U	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	0.5 U	1.0 U	1.0 U
Toluene	0.5 U	0.5 U	1.0 U	0.5 U	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	0.5 U	1.0 U	1.0 U
Total Xylenes	1.5 U	1.5 U	1.0 U	1.5 U	1.5 U	1.5 U	1.0 U	1.0 U	1.5 U	1.5 U	1.0 U	1.0 U	1.5 U	1.5 U	1.0 U	1.0 U	1.5 U	1.5 U	1.0 U	1.0 U
Ethylene dibromide	0.5 U	--	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 5

ANALYTICAL RESULTS FOR PAHs AND VOCs IN SPLIT GROUNDWATER SAMPLES[1]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Well ID	MW-A2 cont.				MW-A3		MW-A4													MW-A5				
Date Sampled	12/18/2014				8/26/2014		6/19/2014	8/26/2014		9/30/2014		10/29/2014		12/5/2014		12/18/2014		6/19/2014			8/26/2014	
Analytical Lab	TA^2		EU^2		TA	EU	TA	TA	EU	TA	EU	TA	EU	TA	EU	TA	EU	TA^2		EU	TA	EU
PAHs (µg/L)																								
1-Methylnaphthalene	0.315	0.314	0.28	0.40	0.0952 U	0.095 U	0.202	0.225	0.25	0.252	0.21	0.478	0.49	0.187	0.13	0.737	0.44	0.0948 U	0.0948 U	0.096 U	0.0952 U	0.043 J
2-Methylnaphthalene	0.0939 U	0.0943 U	0.035 J	0.043 J	0.0952 U	0.095 U	0.127	0.161	0.17	0.14	0.11	0.713	0.77	0.203	0.13	1.1	0.63	0.0948 U	0.0948 U	0.096 U	0.0952 U	0.036 J
Acenaphthene	0.51	0.493	0.42	0.35	0.697	0.93	1.92	2.18	2.5	2.71	2.6 J	3.2	3.6	2.51	1.9	3.34	2.0	2.55	2.71	0.034	2.5	4.3
Acenaphthylene	0.108	0.0943 U	0.071 J	0.067 J	0.0952 U	0.095 U	0.0948 U	0.0962 U	0.092 J	0.0962 U	0.028 J	0.0943 U	0.017 J	0.0952 U	0.018 J	0.0948 U	0.019 J	0.0948 U	0.0948 U	--	0.0952 U	0.13
Anthracene	0.0939 U	0.0943 U	0.018 J	0.020 J	0.0952 U	0.095 U	0.0948 U	0.0962 U	0.15	0.0962 U	0.074	0.112	0.11	0.0952 U	0.057 J	0.142	0.085 J	0.0948 U	0.0948 U	--	0.0952 U	0.10
Benz[a]anthracene	0.0939 U	0.0943 U	0.096 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.0962 U	0.027 J	0.0962 U	0.099 U	0.0943 U	0.096 U	0.0952 U	0.020 J	0.0948 U	0.095 U	0.0948 U	0.0948 U	--	0.0952 U	0.026 J
Benzo(a)pyrene	0.0939 U	0.0943 U	0.096 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.0962 U	0.096 U	0.0962 U	0.099 U	0.0943 U	0.096 U	0.0952 U	0.095 U	0.0948 U	0.095 U	0.0948 U	0.0948 U	--	0.0952 U	0.10 U
Benzo(b)fluoranthene	0.0939 U	0.0943 U	0.096 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.0962 U	0.096 U	0.0962 U	0.099 U	0.0943 U	0.096 U	0.0952 U	0.095 U	0.0948 U	0.095 U	0.0948 U	0.0948 U	--	0.0952 U	0.10 U
Benzo(g,h,i)perylene	0.0939 U	0.0943 U	0.096 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.0962 U	0.096 U	0.0962 U	0.099 U	0.0943 U	0.096 U	0.0952 U	0.095 U	0.0948 U	0.095 U	0.0948 U	0.0948 U	--	0.0952 U	0.10 U
Benzo(k)fluoranthene	0.0939 U	0.0943 U	0.096 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.0962 U	0.096 U	0.0962 U	0.099 U	0.0943 U	0.096 U	0.0952 U	0.095 U	0.0948 U	0.095 U	0.0948 U	0.0948 U	--	0.0952 U	0.10 U
Chrysene	0.0939 U	0.0943 U	0.096 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.0962 U	0.029 J	0.0962 U	0.099 U	0.0943 U	0.096 U	0.0952 U	0.010 J	0.0948 U	0.095 U	0.0948 U	0.0948 U	--	0.0952 U	0.034 J
Dibenzo(a,h)anthracene	0.0939 U	0.0943 U	0.096 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.0962 U	0.096 U	0.0962 U	0.099 U	0.0943 U	0.096 U	0.0952 U	0.095 U	0.0948 U	0.095 U	0.0948 U	0.0948 U	--	0.0952 U	0.10 U
Fluoranthene	0.0939 U	0.0943 U	0.096 U	0.095 U	0.0952 U	0.074 J	0.106	0.107	0.20	0.146	0.12	0.137	0.17	0.115	0.059 J	0.126	0.082 J	0.0948 U	0.0948 U	--	0.0952 U	0.080 J
Fluorene	0.72	0.71	0.60	0.59	0.514	0.60	0.612	0.676	0.86	0.865	0.81	1.16	1.3	0.864	0.64	1.38	0.89	0.0948 U	0.0948 U	--	0.0952 U	0.10
Indeno(1,2,3-cd)pyrene	0.0939 U	0.0943 U	0.096 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.0962 U	0.096 U	0.0962 U	0.099 U	0.0943 U	0.096 U	0.0952 U	0.095 U	0.0948 U	0.095 U	0.0948 U	0.0948 U	--	0.0952 U	0.10 U
Naphthalene	0.119	0.144	0.18	0.17	0.0952 U	0.095 U	1.11	1.25	1.2	0.846	0.68	4.35	3.3	1.8	1.2	7.22	3.5	0.0948 U	0.0948 U	0.034	0.0952 U	0.27
Phenanthrene	0.0939 U	0.0943 U	0.096 U	0.095 U	1.42	1.6	0.534	0.647	0.93	0.771	0.64	0.961	1.0	0.718	0.51	1.18	0.70	0.0948 U	0.0948 U	--	0.103	0.27
Pyrene	0.0939 U	0.0943 U	0.096 U	0.095 U	0.0952 U	0.067 J	0.0948 U	0.0962 U	0.17	0.0962 U	0.080 J	0.0943 U	0.11	0.0952 U	0.059 J	0.0948 U	0.048 J	0.0948 U	0.0948 U	--	0.0952 U	0.085 J
VOCs (µg/L)																								
1,2-Dichloroethane	--	--	--	--	--	--	0.5 U	--	--	--	--	--	--	--	--	--	--	0.5 U	0.5 U	0.50 U	--	--
Benzene	0.5 U	0.5 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.5 U	0.50 U	0.5 UJ	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.16 J	0.5 U	0.5 U	0.50 U	0.5 U	0.50 U
Ethylbenzene	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	1.0 U	0.5 U	0.5 U	1.0 U	0.5 UJ	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	0.5 U	1.0 U	0.5 U	1.0 U
Hexane	--	--	--	--	--	--	0.5 U	--	--	--	--	--	--	--	--	--	--	0.5 U	0.5 U	1.0 U	--	--
Methyl t-butyl ether	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	1.0 U	0.5 U	0.5 U	1.0 U	0.5 UJ	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	0.5 U	1.0 U	0.5 U	1.0 U
Toluene	0.5 U	0.5 U	1.0 U	1.0 U	0.5 U	1.0 U	0.5 U	0.5 U	1.0 U	0.5 UJ	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	0.5 U	1.0 U	0.5 U	1.0 U
Total Xylenes	1.5 U	1.5 U	1.0 U	1.0 U	1.5 U	1.0 U	0.5 U	1.5 U	1.0 U	1.5 UJ	1.0 U	1.5 U	1.0 U	1.5 U	1.0 U	1.5 U	1.0 U	0.5 U	0.5 U	1.0 U	1.5 U	1.0 U
Ethylene dibromide	--	--	--	--	--	--	1.5 U	--	--	--	--	--	--	--	--	--	--	1.5 U	1.5 U	1.0 U	--	--

TABLE 5

ANALYTICAL RESULTS FOR PAHs AND VOCs IN SPLIT GROUNDWATER SAMPLES[1]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Well ID	MW-A5 cont.								MW-A6												
Date Sampled	9/30/2014		10/29/2014		12/5/2014		12/17/2014		6/19/2014			8/26/2014		9/30/2014		10/29/2014		11/20/2014		12/17/2014	
Analytical Lab	TA	EU	TA	EU	TA	EU	TA	EU	TA^2		EU	TA	EU	TA	EU	TA	EU	TA	EU	TA	EU
PAHs (µg/L)																					
1-Methylnaphthalene	0.0943 U	0.16	0.0943 U	0.095 U	0.0943 U	0.019 J	0.0943 U	0.096 U	0.0948 U	0.0948 U	0.097 U	0.0952 U	0.095 U	0.0952 U	0.28	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
2-Methylnaphthalene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.017 J	0.0943 U	0.014 J	0.0948 U	0.0948 U	0.097 U	0.0952 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Acenaphthene	2.49	3.4	2.38	1.1	2.28	1.4	2.06	1.9	0.266	0.177	0.097 U	0.23	0.41	0.619	0.63	0.323	0.25	0.314	0.27	0.287	0.10
Acenaphthylene	0.0943 U	0.096 U	0.0943 U	0.011 J	0.0943 U	0.015 J	0.0943 U	0.025 J	0.0948 U	0.0948 U	--	0.0952 U	0.020 J	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Anthracene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.032 J	0.0943 U	0.017 J	0.0948 U	0.0948 U	--	0.0952 U	0.023 J	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.023 J	0.0943 U	0.095 U
Benz[a]anthracene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.096 U	0.0943 U	0.096 U	0.0948 U	0.0948 U	--	0.0952 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Benzo(a)pyrene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.096 U	0.0943 U	0.096 U	0.0948 U	0.0948 U	--	0.0952 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Benzo(b)fluoranthene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.096 U	0.0943 U	0.096 U	0.0948 U	0.0948 U	--	0.0952 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Benzo(g,h,i)perylene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.096 U	0.0943 U	0.096 U	0.0948 U	0.0948 U	--	0.0952 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Benzo(k)fluoranthene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.096 U	0.0943 U	0.096 U	0.0948 U	0.0948 U	--	0.0952 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Chrysene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.096 U	0.0943 U	0.096 U	0.0948 U	0.0948 U	--	0.0952 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Dibenzo(a,h)anthracene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.096 U	0.0943 U	0.096 U	0.0948 U	0.0948 U	--	0.0952 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Fluoranthene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.013 J	0.0943 U	0.096 U	0.0948 U	0.0948 U	--	0.0952 U	0.066 J	0.0952 U	0.069 J	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.023 J
Fluorene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.027 J	0.0943 U	0.085 J	0.0948 U	0.0948 U	--	0.0952 U	0.087 J	0.127	0.13 J	0.0948 U	0.097 U	0.0943 U	0.045 J	0.0943 U	0.019 J
Indeno(1,2,3-cd)pyrene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.096 U	0.0943 U	0.096 U	0.0948 U	0.0948 U	--	0.0952 U	0.095 U	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Naphthalene	0.0943 U	0.096 U	0.0943 U	0.095 U	0.0943 U	0.013 J	0.0943 U	0.043 J	0.0948 U	0.0948 U	0.097 U	0.0952 U	0.11	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.022 J
Phenanthrene	0.0943 U	0.096 U	0.0943 U	0.016 J	0.0943 U	0.022 J	0.0943 U	0.024 J	0.0948 U	0.0948 U	--	0.0952 U	0.023 J	0.0952 U	0.095 U	0.0948 U	0.097 U	0.0943 U	0.095 U	0.0943 U	0.095 U
Pyrene	0.0943 U	0.025 J	0.0943 U	0.013 J	0.0943 U	0.013 J	0.0943 U	0.056 J	0.0948 U	0.0948 U	--	0.0952 U	0.056 J	0.0952 U	0.059 J	0.0948 U	0.045 J	0.0943 U	0.039 J	0.0943 U	0.022 J
VOCs (µg/L)																					
1,2-Dichloroethane	--	--	--	--	--	--	--	--	0.5 U	0.5 U	0.50 U	--	--	--	--	--	--	--	--	--	--
Benzene	0.5 U	0.17 J	0.5 U	0.19 J	0.5 U	0.18 J	0.5 U	0.22 J	0.5 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U
Ethylbenzene	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U
Hexane	--	--	--	--	--	--	--	--	0.5 U	0.5 U	1.0 U	--	--	--	--	--	--	--	--	--	--
Methyl t-butyl ether	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U
Toluene	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U
Total Xylenes	1.5 U	1.0 U	1.5 U	1.0 U	1.5 U	1.0 U	1.5 U	1.0 U	0.5 U	0.5 U	1.0 U	1.5 U	1.0 U	1.5 U	1.0 U	1.5 U	1.0 U	1.5 U	1.0 U	1.5 U	1.0 U
Ethylene dibromide	--	--	--	--	--	--	--	--	1.5 U	1.5 U	1.0 U	--	--	--	--	--	--	--	--	--	--

TABLE 5

ANALYTICAL RESULTS FOR PAHs AND VOCs IN SPLIT GROUNDWATER SAMPLES[1]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Well ID	**MW-A7**		**MW-A8**		**MW-11**		**MW-19**		**MW-40R**									
Date Sampled	**8/27/2014**		**8/26/2014**		**8/27/2014**		**8/27/2014**		**8/27/2014**		**9/30/2014**		**10/29/2014**		**11/19/2014**		**12/17/2014**	
Analytical Lab	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**	**TA**	**EU**
PAHs (µg/L)																		
1-Methylnaphthalene	0.0952 U	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.122	0.11	12.3	11	11.3	8.7	15.8	3.7	18.2	3.7	13.6	8.9
2-Methylnaphthalene	0.0952 U	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	1.47	1.3	0.899	0.62	0.826	0.18	1.15	0.43	0.756	0.48
Acenaphthene	0.0952 U	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.164	0.12	0.877	0.72	0.87	0.55	0.903	0.48	1.01	0.45	0.838	0.61
Acenaphthylene	0.0952 U	0.10 U	0.0962 U	0.019 J	0.0952 U	0.097 U	0.0952 U	0.099 U	0.115	0.096 U	0.190 U	0.095 U	0.106	0.099 U	0.121	0.064 J	0.0947	0.079 J
Anthracene	0.0952 U	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.110	0.096 U	0.190 U	0.095 U	0.0943 U	0.040 J	0.0943 U	0.040 J	0.0939 U	0.055 J
Benz[a]anthracene	0.0952 UJ	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.0962 U	0.096 U	0.190 U	0.095 U	0.0943 U	0.099 U	0.0943 U	0.096 U	0.0939 U	0.096 U
Benzo(a)pyrene	0.0952 UJ	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.0962 U	0.096 U	0.190 U	0.095 U	0.0943 U	0.099 U	0.0943 U	0.096 U	0.0939 U	0.096 U
Benzo(b)fluoranthene	0.0952 UJ	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.0962 U	0.096 U	0.190 U	0.095 U	0.0943 U	0.099 U	0.0943 U	0.096 U	0.0939 U	0.096 U
Benzo(g,h,i)perylene	0.0952 UR	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.0962 U	0.096 U	0.190 U	0.095 U	0.0943 U	0.099 U	0.0943 U	0.096 U	0.0939 U	0.096 U
Benzo(k)fluoranthene	0.0952 UJ	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.0962 U	0.096 U	0.190 U	0.095 U	0.0943 U	0.099 U	0.0943 U	0.096 U	0.0939 U	0.096 U
Chrysene	0.0952 UJ	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.0962 U	0.045 J	0.190 U	0.095 U	0.0943 U	0.099 U	0.0943 U	0.013 J	0.0939 U	0.019 J
Dibenzo(a,h)anthracene	0.0952 U	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.0962 U	0.096 U	0.190 U	0.095 U	0.0943 U	0.099 U	0.0943 U	0.096 U	0.0939 U	0.096 U
Fluoranthene	0.0952 UR	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.0962 U	0.076 J	0.190 U	0.039 J	0.0943 U	0.039 J	0.0943 U	0.030 J	0.0939 U	0.041 J
Fluorene	0.0952 U	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.050 J	0.815	0.74	0.799	0.52	0.855	0.43	0.88	0.47	0.77	0.62
Indeno(1,2,3-cd)pyrene	0.0952 UR	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.0962 U	0.096 U	0.190 U	0.095 U	0.0943 U	0.099 U	0.0943 U	0.096 U	0.0939 U	0.096 U
Naphthalene	0.0952 U	0.10 U	0.0962 U	0.081 J	0.0952 U	0.012 J	0.306	0.099 U	0.817	0.096 U	0.370	0.095 U	0.272	0.099 U	0.41	0.31	0.327	0.43
Phenanthrene	0.0952 U	0.10 U	0.0962 U	0.020 J	0.0952 U	0.097 U	0.0952 U	0.099 U	0.604	0.42	0.524	0.29	0.457	0.10	0.595	0.25	0.458	0.28
Pyrene	0.0952 U	0.10 U	0.0962 U	0.095 U	0.0952 U	0.097 U	0.0952 U	0.099 U	0.151	0.10	0.190 U	0.071 J	0.0943 U	0.064 J	0.116	0.047 J	0.0939 U	0.059 J
VOCs (µg/L)																		
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	1.7	1.67	2.1	0.5 U	0.96	0.592	0.61	0.576	0.58
Ethylbenzene	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	0.30 J	0.5 U	0.33	0.5 U	0.17 J	0.5 U	0.15 J	0.5 U	1.0 U
Hexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl t-butyl ether	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U
Toluene	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	1.0 U	0.5 U	0.50 J	0.5 U	0.44	0.5 U	0.39	0.5 U	0.30 J	0.5 U	1.0 U
Total Xylenes	1.5 U	1.0 U	1.5 U	1.0 U	1.5 U	1.0 U	1.5 U	1.0 U	1.5 U	2.6 J	2.78	2.4	1.5 U	2.1	1.96	1.5 J	1.77	1.5 J
Ethylene dibromide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
1. Data qualifiers are as follows:
   J = The result is an approximation.
   U = not detected at or above the laboratory reporting limit shown.
   UJ = not detected at or above value shown, which is the estimated reporting limit.
2. The two results shown represent a primary and field duplicate sample.

Abbreviations:
-- = not analyzed
µg/L = micrograms per liter
EU = Eurofins Calscience, Garden Grove, California
PAHs = polycyclic aromatic hydrocarbons
TA = TestAmerica, Nashville, Tennessee
VOCs = volatile organic compounds

TABLE 6

RELATIVE PERCENT DIFFERENCE IN RESULTS BETWEEN LABORATORIES[1]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Well ID	Date Sampled	Analyte	Results		
			TA	EU	RPD
Total Petroleum Hydrocarbons					
MW-A2	8/27/2014	TPH-G	156	180	14
MW-A2 FD			160	180	12
MW-A2	11/19/2014		146	150	3
MW-A2	12/18/2014		178	140	24
MW-A2 FD			165	160	3
MW-40R	10/29/2014		562	460	20
	11/19/2014		640	500	25
	12/17/2014		559	460	19
MW-A1	8/27/2014	TPH-D	1,240	590	71
MW-A2	8/27/2014		565	220	88
	9/30/2014		594	590	1
	10/29/2014		678	360	61
	11/19/2014		345	190	58
	12/18/2014		430	260	49
MW-A2 FD	8/27/2014		602	220	93
	9/30/2014		313	170	59
	10/29/2014		1,140	380	100
	11/19/2014		393	240	48
	12/18/2014		805	280	97
MW-A3	8/26/2014		906	120	153
MW-A4	10/29/2014		298	120	85
MW-A5	8/26/2014		2,160	300	151
	9/30/2014		2,940	140	182
	10/29/2014		2,360	380	145
	12/5/2014		2,090	170	170
	12/17/2014		2,810	230	170
MW-A6	10/29/2014		1,730	190	160
	12/17/2014		2,470	110	183
MW-19	8/27/2014		409	190	73
MW-40R	8/27/2014		1,610	690	80
	9/30/2014		1,540	540	96
	10/29/2014		637	730	14
	11/19/2014		733	590	22
	12/17/2014		1,610	550	98
MW-40R	8/27/2014	TPH-O	276	97	96
	11/19/2014		115	94	20
Volatile Organic Compounds					
MW-40R	9/30/2014	Benzene	1.67	2.1	23
	11/19/2014		0.592	0.61	3
	12/17/2014		0.576	0.58	1
	9/30/2014	Total Xylenes	2.78	2.4	15
	11/19/2014		1.96	1.5	27
	12/17/2014		1.77	1.5	16
Polycyclic Aromatic Hydrocarbons					
MW-A1	8/27/2014	Acenaphthene	0.515	0.50	3
		1-Methylnaphthalene	1.06	0.51	70
MW-A2	8/27/2014	Acenaphthene	0.455	0.44	3
	9/30/2014	Acenaphthene	0.441	0.45	2
		Fluorene	0.425	0.37	14
	10/29/2014	Acenaphthene	0.476	0.61	25
		Fluorene	0.529	1.00	62
	11/20/2014	Acenaphthene	0.589	0.6	4
		Fluorene	0.763	0.9	21
	12/18/2014	Acenaphthene	0.51	0.42	19
		Fluorene	0.72	0.60	18
MW-A2 FD	8/27/2014	Acenaphthene	0.468	0.37	23
		Fluorene	0.443	0.42	5
	10/29/2014	Fluorene	0.560	1.20	73
	11/20/2014	Acenaphthene	0.531	0.5	10
		Fluorene	0.644	0.8	22
	12/18/2014	Acenaphthene	0.493	0.35	34
		Fluorene	0.71	0.59	18
MW-A3	8/26/2014	Acenaphthene	0.697	0.93	29
		Fluorene	0.514	0.60	15
		Phenanthrene	1.42	1.6	12

TABLE 6

RELATIVE PERCENT DIFFERENCE IN RESULTS BETWEEN LABORATORIES[1]

ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Well ID	Date Sampled	Analyte	Results		
			TA	EU	RPD
MW-A4	8/26/2014	Acenaphthene	2.18	2.5	14
		Fluorene	0.676	0.86	24
		Naphthalene	1.25	1.2	4
		Phenanthrene	0.647	0.93	36
	9/30/2014	Acenaphthene	2.71	2.6	4
		Fluorene	0.865	0.81	7
		Naphthalene	0.846	0.68	22
		Phenanthrene	0.771	0.64	19
	10/29/2014	Acenaphthene	3.24	3.60	11
		Fluorene	1.16	1.30	11
		1-Methylnaphthalene	0.478	0.49	2
		2-Methylnaphthalene	0.713	0.77	8
		Naphthalene	4.35	3.30	27
		Phenanthrene	0.961	1.00	4
	12/5/2014	Acenaphthene	2.51	1.9	28
		Fluorene	0.864	0.64	30
		Naphthalene	1.8	1.2	40
		Phenanthrene	0.718	0.51	34
	12/18/2014	1-Methylnaphthalene	0.737	0.44	50
		2-Methylnaphthalene	1.1	0.63	54
		Acenaphthene	3.34	2	50
		Fluorene	1.38	0.89	43
		Naphthalene	7.22	3.5	69
		Phenanthrene	1.18	0.7	51
MW-A5	8/26/2014	Acenaphthene	2.5	4.3	53
	9/30/2014	Phenanthrene	2.49	3.4	31
	10/29/2014	Phenanthrene	2.38	1.1	74
	12/5/2014	Acenaphthene	2.28	1.4	48
	12/17/2014	Acenaphthene	2.06	1.9	8
MW-A6	9/30/2014	Acenaphthene	0.619	0.63	2
MW-40R	8/27/2014	Acenaphthene	0.877	0.72	20
		Fluorene	0.815	0.74	10
		1-Methylnaphthalene	12.3	11	11
		2-Methylnaphthalene	1.47	1.3	12
	9/30/2014	Acenaphthene	0.87	0.55	45
		Fluorene	0.799	0.52	42
		1-Methylnaphthalene	11.3	8.7	26
		2-Methylnaphthalene	0.899	0.62	37
	10/29/2014	1-Methylnaphthalene	15.8	3.7	124
	11/19/2014	1-Methylnaphthalene	18.2	3.7	132
		2-Methylnaphthalene	1.15	0.43	91
		Acenaphthene	1.01	0.45	77
		Fluorene	0.88	0.47	61
		Phenanthrene	0.595	0.25	82
	12/17/2014	1-Methylnaphthalene	13.6	8.9	42
		2-Methylnaphthalene	0.756	0.48	45
		Acenaphthene	0.838	0.61	31
		Fluorene	0.77	0.62	22

Notes
1. Results reported in micrograms per liter.

Abbreviations
EU = Eurofins Calscience, Garden Grove, California
FD = field duplicate
RPD = relative percent difference
TA = TestAmerica, Nashville, Tennessee
TPH-D = total petroeum hydrocarbons diesel
TPH-G = total petroleum hydrocarbons gasoline
TPH-O = total petroleum hydrocarbons oil

TABLE 7

SUMMARY STATISTICS FOR RELATIVE PERCENT DIFFERENCE IN RESULTS BETWEEN LABORATORIES

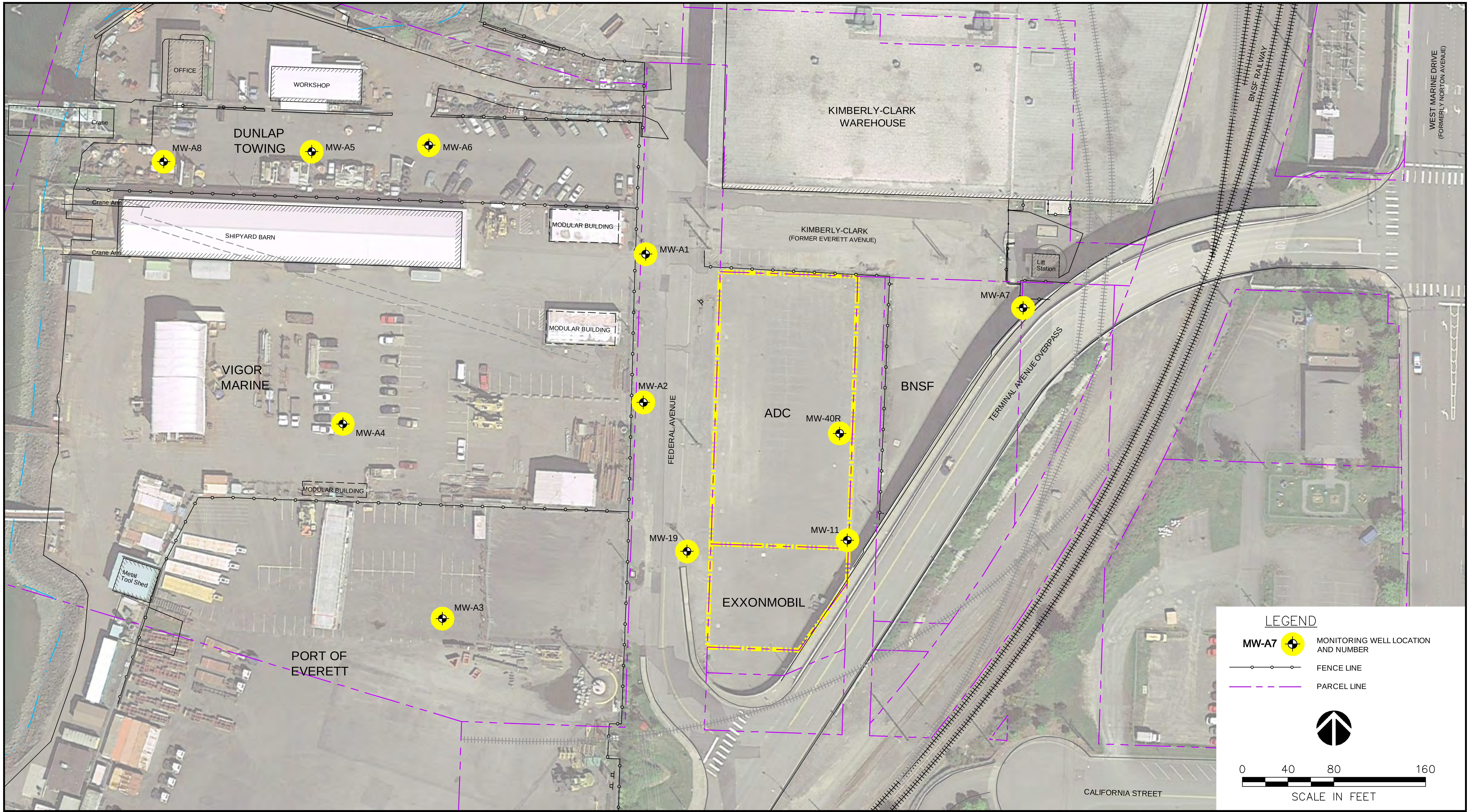
ExxonMobil/ADC Property, Ecology Site ID 2728
Everett, Washington

Analyte	Number of Measurements	Relative Percent Difference		
		Minimum	Maximum	Average
TPH-G	8	3	25	15
TPH-D	26	1	183	96
TPH-O	2	20	96	58
VOCs	6	1	27	14
PAHs	69	2	132	33

Abbreviations:

PAHs = polycyclic aromatic hydrocarbons
TPH-D = total petroleum hydrocarbons in the diesel range
TPH-G = total petroleum hydrocarbons in the gasoline range
TPH-O = total petroleum hydrocarbons in the oil range
VOCs = volatile organic compounds

FIGURES



CLIENT LOGO

CLIENT:

EXXONMOBIL
AMERICAN DISTRIBUTING CO.

AMEC
Environment & Infrastructure, Inc.
600 University Street, Suite 600
Seattle, WA, U.S.A. 98101

amec

DWN BY: APS
CHK'D BY: LV
DATUM: NAD 83 N FT
PROJECTION: WASP
SCALE: AS SHOWN

PROJECT
EXXONMOBIL/ADC PROPERTY
ECOLOGY SITE ID 2728

TITLE
MONITORING WELL NETWORK

DATE: 2015
PROJECT NO: 6103150009
REV. NO.:
FIGURE No. 1

ATTACHMENT A

Friedman & Bruya Assessment

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
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November 18, 2014

Leah Vigoren, Project Manager
AMEC Environment & Infrastructure, Inc.
One Union Square
600 University Street, Suite 600
Seattle, WA 98101

Dear Ms. Vigoren:

As requested, we have reviewed the documents provided by AMEC Environment & Infrastructure, Inc. regarding the 2717 and 2713 Federal Avenue, Everett, WA project. These documents included analytical data generated from the testing of water samples for total petroleum hydrocarbons (TPH) as diesel and motor oil, extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH) by TestAmerica (TA) Nashville and Eurofins in June, August, and September 2014. In addition, we have reviewed the standard operating procedures (SOPs) for TPH, EPH, VPH, silica gel, and aqueous sample extractions provided by the laboratories.

It is our understanding that TA Nashville has been used exclusively for the analysis of groundwater samples from the 2717 and 2713 Federal Avenue, Everett, WA site for several years. During this time period, TA Nashville reported TPH results for two wells in the range of 2,500-3,000 ug/L. In May 2014, TA Nashville analyzed a sample from one of the wells for EPH/VPH and reported that EPH was non-detect. TA Nashville could provide no explanation for the difference between the high level of TPH reported and the non-detect EPH result. To elucidate this issue, a monthly sampling program was initiated in which split samples were submitted to TA Nashville and to the other contract laboratory available to analyze site samples (Eurofins). In June 2014, both laboratories were requested to analyze split samples for TPH and EPH/VPH. In August, both laboratories were requested to analyze samples for TPH with silica gel cleanup, and in September, TPH with and without silica gel cleanup. Review of the data generated shows that the TPH results reported by the two laboratories differ substantially, with Eurofins' results significantly lower than TA's.

The purpose of this evaluation is to understand the reason for the differences between the results reported by the two laboratories and to evaluate which laboratory provided more representative results of the actual site conditions. Review of the documents provided included, but was not limited to, evaluation of raw analytical data, laboratory bench sheets, chromatograms, quality assurance data, laboratory calculations, and laboratory extraction and analytical procedures. Information regarding the sample matrices, such as the sample pH and presence or absence of sediment or sheen in the samples, was also evaluated. Our findings are provided below.

- **Comparison of TPH Results:** Review of the documents provided shows that discrepancies exist between the TPH results generated by TA Nashville and Eurofins. For example, a summary of the results of the TPH as diesel (TPH-D) analysis without silica gel for the samples MW-A5 and MW-A6 is provided as Table 1. A summary of the results of the TPH-D analysis with silica gel for the samples MW-A5 and MW-A6 is provided as Table 2.

Table 1. TPH-D Without Silica Gel for MW-A5 and MW-A6 (Results reported in ppb)

Laboratory	**TA Nashville**			**Eurofins**		
Sampling Event Date	**June 2014**	**Aug 2014**	**Sept 2014**	**June 2014**	**Aug 2014**	**Sept 2014**
MW-A5	no data	no data	155 [a]	590	no data	310
MW-A6	no data	no data	243 [a]	340	no data	130

a - The surrogate recovery was outside of control limits (4-6%) indicating poor extraction efficiency.

Table 2. TPH-D With Silica Gel for MW-A5 and MW-A6 (Results reported in ppb)

Laboratory	**TA Nashville**			**Eurofins**		
Sampling Event Date	**June 2014**	**Aug 2014**	**Sept 2014**	**June 2014**	**Aug 2014**	**Sept 2014**
MW-A5 w/ sg	3360	2160	2940	360	300	140
MW-A6 w/ sg	3270	2430	3150	130	<100	<100

Review of Table 1 shows that no data were available and/or the data were unreliable from TA Nashville regarding the level of TPH-D before silica gel in the samples MW-A5 and MW-A6. For the only sampling event for which data are available (Sept 2014), the levels of TPH-D reported are similar between the 2 laboratories. However, the low recovery of the surrogate for the results from TA Nashville indicate that much higher results may be present. Adjusting the TA Nashville results for the low surrogate recovery by multiplying the reported values by approximately 20, yield results that are considerably different (greater than 10 fold) than those reported by Eurofins.

Review of Table 2 shows that considerable differences (approximately 10 fold) exist between TA Nashville and Eurofins. In addition, the TA Nashville results in Table 2 can be used to predict the June and August 2014 TA Nashville results. The action of silica gel is to remove polar material from sample extracts. This means that the TPH-D results will always be higher than the TPH-D silica gel results. Since the use of silica gel should remove non-hydrocarbon material from the samples, the TA Nashville TPH data for Table 1 should all exceed 2,000 ppb based on the results shown in Table 2.

Comparison of the data generated shows that the TPH-D results reported by Eurofins before silica gel are much lower than those those expected from TA Nashville. The discrepancy in these results may be due to sample inhomogeneity and/or anomalies in Eurofins' extraction procedure that were not readily identified.[1]

Review of Table 2 shows that TA Nashville's TPH-D after silica gel results were much higher than Eurofins' results. TA Nashville reported greater than 2,000 ppb TPH-D after silica gel, while Eurofins reported less than 400 ppb in the samples MW-A5 and MW-6. These differences may be due to the practice followed by each laboratory when treating each sample with silica gel.

Silica gel cleanup is used to remove interfering non-hydrocarbon or polar material from hydrocarbon material in sample extracts prior to analysis. This cleanup is typically performed using one of two methods: the "Shake" method or the "Column" method. The "Shake" method involves adding a small amount (typically less than 1 gram) of silica gel to the sample extract and shaking the vial to remove polar compounds. The "Column" method involves passing the sample extract through a glass column filled with approximately 3-10 grams of silica gel to remove polar compounds. The "Shake" method of silica gel cleanup has been shown to be less effective in separating polar compounds from hydrocarbons in TPH analysis compared to the "Column" method.[2] In addition,

---

[1] Solvent, solvent extraction time, temperature of the sample, and the addition of solvent to the sample container can all have an impact on sample results and are virtually impossible to assess after analyses are conducted.

[2] Zemo, D.A., Synowiec, K.A., Magaw, R.I. and Mohler, R.E. (2013), Comparison of Shake and Column Silica Gel Cleanup Methods for Groundwater Extracts to Be Analyzed for TPHd/DRO. Groundwater Monitoring & Remediation, 33: 108-112. doi: 10.1111/gwmr.12032. http://www.onlinelibrary.wiley.com/doi/10.1111/gwmr.12032/pdf

EPA method 3630 references the “Column” method, not the “Shake” method, for silica gel cleanup of sample extracts. [3]

Comparison of the SOPs provided shows that TA Nashville and Eurofins perform their TPH-D silica gel cleanup procedures using the “Shake” method. The differences seen in the reported TPH-D results after silica gel between TA and Eurofins is likely due at least in part to the laboratories’ use of the “Shake” method of silica gel cleanup, which may or may not be adequate to effect the removal of the majority of polar compounds present in the samples.

- **<u>Comparison of TPH and EPH Results:</u>** Review of the documents shows that discrepancies exist between the TPH silica gel results and EPH results generated by TA Nashville and Eurofins. A summary of these results for the samples MW-A5 and MW-A6 is provided as Table 3. For comparison, the aliphatic and aromatic fractions of the EPH analysis have been totaled to show a total EPH value.

Table 3. TPH-D w/SG and Total EPH for MW-A5 and MW-A6 (Results reported in ppb)

Analysis	TPH-D with Silica Gel		Total EPH	
Laboratory	**TA Nashville**	**Eurofins**	**TA Nashville**	**Eurofins**
Sampling Event Date	**June 2014**	**June 2014**	**June 2014**	**June 2014**
MW-A5	3360	360	<340	18.8
MW-A6	3270	130	<340	<50

Review of Table 3 shows that TA Nashville identified greater than 3,000 ppb TPH-D after silica gel in the samples MW-A5 and MW-A6, while Eurofins identified less than 400 ppb. The results of the EPH analysis for these samples were reported as non-detect or nearly non-detect by both TA Nashville and Eurofins.

Both the TPH-D with silica gel analysis and the EPH analysis use silica gel to remove non-hydrocarbon or polar material from hydrocarbon material in sample extracts. If the silica gel cleanup proved effective in both cases, the TPH-D and EPH results should be similar. However, review of the results generated shows that the TPH-D with silica gel results were much higher than the EPH results for both laboratories. The level of material remaining after the TPH-D silica gel cleanup indicates that the “Shake” method of cleanup used by TA Nashville and

---

[3] US Environmental Protection Agency. *Method 3630C: Silica Gel Cleanup, Rev. 3.* December 1996. USEPA. http://www.epa.gov/osw/hazard/testmethods/sw846/pdfs/3630c.pdf.

> Eurofins was inadequate at removing polar compounds present in the samples. In addition, the reduction in the level of material after EPH analysis compared to the TPH analysis is an indication that the vast majority of the material present in the samples MW-A5 and MW-A6 is polar in nature.
>
> Furthermore, review of each laboratory's SOP shows that the EPH analysis was performed by passing the sample extracts through a large glass column filled with approximately 6 or 10 grams of silica gel. This procedure is similar to the TPH-D silica gel "Column" method described above. The reduction in the level of material after EPH analysis compared to the TPH analysis is an indication that the "Column" method of silica gel cleanup is more effective at removing polar compounds in sample extracts than the laboratories' "Shake" method.
>
> Finally, it should be noted that comparison of the data generated shows that Eurofins' TPH-D results after silica gel (130-360 ppb) are more similar to the non-detect or nearly non-detect EPH results than TA Nashville's results (greater than 3,000 ppb).

In conclusion, the discrepancies seen between TA Nashville and Eurofins' TPH results before silica gel may be due to sample inhomogeneity and/or anomalies in Eurofins' extraction procedure that were not readily identified. Review of the data provided shows that many of the samples at the site contain a significant level of polar compounds that interfere with the analysis of TPH. Silica gel treatment of the sample extracts is appropriate to remove the polar compounds present in these samples prior to TPH analysis. The discrepancies seen between TA Nashville and Eurofins' TPH results after silica gel and their EPH results are likely due at least in part to the laboratories' use of the "Shake" method of silica gel cleanup. Based on the data generated, the "Column" method of silica gel cleanup provides more effective removal of the interfering polar compounds than the laboratories' "Shake" methods. Finally, it should be noted that comparison of the data generated shows that Eurofins' TPH-D results after silica gel are more similar to the non-detect or nearly non-detect EPH results than TA Nashville's results.

Further testing of water samples at the site using the "Column" method of silica gel cleanup is recommended, if warranted. In addition, TPH analysis of the samples both with and without silica gel, as well as TPH analysis of a matrix spike with and without silica gel, may be useful in further characterizing the material present at this site. Finally, use of a secondary polar reverse surrogate in the TPH extraction may also be useful in monitoring the efficiency of the laboratory's silica gel cleanup procedures.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michele Costales Poquiz

Michele Costales Poquiz
Chemist

Enclosures
c: leah.vigoren@amec.com, larry.mcgaughey@amec.com
GMX1118R.DOC

ATTACHMENT B

Laboratory Data Reports (to be provided separately) and Data Validation Memoranda

Memo

To: Leah Vigoren
From: Crystal Neirby
Tel: (206) 342-1760
Fax: (206) 342-1761
Date: January 21, 2015

Project: 6103140009
cc: Project File

Subject: ExxonMobil/ADC Site – June 2014 Split Groundwater Sampling Data Quality Review – TestAmerica SDG 490-55979-1

This memorandum presents a summary data quality review for analyses of five primary ground water samples, two groundwater field blanks, and one trip blank collected on June 19, 2014. The samples were submitted to TestAmerica Laboratories, Inc., located in Nashville, Tennessee, a laboratory certified by the Washington State Department of Ecology (Ecology). The samples were analyzed for the following analytes:

- Volatile organic compounds (VOCs) by EPA Method 8260B (only benzene, toluene, ethylbenzene, total xylenes, methyl tert-butyl ether, 1,2-dibromoethane, 1.2-dichloroethane, and hexane were reported);
- Polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270D with select ion monitoring (SIM);
- Total petroleum hydrocarbons (TPH) as diesel (TPH-D) (reported as C10-C24) and motor oil (reported as C24-C40) by NWTPH-Dx with silica gel cleanup;
- Extractable petroleum hydrocarbons (EPH) by Ecology Method NWTPH-EPH; and
- Volatile petroleum hydrocarbons (VPH) by Ecology Method NWTPH-VPH.

The sample IDs, sample collection dates, laboratory sample IDs, and analyses conducted on the samples are listed in the table below.

Sample ID	Well ID	Sample Collection Date	Laboratory Sample ID	Requested Analyses
XOM061914-01	MW-A4	6/19/2014	490-55979-1	all
XOM061914-02	MW-A5	6/19/2014	490-55979-2	all
XOM061914-06	MW-A5 field duplicate	6/19/2014	490-55979-3	all
XOM061914-03	MW-A6	6/19/2014	490-55979-4	all
XOM061914-07	MW-A6 field duplicate	6/19/2014	490-55979-5	all
XOM061914-04	MW-A1	6/19/2014	490-55979-6	all
XOM061914-05	MW-A2	6/19/2014	490-55979-7	all
Trip Blank-01	Trip Blank	6/19/2014	490-55979-8	VOCs

Upon receipt by the laboratory, information from the sample jars was compared to the chain-of-custody forms. The temperatures of the coolers were recorded as part of the check-in procedure, and were less than the maximum acceptable temperature of 6 degrees Celsius (°C).

The analytical results for these samples were reviewed in accordance with the requirements specified in EPA National Functional Guidelines (EPA, 2008), the analytical methods referenced by the laboratory, Amec Foster Wheeler data review procedures, and the laboratory quality control limits. The EPA guidelines referenced above were written specifically for the Contract Laboratory Program, and have been modified for the purposes of this data quality review where they differ from EPA SW-846 method requirements.

All of the certified laboratory reports were reviewed to assess the following criteria: chain-of-custody compliance; holding time compliance; presence or absence of laboratory contamination as demonstrated by method and trip blanks; laboratory control samples (LCS) and LCS duplicates (LCSD) and matrix spike (MS) samples; and analytical precision as the relative percent (%) difference between replicate sample results (i.e., laboratory and field duplicates) or MS and matrix spike duplicates (MSD). This level of data review is equivalent to an EPA Level 2A data review.

Samples were analyzed for the methods identified in the introduction to this report and were evaluated for the following criteria.

1. **Holding Times** – Acceptable.

   The pH of each sample was measured prior to analysis, and the pH of sample MW-A4 (XOM061914-01) was equal to 7 at the time of analysis, above the method required pH of 2. The holding time for samples not preserved at a pH of 2 is 7 days, and the sample was analyzed within the holding time.

2. **Blanks** – Acceptable.

3. **LCS/LCSD** – Acceptable except as noted:

   EPH by NWTPH-EPH: The recoveries for C8-C10 aliphatics and C10-C12 aliphatics were 5 and 26 percent, below the control limits of 50 to 150 and 70 to 130 percent, in the aliphatic range LCS analyzed on June 27, 2014. These ranges were not detected in the associated samples; therefore, the results are rejected due to the possible low analytical bias.

   The recovery for C10-C12 aromatics was 61 percent, below the control limits of 70 to 130 percent, in the aromatic range LCS analyzed in June 27, 2014. This range was not detected in the associated samples; therefore, the results are qualified as estimated and flagged with a "J" due to the possible low analytical bias.

   The recoveries for C8-C10 aliphatics and C10-C12 aliphatics were 26 and 49 percent, below the control limits of 50 to 150 and 70 to 130 percent, in the aliphatic range LCS analyzed on July 1, 2014. The results for these ranges were rejected in the samples that were below detection, and were qualified as estimated and flagged with a "J" in the samples with detections.

4. **MS/MSD** – Acceptable except as noted:

   EPH by NWTPH-EPH: The recoveries for C8-C10 aliphatics and C10-C12 aliphatics were below the control limits in the MS/MSD performed with sample MW-A4 (XOM061914-01).

Results for these carbon ranges were previously rejected in the associated samples due to low LCS/LCSD recoveries and are not further qualified.

5. **Laboratory Duplicates** – Acceptable except as noted:

   TPH as diesel by NWTPH-Dx: The laboratory duplicate relative percent difference (RPD) for C10-C24 was 170 percent in the laboratory duplicate performed with sample XOM061914-06. The laboratory stated extraction difficulties resulted in the low values for the primary analysis. The C10-C24 and C24-C40 results for sample XOM061914-06 were rejected due to the quality control issues encountered with this analysis.

   Sample XOM061914-06 was a blind field duplicate sample for XOM061914-02, and the results of the laboratory duplicate reported on the quality control page showed good agreement with the results for sample XOM061914-02. This is further evidence of the analytical issues encountered with the primary analysis of sample XOM061914-06, which supports rejecting the C10-C24 and C24-C40 results for sample XOM061914-06.

6. **Field Duplicates** – Acceptable except as noted:

   Two field duplicates were submitted during this sampling event. Primary and duplicate results are summarized in the table below. The RPDs for the field duplicate are within 30 percent for concentrations greater than five times the reporting limit and the differences are no greater than the reporting limit for sample concentrations less than five times the reporting limit, except for the primary and duplicate results for C10-C24 and C24-C40 for samples XOM061914-02/XOM061914-06. The RPD is not calculated for results that are less than five times the reporting limit, as indicated on the table below by "NC."

   As stated above, the C10-C24 and C24-C40 results for field duplicate sample XOM061914-06 are rejected, and are not further qualified due to the field duplicate results.

Sample ID/ Field Duplicate ID	Analyte	Primary Result (µg/L)	Duplicate Result (µg/L)	Reporting Limit (µg/L)	RPD (%)
XOM061914-02/ XOM061914-06	acenaphthene	2.55	2.71	0.0948	6
	C10-C24	3360	272	93.9	170
	C24-C40	333	ND	93.9	NC
XOM061914-03/ XOM061914-07	acenaphthene	0.266	0.177	0.0948	NC
	C10-C24	3270	2550	93.9	25
	C24-C40	272	230	93.9	17

Notes
µg/L = micrograms per liter
NC = not calculated
RPD = relative percent difference

7. **Surrogates** – Acceptable except as noted:

   EPH by NWTPH-EPH: the surrogate 2-bromonaphthene was recovered at 50 percent, below the control limits of 60 to 140 percent, in the aromatic-range method blank associated with analysis on July 1, 2014. Sample results are not qualified due to surrogate recoveries in associated quality control samples.

The recovery for one of four surrogates, 2-bromonaphthene, was 54 percent, below the control limits of 60 to 140 percent for sample XOM061914-05. The low recovery equates to a low bias in the samples; therefore, sample results associated with this surrogate are qualified as estimated with detections flagged with a “J” and non-detections flagged with “UJ”.

TPH as diesel by NWTPH-Dx: The surrogate recovery for sample XOM061914-06 (MW-A5 FD) was 7 percent, below the control limits of 50 to 150 percent. The laboratory stated in the case narrative that there was insufficient sample volume to re-extract and reanalyze the sample. The C10-C24 and C24-C40 results are rejected due to the low surrogate recovery and the results of the field and laboratory duplicates.

8. **Reporting Limits and Laboratory Flags** – Acceptable.

OVERALL ASSESSMENT OF DATA

The TA work order 490-55979-7 is 95 percent complete. Evaluation of the data usability is based on EPA’s guidance documents. Except for the rejected data, the remaining data are acceptable and meet the project’s data quality objectives.

Sample Identifications and Qualified Results

Sample ID	Method	Qualified Analyte	Qualified Result	Qualifier Reason
XOM061914-01	EPH	C8-C10 Aliphatics C10-C12 Aliphatics C10-12 Aromatics	19.2 UR 9.62 UR 9.62 UJ	LCS recoveries
XOM061914-02	EPH	C8-C10 Aliphatics C10-C12 Aliphatics C10-12 Aromatics	18.9 UR 9.43 UR 9.43 UJ	LCS recoveries
XOM061914-06	EPH “ “ NWTPH-Dx “	C8-C10 Aliphatics C10-C12 Aliphatics C10-12 Aromatics C10-C24 C24-C40	19.0 UR 9.52 UR 9.81 J 272 R 93.9 UR	LCS recoveries “ “ lab/field duplicate RPDs and surrogate recovery
XOM061914-03	EPH	C8-C10 Aliphatics C10-C12 Aliphatics	18.9 UR 9.43 UR	LCS recoveries
XOM061914-07	EPH	C8-C10 Aliphatics C10-C12 Aliphatics	18.7 UR 9.35 UR	LCS recoveries
XOM061914-04	EPH	C8-C10 Aliphatics C10-C12 Aliphatics	19.2 UR 9.62 UR	LCS recoveries
XOM061914-05	EPH	C8-C10 Aliphatics C10-C12 Aliphatics C8-C10 Aromatics C10-C12 Aromatics C12-C16 Aromatics C16-C21 Aromatics C21-C34 Aromatics	18.9 UR 17.4 J 47.2 UJ 15.1 J 37.7 UJ 47.2 UJ 47.2 UJ	LCS recoveries “ surrogate recovery ” “ “ “
Trip Blank-01		None		

REFERENCES

EPA, 2008, U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-08-001, June.

Memo

To:	Leah Vigoren	Project:	6103140009
From:	Crystal Neirby Danille Jorgensen	cc:	Project File
Tel:	(206) 342-1760		
Fax:	(206) 342-1761		
Date:	April 8, 2014		

Subject: **ExxonMobil/ADC Site – February 2014 Semiannual Ground Water Sampling**
EPA Level 3 Data Quality Review – SDG 490-47364-1

This memorandum presents a summary data quality review for analyses of one primary groundwater sample, one groundwater field duplicate, and six trip blanks collected on February 25, 2014. The samples were submitted to TestAmerica, located in Nashville, Tennessee, a laboratory certified by the Washington State Department of Ecology (Ecology).

The samples were analyzed for the following constituents:

- Volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (EPA) Method 8260B (only benzene, toluene, ethylbenzene, total xylenes, and methyl tert-butyl ether were reported);
- Polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270D with select ion monitoring (SIM);
- Total petroleum hydrocarbons (TPH) as gasoline (reported as C6-C12) by Ecology Method NWTPH-Gx; and
- TPH as diesel (reported as C10-C24) and motor oil (reported as C24-C40) by Ecology Method NWTPH-Dx, with silica gel cleanup.

The sample IDs, sample collection date, laboratory sample ID, and analyses conducted on the samples are listed in the table below.

Sample ID	Sample Collection Date	Laboratory Sample ID	Requested Analyses
MWA7-022514	2/25/14	490-47364-1	VOCs, PAHs, TPH
DUP-022514	2/25/14	490-47364-2	VOCs, PAHs, TPH
Trip Blank	2/25/14	490-47364-3	VOCs
Trip Blank	2/25/14	490-47364-4	VOCs
Trip Blank	2/25/14	490-47364-5	VOCs
Trip Blank	2/25/14	490-47364-6	VOCs
Trip Blank	2/25/14	490-47364-7	VOCs
Trip Blank	2/25/14	490-47364-8	VOCs

The analytical results for these samples were reviewed in accordance with the requirements specified in EPA National Functional Guidelines (EPA, 2008), the analytical methods referenced by the laboratory, AMEC data review procedures, and the laboratory quality control limits. The EPA guidelines referenced above were written specifically for the Contract Laboratory Program, and have been modified for the purposes of this data quality review where they differ from EPA SW-846 method requirements.

This certified laboratory report was reviewed to assess the following: chain-of-custody compliance; holding time compliance; presence or absence of laboratory contamination as demonstrated by method and trip blanks; laboratory control samples (LCS) and matrix spike (MS) samples; analytical precision as the relative percent (%) difference between replicate sample results (i.e., laboratory and field duplicates) or MS and matrix spike duplicates (MSD) or LCS and laboratory control sample duplicates (LCSD); initial and continuing calibrations; recalculation of instrument and sample results from the laboratory responses; and comparison of the recalculated results to laboratory reported results. This level of data review is equivalent to EPA Level 3 validation.

Upon receipt by the laboratory, the sample jar information was compared to the chain-of-custody forms. The temperatures of the coolers were recorded as part of the check-in procedure, and were less than the maximum acceptable temperature of 6 degrees Celsius (°C).

Samples were analyzed using the methods identified in the introduction to this report, and the results were evaluated for the following criteria.

1. **GC/MS Instrument Performance Check (VOCs and PAHs)** – Acceptable
2. **Holding Times** – Acceptable.
3. **Blanks** – Acceptable.

   Trip blanks were submitted with every cooler containing samples for VOC analysis. The sample results were not qualified.

   Method blanks were analyzed for every batch of 20 samples for each method reviewed.
4. **LCS/LCSD** – Acceptable.

5. **MS/MSD** – Acceptable except as noted:

   <u>VOCs by 8260</u>

   The recovery of methyl tert-butyl ether (64%) was less than the lower laboratory-specified control limit in the MS analysis performed on sample MWA7-022514.The results for nondetected methyl tert-butyl ether from sample MWA7-022514 was qualified as estimated and flagged with UJ due to potential matrix interference.

   <u>PAHs by 8270</u>

   The laboratory performed an MS/MSD analysis for sample MWA7-022514. The percent recoveries were within laboratory-specified control limits in the MS/MSD, with the following exceptions. The recoveries of benzo[a]anthracene (43%), benzo[a]pyrene (12%), benzo[b]fluoranthene (12%), benzo[g,h,i]perylene (9%), benzo[k]fluoranthene (13%), chrysene (52%), dibenz(a,h)anthracene (9%), and indeno[1,2,3-cd]pyrene (8%) were less than lower laboratory-specified limits in the MS sample. Additionally, the RPDs between the MS and MSD recoveries were greater than the laboratory-specified control limit for anthracene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene , benzo[g,h,i]perylene, benzo[k]fluoranthene , chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, phenanthrene, and pyrene. Data limitations are summarized below.

- AMEC qualified the results for nondetected benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno[1,2,3-cd]pyrene from sample MWA7-022514 as estimated and flagged the results with UJ due to potential matrix interference and analytical imprecision.
- AMEC qualified the results for nondetected anthracene, fluoranthene, fluorene, phenanthrene, and pyrene from sample MWA7-022514 as estimated and flagged the results with UJ due to analytical imprecision.

6. **Laboratory Duplicates** – Acceptable.
7. **Field Duplicates** – Acceptable. DUP-022514 was collected as a field duplicate of sample MWA7-022514.
8. **Surrogates** – Acceptable.
9. **Internal Standards** – Acceptable.
10. **Reporting Limits and Laboratory Flags** – Acceptable.
11. **Initial Calibrations** – Acceptable
12. **Continuing Calibrations** – Acceptable
13. **Calculation Check** – Acceptable

OVERALL ASSESSMENT OF DATA

The TestAmerica sample delivery group 490-47364 is 100 percent complete. Evaluation of the data usability is based on EPA's guidance documents. Few problems were identified, and analytical performance was generally within specified limits. The data are acceptable and meet the project's data quality objectives.

A summary of qualified results is presented in the table below.

Sample Identifications and Qualified Results

Sample ID	Qualified Analyte	Qualified Result	Units	Qualifier
MWA7-022514	Methyl t-butyl ether	0.5	µg/L	UJ
MWA7-022514	benzo[a]anthracene	0.0943	µg/L	UJ
MWA7-022514	benzo[a]pyrene	0.0943	µg/L	UJ
MWA7-022514	benzo[b]fluoranthene	0.0943	µg/L	UJ
MWA7-022514	benzo[g,h,i]perylene	0.0943	µg/L	UJ
MWA7-022514	benzo[k]fluoranthene	0.0943	µg/L	UJ
MWA7-022514	chrysene	0.0943	µg/L	UJ
MWA7-022514	dibenz(a,h)anthracene	0.0943	µg/L	UJ
MWA7-022514	indeno[1,2,3-cd]pyrene	0.0943	µg/L	UJ
MWA7-022514	anthracene	0.0943	µg/L	UJ
MWA7-022514	fluoranthene	0.0943	µg/L	UJ

Sample ID	Qualified Analyte	Qualified Result	Units	Qualifier
MWA7-022514	fluorene	0.0943	µg/L	UJ
MWA7-022514	phenanthrene	0.0943	µg/L	UJ
MWA7-022514	pyrene	0.0943	µg/L	UJ

REFERENCES

EPA, 2008, U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-08-001, June.

Memo

To: Leah Vigoren
From: Crystal Neirby
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Fax: (206) 342-1761
Date: January 21, 2015

Project: 6103140009
cc: Project File

Subject: ExxonMobil/ADC Site – TestAmerica Analytical Split Groundwater Sampling Data Quality Review – SDGs 490-62707-1, 490-65219-1, 490-66967-1, 490-68031-1, and 490-69152-1

This memorandum presents a summary data quality review for analyses of 22 primary groundwater samples, four groundwater field duplicate samples, and five trip blanks collected during four separate sampling events that took place between September and December 2014. The samples were submitted to TestAmerica, located in Nashville, Tennessee, a laboratory certified by the Washington State Department of Ecology (Ecology).

The samples were analyzed for the following analytes:

- Selected volatile organic compounds (VOCs) (benzene, toluene, ethylbenzene, m,p-xylenes, o-xylenes, total xylenes, and methyl tert-butyl ether) by U.S. Environmental Protection Agency (EPA) Method 8260B;
- Polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270D with select ion monitoring (SIM);
- Total petroleum hydrocarbons (TPH) as gasoline by Ecology Method NWTPH-Gx; and
- TPH as diesel and motor oil by Ecology Method NWTPH-Dx (analyses were performed with and without silica gel cleanup).

The sample IDs, well locations, laboratory sample delivery group numbers, sample collection dates, and requested analyses are listed in the table below.

Sample ID	Monitoring Well ID	Laboratory SDG	Sample Collection Date	Requested Analyses
XOM093014-01	MW-A4	490-62707-1	9/30/2014	all
XOM093014-02	MW-A6	490-62707-1	9/30/2014	all
XOM093014-03	MW-A5	490-62707-1	9/30/2014	all
XOM093014-04	MW-A2	490-62707-1	9/30/2014	all
XOM093014-05	MW-40R	490-62707-1	9/30/2014	all
XOM093014-11	Field Duplicate of MW-A2	490-62707-1	9/30/2014	all
Trip Blank-01	--	490-62707-1	9/30/2014	VOCs
XOM102914-01	MW-A4	490-65219-1	10/29/2014	all

Sample ID	Monitoring Well ID	Laboratory SDG	Sample Collection Date	Requested Analyses
XOM102914-02	MW-A5	490-65219-1	10/29/2014	all
XOM102914-03	MW-A6	490-65219-1	10/29/2014	all
XOM102914-04	MW-A2	490-65219-1	10/29/2014	all
XOM102914-05	MW-40R	490-65219-1	10/29/2014	all
XOM102914-11	Field Duplicate of MW-A2	490-65219-1	10/29/2014	all
Trip Blank	--	490-65219-1	10/29/2014	VOCs
XOM111914-01	MW-A2	490-66967-1	11/19/2014	all
XOM111914-02	MW-40R	490-66967-1	11/19/2014	all
XOM112014-03	MW-A4	490-66967-1	11/20/2014	all
XOM112014-04	MW-A5	490-66967-1	11/20/2014	all
XOM112014-05	MW-A6	490-66967-1	11/20/2014	all
XOM111914-11	Field Duplicate of MW-A2	490-66967-1	11/19/2014	all
Trip Blank	--	490-66967-1	11/20/2014	VOCs
XOM120514-01	MW-A4	490-68031-1	12/5/2014	all
XOM120514-02	MW-A5	490-68031-1	12/5/2014	all
Trip Blank	--	490-68031-1	12/5/2014	VOCs
XOM121714-01	MW-A5	490-69152-1	12/17/2014	all
XOM121714-02	MW-A6	490-69152-1	12/17/2014	all
XOM121714-03	MW-40R	490-69152-1	12/17/2014	all
XOM121714-04	MW-A4	490-69152-1	12/17/2014	all
XOM121714-05	MW-A2	490-69152-1	12/17/2014	all
XOM121714-11	Field Duplicate of MW-A2	490-69152-1	12/17/2014	all
Trip Blank	--	490-69152-1	12/17/2014	VOCs

The analytical results for these samples were reviewed in accordance with the requirements specified in EPA National Functional Guidelines (EPA, 2008), the analytical methods referenced by the laboratory, Amec Foster Wheeler data review procedures, and the laboratory quality control limits. The EPA guidelines referenced above were written specifically for the Contract Laboratory Program, and have been modified for the purposes of this data quality review where they differ from EPA SW-846 method requirements.

All of the certified laboratory reports were reviewed to assess the following criteria: chain-of-custody compliance; holding time compliance; presence or absence of laboratory contamination as demonstrated by method and trip blanks; laboratory control samples (LCS) and LCS duplicates (LCSD) and matrix spike (MS) samples; and analytical precision as the relative percent (%) difference between replicate sample results (i.e., laboratory and field duplicates) or MS and matrix spike duplicates (MSD). This level of data review is equivalent to an EPA Level 2A data review.

Upon receipt by the laboratory, information from the sample jars was compared to the chain-of-custody forms. The temperatures of the coolers were recorded as part of the check-in procedure, and were less than the maximum acceptable temperature of 6 degrees Celsius (°C), except for the following:

- The cooler containing samples collected from monitoring wells MW-A4 and MW-A5 on November 20, 2014, was received by the laboratory several days after the samples had been collected at a temperature exceeding 6 °C. The purpose of the samples addressed in this data review was to compare groundwater analytical results for the same samples at two separate laboratories. Samples MW-A4 and MW-A5, collected on November 20, 2014, were resampled on December 5, 2014. So that true split samples for comparison, the results from December 5, 2014, are evaluated here, and the results for samples collected from these two wells on November 20, 2014, are rejected.

Samples were analyzed using the methods identified in the introduction to this report, and the results were evaluated for the following criteria.

1. **Holding Times** – Acceptable except as noted:

   BTEX by 8260B and TPH-G by NWTPH-Gx: Though the samples were collected in preserved bottles, when verified by the laboratory, the pH of the following samples was not at the method required pH of <2: XOM093014-1, XOM102914-02, XOM112014-03, XOM120514-01, and XOM121714-04.

   The technical holding time for samples not preserved at a pH of <2 is 7 days from collection to analysis. Samples that were analyzed past this holding time are qualified as estimated with detected results flagged with a “J” and non-detected results flagged with a “UJ.”

2. **Blanks** – Acceptable except as noted:
3. **LCS/LCSD** – Acceptable except as noted:

   TPH-D and TPH-O by NWTPH-Dx (with silica gel)
   The recovery for C10-C24 in the LCS associated with samples in work order 490-69152 and analysis batch 217902 was 36 percent, below the control limits of 51 to 132 percent. The C10-C24 and C24-C40 results in the associated sample, XOM121714-05, were qualified as estimated and flagged with a “J” due to the potential low bias.

4. **MS/MSD** – Acceptable
5. **Laboratory Duplicates** – Acceptable except as noted:

   TPH-D and TPH-O by NWTPH-Dx (with silica gel)

   The relative percent difference (RPD) for C10-C24 was 45 percent and for C24-C40 in laboratory duplicate samples was 67 percent, greater than the control limit of 41 percent. The laboratory duplicate analysis was performed with sample XOM120514-02, and sample results were also qualified due to low surrogate recoveries (see below). Sample results are not qualified further as a result of the laboratory duplicate analyses.

The RPD for C24-C40 in the laboratory duplicate analysis performed with sample XOM121714-11 was 58 percent, greater than the control limit of 41 percent,. The C24-C40 results for sample XOM121714-11 were qualified as estimated and flagged with a "J."

TPH-D and TPH-O by NWTPH-Dx (without silica gel)

The RPD for C10-C24 in the laboratory duplicate analysis performed with sample XOM121714-05 was 60 percent, greater than the control limits of 41 percent. The results for C10-C24 and C24-C40 were qualified as estimated in sample XOM121714-05 and flagged with a "J."

6. **Field Duplicates** – Acceptable.

Field duplicates were collected during each of the sampling events and are identified in the table below. The field duplicate RPD is not calculated if both the primary and duplicate results are not at least five times greater than the reporting limit, as indicated in the table below by "NC." In these cases, the difference between the primary and duplicate results should not exceed the value of the reporting limit. As shown in the table below, RPDs were acceptable where calculated. In cases when the RPDs could not be calculated, the differences between the primary and duplicate results were acceptable, except as indicated in the table below by **bold** type. The primary and field duplicate results that do not have acceptable RPDs are qualified as estimated and flagged with a "J.", except where previously qualified due to additional non-compliant quality control results

Sample ID/ Field Duplicate ID	Analyte	Primary Result (µg/L)	Duplicate Result (µg/L)	Reporting Limit (µg/L)	RPD (%)
XOM093014-04/ XOM093014-11	C10-C24 (no SG)	1050	834	95.7	23
	C24-C40 (no SG)	168	181	95.7	NC
	C10-C24 (with SG)	594	313	95.7	**NC**
XOM102914-04/ XOM102914-11	1-methylnaphthalene	0.508	0.533	0.0948	5
	acenaphthene	0.476	0.482	0.0948	1
	fluorene	0.529	0.560	0.0948	6
	C6-C12	156	160	100	NC
	C10-C24 (with SG)	678	1140	94.3	**51**
	C24-C40 (with SG)	94.3 U	141	94.3	NC
	C10-C24 (no SG)	1190	3000	94.3	**86**
	C24-C40 (no SG)	305	784	94.3	**NC**
XOM111914-01/ XOM111914-11	acenaphthene	0.589	0.531	0.0943	10
	fluorene	0.763	0.644	0.0943	17
	C6-C12	146	100 U	100	NC
	C10-C24 (with SG)	345	393	93.9	13
	C24-C40 (with SG)	93.9 U	93.9 U	93.9	NC
	C10-C24 (no SG)	938	999	93.9	6

Sample ID/ Field Duplicate ID	Analyte	Primary Result (µg/L)	Duplicate Result (µg/L)	Reporting Limit (µg/L)	RPD (%)
	C24-C40 (no SG)	197	284	93.9	**36**
XOM121714-05/ XOM121714-11	acenaphthene	0.510	0.493	0.0939	3
	fluorene	0.720	0.710	0.0939	1
	C6-C12	178	165	100	8
	C10-C24 (with SG)	430	952	95.2	**76**
	C24-C40 (with SG)	95.2 U	164	95.2	NC
	C10-C24 (no SG)	849	805	95.2	5
	C24-C40 (no SG)	158	218	95.2	**NC**

Notes
µg/L = micrograms per liter
RPD= relative percent difference

7. **Surrogates** – Acceptable except as noted:

   TPH-G by NWTPH-Gx

   Work Order 490-62707-1: Surrogate recoveries for samples XOM093014-01, XOM093014-03, XOM093014-04, and XOM093014-11 were between 151 and 155 percent, respectively, greater than the control limits of 50 to 150 percent. TPH-G was not detected in the samples; therefore, results are not affected by the potential high bias and are not qualified.

   TPH-D and TPH-O by NWTPH-Dx (without silica gel)

   The surrogate recoveries for samples XOM093014-02 and XOM093014-03 were 6 and 4 percent, respectively, below the control limits of 50 to 150 percent. The TPH-D results are qualified as estimated and flagged with a “J.” TPH-O was not detected in the samples; therefore, the results are rejected due to the bias associated with the extremely low surrogate recoveries.

   The surrogate recovery for sample XOM093014-05 was 32 percent, also below the control limits of 50 to 150 percent. The TPH-D and TPH-O results in sample XOM093014-05 were qualified as estimated due to the potential low bias.

   The surrogate recovery for sample XOM102914-11 was 37 percent, below the control limits of 50 to 150 percent. The TPH-D and TPH-O results in sample XOM102914-11 were qualified as estimated due to the potential low bias.

   The surrogate recoveries in samples XOM121714-01, XOM121714-02, XOM121714-03, and XOM121714-11 were between 40 and 47 percent, below the control limits of 50 to 150 percent. The TPH-D and TPH-O results in samples XOM121714-01, XOM121714-02, XOM121714-03, and XOM121714-11were qualified as estimated due to the potential low bias.

The surrogate recoveries in the laboratory duplicates performed with samples XOM121714-05 and XOM121714-03 were below the control limits of 50 to 150 percent at 37 and 40 percent, respectively. Associated sample results are not qualified based on surrogate recoveries in quality control samples; therefore, sample results are not qualified due to the low surrogate recoveries.

TPH-D and TPH-O by NWTPH-Dx (with silica gel)

The surrogate recovery in sample XOM093014-05 was 40 percent, below the control limits of 50 to 150 percent. The TPH-D and TPH-O results in sample XOM093014-05 were qualified as estimated due to the potential low bias.

The surrogate recoveries for samples XOM111914-01 and XOM111914-02 were 49 and 44 percent, respectively, below the control limits of 50 to 150 percent. The TPH-D and TPH-O results in samples XOM111914-01 and XOM111914-02 were qualified as estimated due to the potential low bias.

The surrogate recovery for sample XOM120514-02 was 48 percent, below the control limits of 50 to 150 percent. The TPH-D and TPH-O results in sample XOM120514-02 were qualified as estimated due to the potential low bias.

The surrogate recovery for the LCS associated with analysis batch 217902 in work order 490-69152-1 was 37 percent, below the control limits of 50 to 150 percent. Associated samples results are not qualified based on surrogate recoveries in quality control samples; therefore, sample results are not qualified due to the low surrogate recovery.

VOCs by EPA 8260B

The surrogate toluene-d8 was recovered at 131 percent in sample XOM121714-04, greater than the control limits of 70 to 130 percent. The affected compounds were not detected in the sample; therefore, results are not affected by the potential high bias and are not qualified.

8. **Reporting Limits and Laboratory Flags** – Acceptable.

   The laboratory reported detections between the MDL and RL and qualified these results as estimated with a “J” flag. The results are reported as qualified and are not further qualified as a result of this review.

OVERALL ASSESSMENT OF DATA

Analytical results for TestAmerica sample delivery groups 490-62707-1, 490-65219-1, 490-66967-1, 490-68031-1, and 490-69152-1 are 95 percent complete. Evaluation of data usability is based on EPA’s guidance documents. Few problems were identified, and analytical performance was generally within specified limits. Except for the rejected results, the data are acceptable and meet the project’s data quality objectives.

A summary of qualified results is presented in the table below.

Sample Identifications and Qualified Results

Sample ID	Qualified Analyte	Qualified Results	Qualifier Reason
XOM093014-01	benzene toluene ethylbenzene total xylenes MTBE C6-C12	0.50 UJ 0.50 UJ 0.50 UJ 1.5 UJ 0.50 UJ 500 UJ	analyzed past the technical holding time
XOM093014-02	C10-C24 (no SG) C24-C40 (no SG)	243 J 94.3 UR	low surrogate recovery
XOM093014-03	C10-C24 (no SG) C24-C40 (no SG)	155 J 94.3 UR	low surrogate recovery
XOM093014-04	C10-C24 (with SG)	594 J	field duplicate RPD
XOM093014-05	C10-C24 (no SG) C24-C40 (no SG) C10-C24 (with SG) C24-C40 (with SG)	2,080 J 500 J 1,540 J 165 J	low surrogate recoveries “
XOM093014-11	C10-C24 (with SG)	313 J	field duplicate RPD
Trip Blank-01	none		
XOM102914-01	none		
XOM102914-02	none		
XOM102914-03	none		
XOM102914-04	C10-C24 (no SG) C10-C24 (with SG) C24-C40 (with SG)	678 J 1,190 J 305 J	field duplicate RPDs
XOM102914-05	none		
XOM102914-11	C10-C24 (no SG) C24-C40 (no SG) C10-C24 (with SG)	3000 J 784 J 1140 J	low surrogate recovery “ field duplicate RPD
Trip Blank	none		
XOM111914-01	C10-C24 (with SG) C24-C40 (with SG) C24-C40 (no SG)	345 J 93.9 UJ 197 J	low surrogate recovery field duplicate RPD
XOM111914-02	C10-C24 (with SG) C24-C40 (with SG)	733 J 115 J	low surrogate recovery
XOM112014-03	all	all rejected	results reported from data package 490-68031-1
XOM112014-04	all	all rejected	results reported from data package 490-68031-1
XOM112014-05	none		
XOM111914-11	C24-C40 (no SG)	284 J	field duplicate RPD
Trip Blank	none		
XOM120514-01	none		

Sample ID	Qualified Analyte	Qualified Results	Qualifier Reason
XOM120514-02	C10-C24 C24-C40	2,090 J 184 J	low surrogate recovery
Trip Blank	none		
XOM121714-01	C10-C24 (no SG) C24-C40 (no SG)	3560 J 612 J	low surrogate recovery
XOM121714-02	C10-C24 (no SG) C24-C40 (no SG)	2770 J 383 J	low surrogate recovery
XOM121714-03	C10-C24 (no SG) C24-C40 (no SG)	2040 J 644 J	low surrogate recovery
XOM121714-04	C6-C12	500 UJ	analyzed past the technical holding time
XOM121714-05	C10-C24 (with SG) C24-C40 (with SG) C10-C24 (no SG) C24-C40 (no SG)	430 J 95.2 UJ 849 J 158 J	LCS recoveries “ laboratory duplicate RPD ”
XOM121714-11	C10-C24 (with SG) C24-C40 (with SG) C10-C24 (no SG) C24-C40 (no SG)	952 J 164 J 805 J 218 J	field duplicate RPD laboratory duplicate RPD surrogate recoveries “
Trip Blank	none		

REFERENCES

EPA, 2008, U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-08-001, June.

Memo

To: Leah Vigoren
From: Crystal Neirby
Tel: (206) 342-1760
Fax: (206) 342-1761
Date: January 21, 2015

Project: 6103140009
cc: Project File

Subject: ExxonMobil/ADC Site – June 2014 Split Groundwater Sampling Data Quality Review – Eurofins SDG 14-06-1614

This memorandum presents a summary data quality review for analyses of two primary groundwater samples and one trip blank collected on June 19, 2014. The samples were submitted to Eurofins CalScience, located in Garden Grove, California, a laboratory certified by the Washington State Department of Ecology (Ecology). The samples were analyzed for the following analytes:

- Volatile organic compounds (VOCs) by EPA Method 8260B (only benzene, toluene, ethylbenzene, total xylenes, methyl tert-butyl ether, 1,2-dibromoethane, 1.2-dichloroethane, and hexane were reported);
- Polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270C with select ion monitoring (SIM) (only 1-methylnaphthalene, 2-methylnaphthlane, and naphthalene were reported);
- Total petroleum hydrocarbons (TPH) as diesel (TPH-D) (reported as C10-C24) and motor oil (reported as C24-C40) by NWTPH-Dx with silica gel cleanup;
- Extractable petroleum hydrocarbons (EPH) by Ecology Method NWTPH-EPH; and
- Volatile petroleum hydrocarbons (VPH) by Ecology Method NWTPH-VPH.

The sample IDs, sample collection dates, laboratory sample IDs, and analyses conducted on the samples are listed in the table below.

Sample ID	Well ID	Sample Collection Date	Laboratory Sample ID	Requested Analyses
XOM061914-08	MW-A5	6/19/2014		all
XOM061914-09	MW-A6	6/19/2014		all
Trip Blank-02	Trip Blank	6/19/2014		VOCs

Upon receipt by the laboratory, information from the sample jars was compared to the chain-of-custody forms. The temperatures of the coolers were recorded as part of the check-in procedure, and were less than the maximum acceptable temperature of 6 degrees Celsius (°C).

The analytical results for these samples were reviewed in accordance with the requirements specified in EPA National Functional Guidelines (EPA, 2008), the analytical methods referenced by the laboratory, Amec Foster Wheeler data review procedures, and the laboratory quality control limits. The EPA guidelines referenced above were written specifically for the Contract Laboratory Program, and have been modified for the purposes of this data quality review where they differ from EPA SW-846 method requirements.

All of the certified laboratory reports were reviewed to assess the following: chain-of-custody compliance; holding time compliance; presence or absence of laboratory contamination as demonstrated by method and trip blanks; laboratory control samples (LCS) and LCS duplicates (LCSD) and matrix spike (MS) samples; and analytical precision as the relative percent (%) difference between replicate sample results (i.e., laboratory and field duplicates) or MS and matrix spike duplicates (MSD). This level of data review is equivalent to an EPA Level 2A data review.

Samples were analyzed for the methods identified in the introduction to this report and were evaluated for the following criteria.

1. **Holding Times** – Acceptable.
2. **Blanks** – Acceptable.
3. **LCS/LCSD** – Acceptable except as noted:

   The LCS recovery for o-xylene was 126 percent, which is greater than the control limits of 74 to 122 percent. The high recovery equates to a possible high bias in the samples. Because o-xylene was not detected in the samples, sample results are not affected by the possible high bias and are not qualified.
4. **MS/MSD** – Acceptable.
5. **Laboratory Duplicates** – Acceptable.
6. **Field Duplicates** – Acceptable.

   Field duplicates were not submitted.
7. **Surrogates** – Acceptable.
8. **Reporting Limits and Laboratory Flags** – Acceptable.

OVERALL ASSESSMENT OF DATA

The CalScience work order 14-06-1614 is 100 percent complete. Evaluation of the data usability is based on EPA’s guidance documents. Few problems were identified and analytical performance was generally within specified limits. The data are acceptable and meet the project’s data quality objectives.

Sample Identifications and Qualified Results

Sample ID	Qualified Analyte
XOM061914-08	none
XOM061914-09	none
Trip Blank-02	none

REFERENCES

EPA, 2008, U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-08-001, June.

Memo

To: Leah Vigoren
From: Crystal Neirby
Tel: (206) 342-1760
Fax: (206) 342-1761
Date: January 21, 2015

Project: 6103140009
cc: Project File

Subject: ExxonMobil/ADC Site – Eurofins Analytical Split Groundwater Sampling Data Quality Review – SDGs 14-08-2237, 14-10-0161, 14-10-2521, 14-11-1758, 14-12-0694, and 14-12-1855

This memorandum presents a summary data quality review for analyses of 33 primary groundwater samples, five groundwater field duplicate samples, and six trip blanks collected during five separate sampling events that took place between August and December 2014. The samples were submitted to Eurofins Calscience, located in Garden Grove, California, a laboratory certified by the Washington State Department of Ecology (Ecology).

The samples were analyzed for the following analytes:

- Selected volatile organic compounds (VOCs) (benzene, toluene, ethylbenzene, m,p-xylenes, o-xylenes, total xylenes, and methyl tert-butyl ether) by U.S. Environmental Protection Agency (EPA) Method 8260B;
- Polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270C with select ion monitoring (SIM);
- Total petroleum hydrocarbons (TPH) as gasoline by Ecology Method NWTPH-Gx; and
- TPH as diesel and motor oil by Ecology Method NWTPH-Dx both with and without silica gel cleanup.

The sample IDs, well locations, laboratory sample delivery group numbers, sample collection dates, and requested analyses are listed in the table below.

Sample ID	Monitoring Well ID	Laboratory SDG	Sample Collection Date	Requested Analyses
XOM082614-12	MW-A4	14-08-2237	8/26/2014	all
XOM082614-13	MW-A8	14-08-2237	8/26/2014	all
XOM082614-14	MW-A5	14-08-2237	8/26/2014	all
XOM082614-15	MW-A6	14-08-2237	8/26/2014	all
XOM082614-16	MW-A3	14-08-2237	8/26/2014	all
XOM082714-17	MW-A1	14-08-2237	8/27/2014	all
XOM082714-18	MW-A2	14-08-2237	8/27/2014	all
XOM082714-19	MW-19	14-08-2237	8/27/2014	all
XOM082714-20	MW-40R	14-08-2237	8/27/2014	all
XOM082714-21	MW-11	14-08-2237	8/28/2014	all
XOM082714-22	MW-A7	14-08-2237	8/27/2014	all

Sample ID	Monitoring Well ID	Laboratory SDG	Sample Collection Date	Requested Analyses
XOM082714-24	Field duplicate of MW-A2	14-08-2237	8/28/2014	all
Trip Blank-03	--	14-08-2237	8/28/2014	VOCs
XOM093014-06	MW-A4	14-10-0161	9/30/2014	all
XOM093014-07	MW-A6	14-10-0161	9/30/2014	all
XOM093014-08	MW-A5	14-10-0161	9/30/2014	all
XOM093014-09	MW-A2	14-10-0161	9/30/2014	all
XOM093014-10	MW-40R	14-10-0161	9/30/2014	all
XOM093014-12	Field Duplicate of MW-A2	14-10-0161	9/30/2014	all
Trip Blank-02	--	14-10-0161	9/30/2014	VOCs
XOM102914-06	MW-A4	14-10-2521	10/29/2014	all
XOM102914-07	MW-A5	14-10-2521	10/29/2014	all
XOM102914-08	MW-A6	14-10-2521	10/29/2014	all
XOM102914-09	MW-A2	14-10-2521	10/29/2014	all
XOM102914-10	MW-40R	14-10-2521	10/29/2014	all
XOM102914-12	Field Duplicate of MW-A2	14-10-2521	10/29/2014	all
Trip Blank	--	14-10-2521	10/29/2014	VOCs
XOM111914-06	MW-A2	14-11-1758	11/19/2014	all
XOM111914-07	MW-40R	14-11-1758	11/19/2014	all
XOM112014-08	MW-A4	14-11-1758	11/20/2014	all
XOM112014-09	MW-A5	14-11-1758	11/20/2014	all
XOM112014-10	MW-A6	14-11-1758	11/20/2014	all
XOM111914-12	Field Duplicate of MW-A2	14-11-1758	11/19/2014	all
Trip Blank	--	14-11-1758	11/20/2014	VOCs
XOM120514-03	MW-A4	14-12-0694	12/5/2014	all
XOM120514-04	MW-A5	14-12-0694	12/5/2014	all
Trip Blank	--	14-12-0694	12/5/2014	VOCs
XOM121714-06	MW-A5	14-12-1855	12/17/2014	all
XOM121714-07	MW-A6	14-12-1855	12/17/2014	all
XOM121714-08	MW-40R	14-12-1855	12/17/2014	all
XOM121714-09	MW-A4	14-12-1855	12/18/2014	all
XOM121714-10	MW-A2	14-12-1855	12/18/2014	all

Sample ID	Monitoring Well ID	Laboratory SDG	Sample Collection Date	Requested Analyses
XOM121714-12	Field Duplicate of MW-A2	14-12-1855	12/18/2014	all
Trip Blank	Trip Blank	14-12-1855	12/18/2014	VOCs

The analytical results for these samples were reviewed in accordance with the requirements specified in EPA National Functional Guidelines (EPA, 2008), the analytical methods referenced by the laboratory, Amec Foster Wheeler data review procedures, and the laboratory quality control limits. The EPA guidelines referenced above were written specifically for the Contract Laboratory Program, and have been modified for the purposes of this data quality review where they differ from EPA SW-846 method requirements.

All of the certified laboratory reports were reviewed to assess the following criteria: chain-of-custody compliance; holding time compliance; presence or absence of laboratory contamination as demonstrated by method and trip blanks; laboratory control samples (LCS) and LCS duplicates (LCSD) and matrix spike (MS) samples; and analytical precision as the relative percent (%) difference between replicate sample results (i.e., laboratory and field duplicates) or MS and matrix spike duplicates (MSD). This level of data review is equivalent to an EPA Level 2A data review.

Upon receipt by the laboratory, information from the sample jars was compared to the chain-of-custody forms. The temperatures of the coolers were recorded as part of the check-in procedure, and were less than the maximum acceptable temperature of 6 degrees Celsius (°C).

Groundwater wells MW-A4 and MW-A5 were resampled on December 5, 2014. The purpose of the samples addressed in this data review was to compare groundwater analytical results from two separate laboratories. The cooler containing samples collected from monitoring wells MW-A4 and MW-A5 on November 20, 2014, was received by the other laboratory several days after the samples had been collected at a temperature exceeding 6°C. So that true split samples were analyzed for comparison, the results from December 5, 2014, are evaluated here, and the results for samples collected from these two wells on November 20, 2014, are rejected.

Samples were analyzed using the methods identified in the introduction to this report, and the results were evaluated for the following criteria.

1. **Holding Times** – Acceptable.
2. **Blanks** – Acceptable except as noted:

   <u>PAHs by EPA 8270C</u>
   Naphthalene was detected in the method blank associated with work order 14-10-0161 at a concentration between the method detection limit (MDL) and reporting limit (RL) of 0.039 µg/L. The naphthalene results for the associated samples that were also between the MDL and RL were reported as non-detected at the RL. Sample results that were either greater than the RL or not detected were not affected by the blank contamination and were not qualified.

3. **LCS/LCSD** – Acceptable

4. **MS/MSD** – Acceptable
5. **Laboratory Duplicates** – Acceptable
6. **Field Duplicates** – Acceptable.

   Field duplicates were collected during each of the sampling events and are identified in the table below. The field duplicate relative percent difference (RPD) is not calculated if both the primary and duplicate results are not at least five times greater than the reporting limit, as indicated in the table below with "NC." In these cases, the difference between the primary and duplicate results should not exceed the value of the reporting limit. As shown in the table below, RPDs were acceptable where calculated. In cases when the RPDs could not be calculated, the differences between the primary and duplicate results were acceptable, except for results for TPH as diesel for XOM093014-09 and XOM093014-12. The TPH as diesel results for both the primary and duplicate samples are qualified as estimated and flagged with a "J."

Sample ID/ Field Duplicate ID	Analyte	Primary Result (µg/L)	Duplicate Result (µg/L)	Reporting Limit (µg/L)	RPD (%)
XOM082714-18/ XOM082714-22	TPH as diesel	220	220	100	NC
	TPH as gasoline	130	120	100	NC
	1-methylnaphthalene	0.075	0.061	0.095	NC
	acenaphthene	0.44	0.37	0.095	NC
	fluorene	0.42	0.34	0.095	NC
XOM093014-09/ XOM093014-12	TPH as diesel	590	170	100	**NC**
	TPH as motor oil	190	<100	100	NC
	TPH as gasoline	130	140	100	NC
	1-methylnapthalene	0.084	<0.095	0.095	NC
	acenaphthene	0.45	0.35	0.095	NC
	fluorene	0.37	0.31	0.095	NC
XOM102914-09/ XOM102914-12	TPH as diesel (no SG)	500	550	100	10
	TPH as diesel (with SG)	360	380	100	NC
	TPH as gasoline	180	180	100	NC
	1-methylnaphthalene	1.6	2.1	0.095	27
	acenaphthene	0.61	0.69	0.095	12
	fluorene	1.0	1.2	0.095	18
XOM111914-06/ XOM111914-12	TPH as diesel (no SG)	220	300	100	NC
	TPH as diesel (with SG)	190	240	100	NC
	TPH as gasoline	150	160	100	NC
	naphthalene	0.21	0.20	0.096	NC
	1-methylnaphthalene	0.28	0.27	0.096	NC
	acenaphthylene	0.11	0.099	0.096	NC

Sample ID/ Field Duplicate ID	Analyte	Primary Result (µg/L)	Duplicate Result (µg/L)	Reporting Limit (µg/L)	RPD (%)
	acenaphthene	0.51	0.48	0.096	6
XOM121814-10/ XOM121814-12	TPH as diesel (no SG)	320	340	100	NC
	TPH as diesel (with SG)	260	280	100	NC
	TPH as gasoline	140	160	100	NC
	fluorine	0.60	0.59	0.096	2

Notes
µg/L = micrograms per liter
RPD= relative percent difference

7. **Surrogates** – Acceptable.
8. **Reporting Limits and Laboratory Flags** – Acceptable.

   The laboratory reported detections between the MDL and RL and qualified these results as estimated with a “J” flag. The results are reported as qualified and are not further qualified as a result of this review.

OVERALL ASSESSMENT OF DATA

The Eurofins sample delivery groups 14-08-2237, 14-10-0161, 14-10-2521, 14-11-1758, 14-12-0694, and 14-12-1855 are 100 percent complete. Evaluation of the data usability is based on EPA’s guidance documents. Few problems were identified, and analytical performance was generally within specified limits. Except for the rejected results, the data are acceptable and meet the project’s data quality objectives.

A summary of qualified results is presented in the table below.

Sample Identifications and Qualified Results

Sample ID	Qualified Analyte	Qualified Results	Qualifier Reason
XOM082614-12	none		
XOM082614-13	none		
XOM082614-14	none		
XOM082614-15	none		
XOM082614-16	none		
XOM082714-17	none		
XOM082714-18	none		
XOM082714-19	none		
XOM082714-20	none		
XOM082714-21	none		

Sample ID	Qualified Analyte	Qualified Results	Qualifier Reason
XOM082714-22	none		
XOM082714-24	none		
Trip Blank-03	none		
XOM093014-06	none		
XOM093014-07	naphthalene	0.095 U	method blank contamination
XOM093014-08	none		
XOM093014-09	TPH as diesel	590 J	field duplicate RPD
XOM093014-10	none		
XOM093014-12	TPH as diesel	170 J	field duplicate RPD
Trip Blank-02	none		
XOM102914-06	none		
XOM102914-07	none		
XOM102914-08	all	all rejected	results reported from data package 14-12-0694
XOM102914-09	all	all rejected	results reported from data package 14-12-0694
XOM102914-10	none		
XOM102914-12	none		
Trip Blank	none		
XOM111914-06	none		
XOM111914-07	none		
XOM112014-08	none		
XOM112014-09	none		
XOM112014-10	none		
XOM111914-12	none		
Trip Blank	none		
XOM120514-03	none		
XOM120514-04	none		
Trip Blank	none		
XOM121714-06	none		
XOM121714-07	none		
XOM121714-08	none		
XOM121714-09	none		
XOM121714-10	none		
XOM121714-12	none		
Trip Blank	none		

REFERENCES

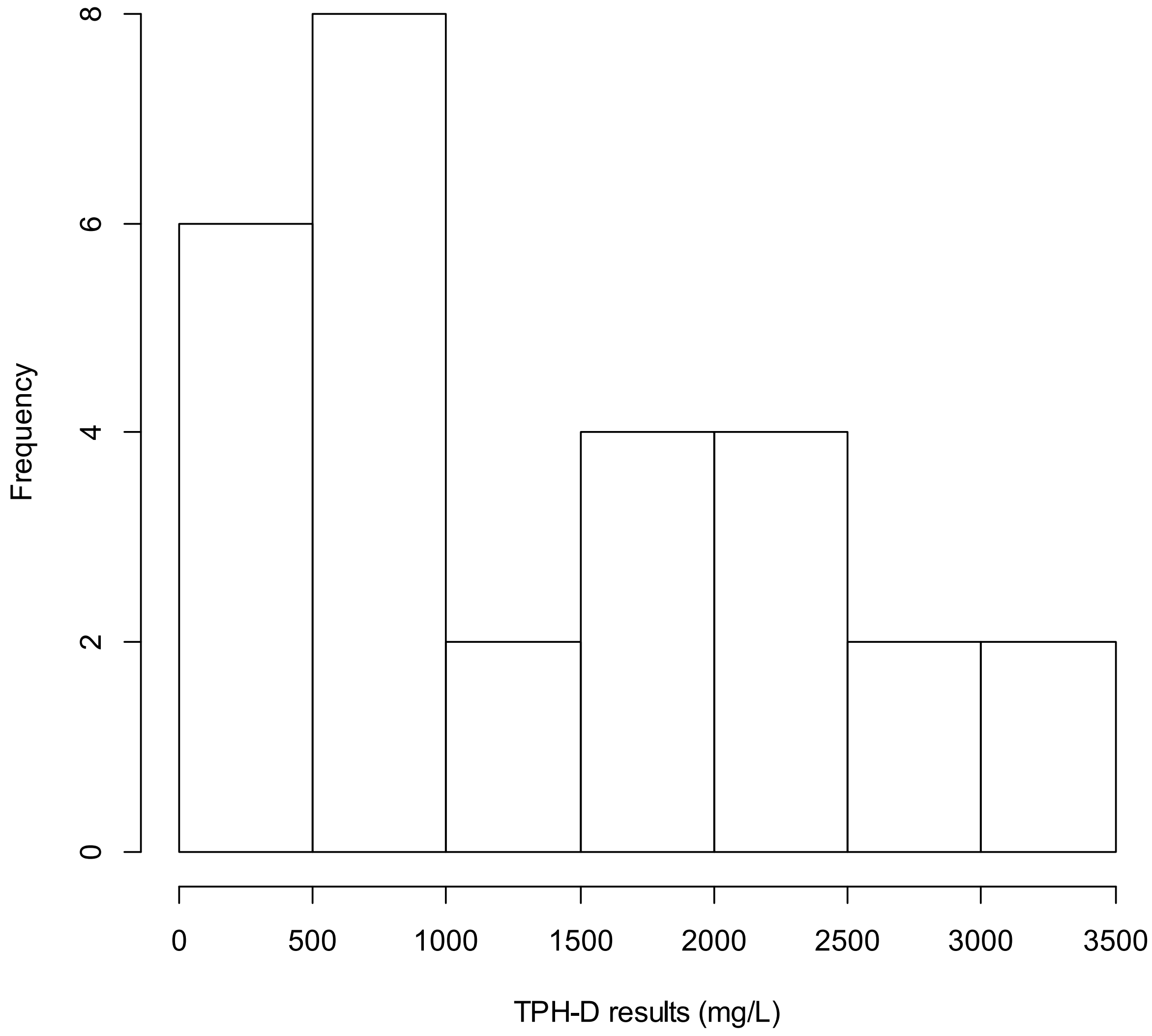
EPA, 2008, U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-08-001, June.

ATTACHMENT C

Statistical Data Input and Program Output

```
"Well.ID","Date","Analyte","TestAmerica","Eurofins"
"1","MW-A1","8/27/2014","TPH-D",1240,590
"2","MW-A2","8/27/2014","TPH-D",565,220
"3","MW-A2","9/30/2014","TPH-D",594,590
"4","MW-A2","10/29/2014","TPH-D",678,360
"5","MW-A2","8/27/2014","TPH-D",602,220
"6","MW-A2","9/30/2014","TPH-D",313,170
"7","MW-A2","10/29/2014","TPH-D",1140,380
"8","MW-A2","11/19/2014","TPH-D",345,190
"9","MW-A2","11/19/2014","TPH-D",393,240
"10","MW-A2","12/18/2014","TPH-D",430,260
"11","MW-A2","12/18/2014","TPH-D",805,280
"12","MW-A3","8/26/2014","TPH-D",906,120
"13","MW-A4","10/29/2014","TPH-D",298,120
"14","MW-A5","6/19/2014","TPH-D",3360,360
"15","MW-A5","8/26/2014","TPH-D",2160,300
"16","MW-A5","9/30/2014","TPH-D",2940,140
"17","MW-A5","10/29/2014","TPH-D",2360,380
"18","MW-A5","12/05/2014","TPH-D",2090,170
"19","MW-A5","12/17/2014","TPH-D",2810,230
"20","MW-A6","6/19/2014","TPH-D",3270,130
"21","MW-A6","10/29/2014","TPH-D",1730,190
"22","MW-A6","12/17/2014","TPH-D",2470,110
"24","MW-19","8/27/2014","TPH-D",409,190
"25","MW-40R","8/27/2014","TPH-D",1610,690
"26","MW-40R","9/30/2014","TPH-D",1540,540
"27","MW-40R","10/29/2014","TPH-D",637,730
"28","MW-40R","11/19/2014","TPH-D",733,590
"29","MW-40R","12/19/2014","TPH-D",1610,550
```

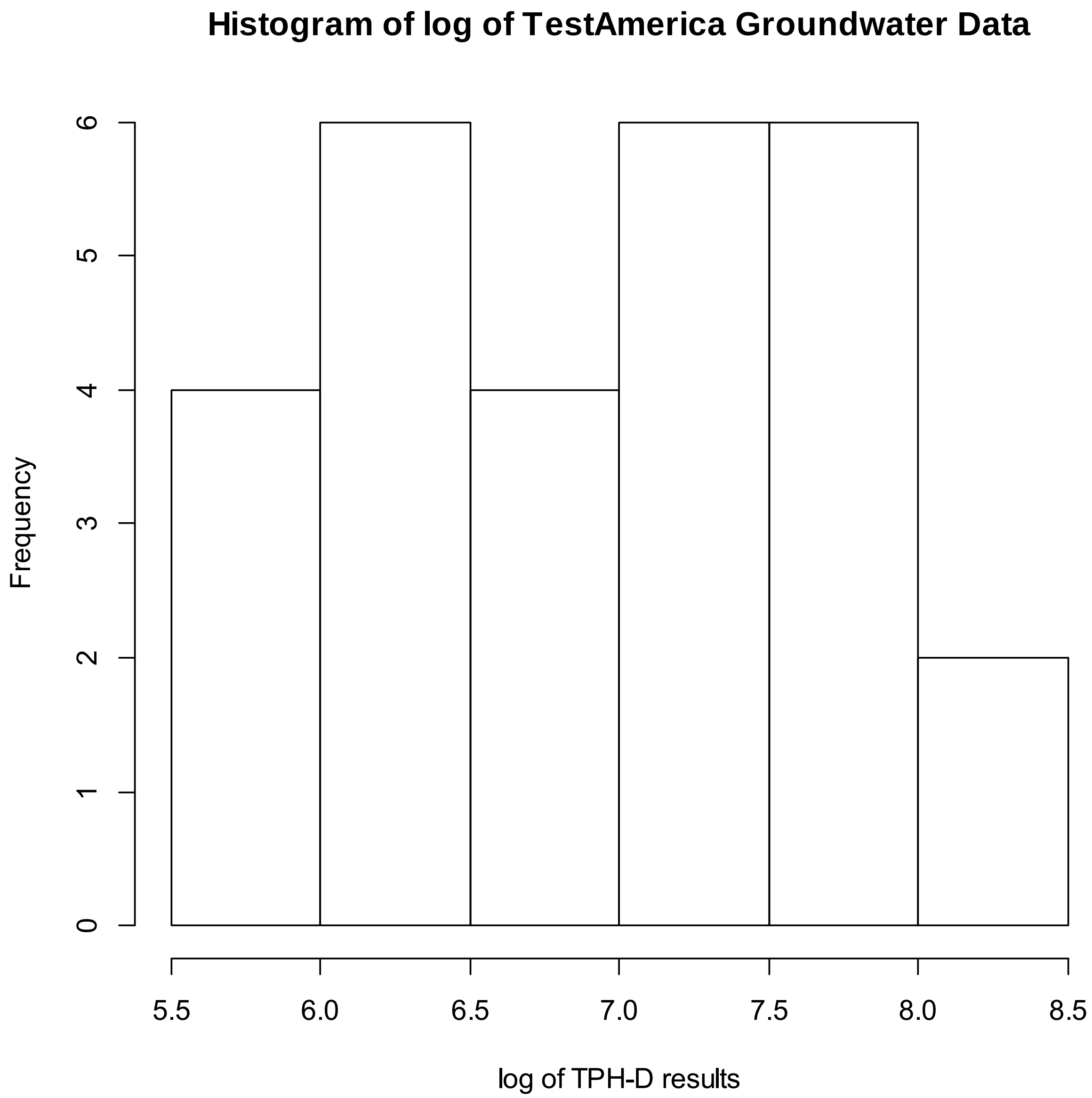
Histogram of TestAmerica Groundwater Data



```
        Shapiro-Wilk normality test

data:  ExxonInput$TestAmerica
W = 0.8842, p-value = 0.004975
```

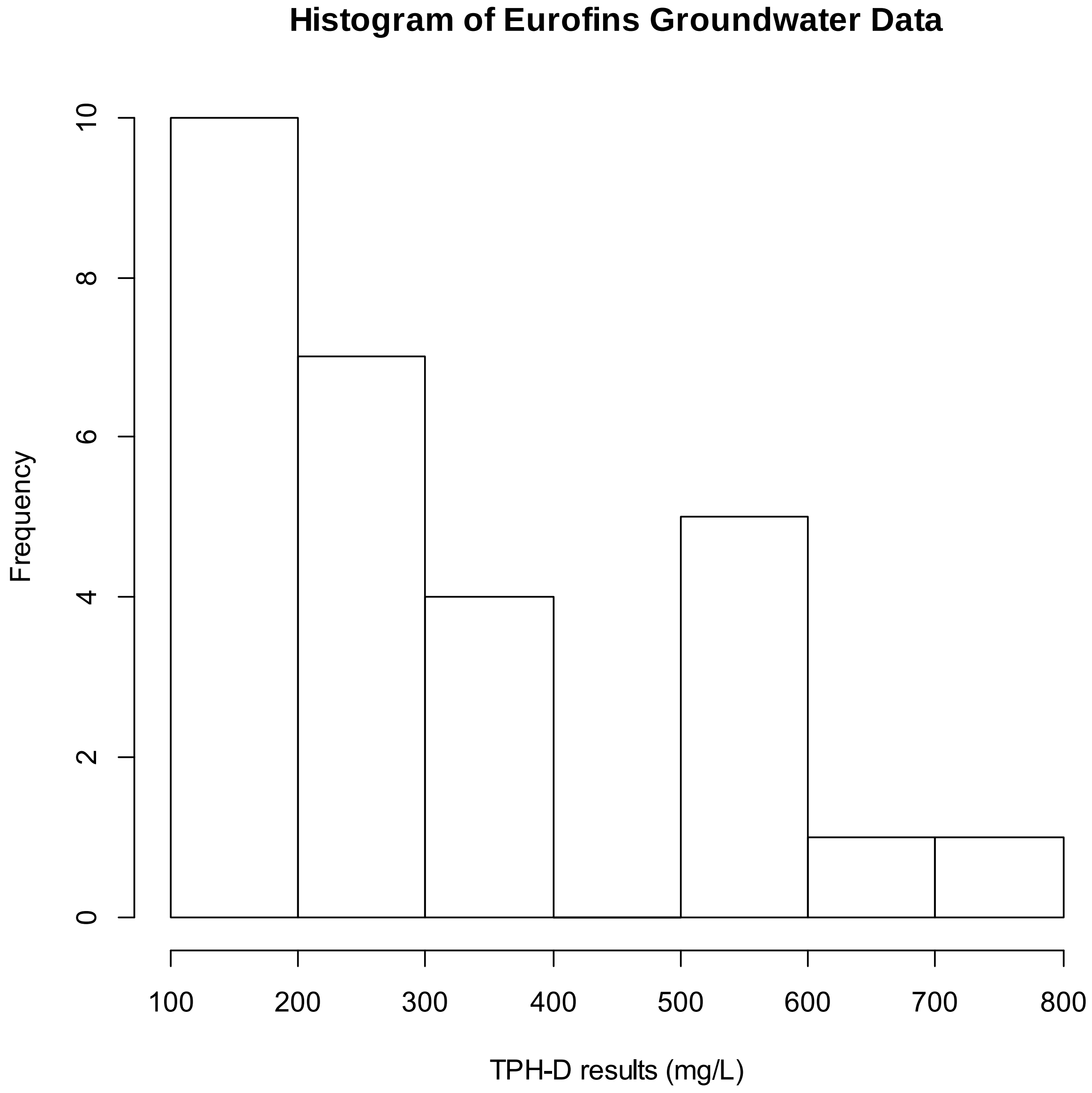
The TestAmerica data are not normally distributed, as is typical of environmental data.



```
        Shapiro-Wilk normality test

data:  ExxonInput$TA2
W = 0.9366, p-value = 0.09076
```

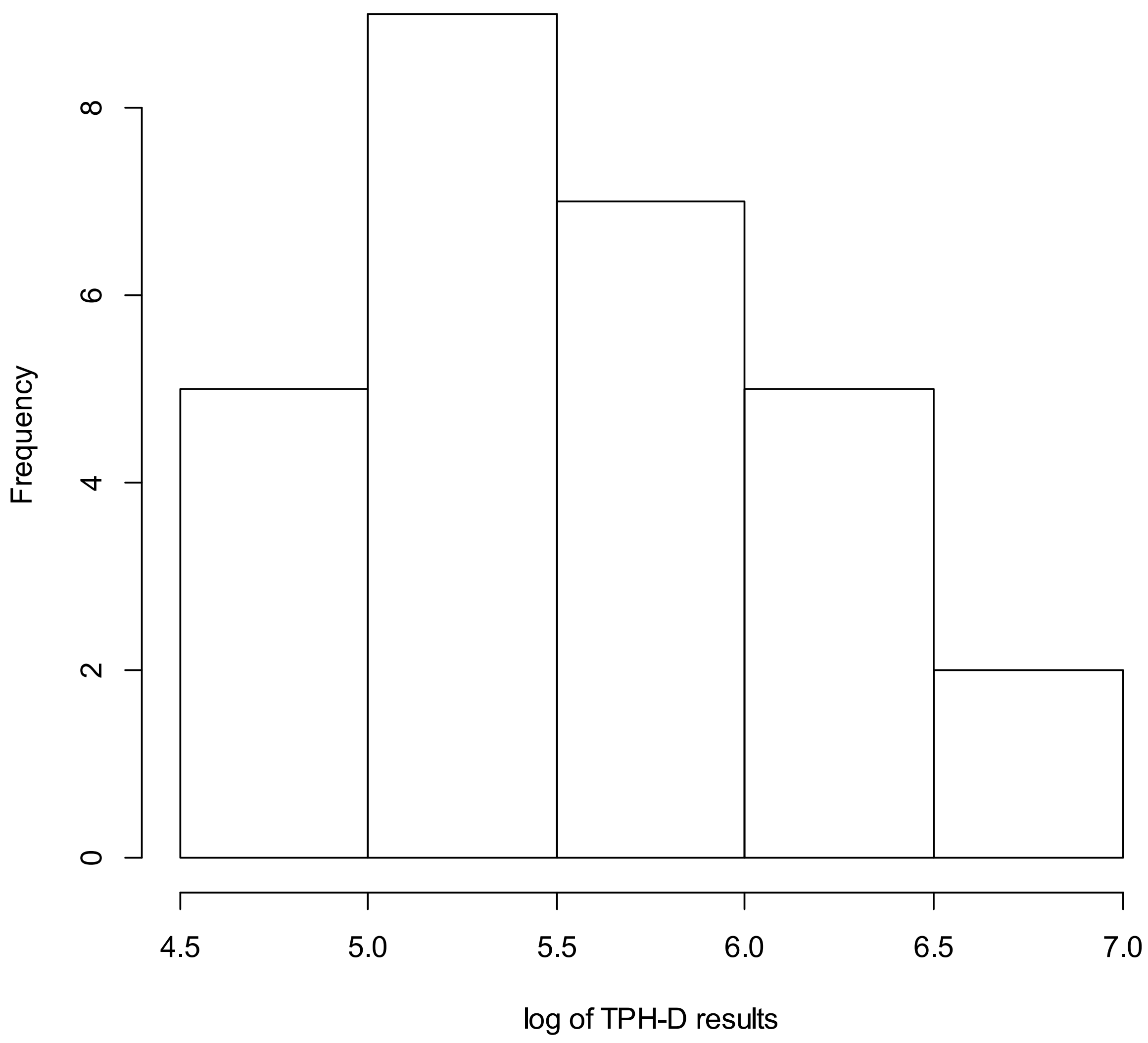
The log-transformed data are more nearly normally distributed.



```
	Shapiro-Wilk normality test

data:  ExxonInput$Eurofins
W = 0.8773, p-value = 0.003502
```

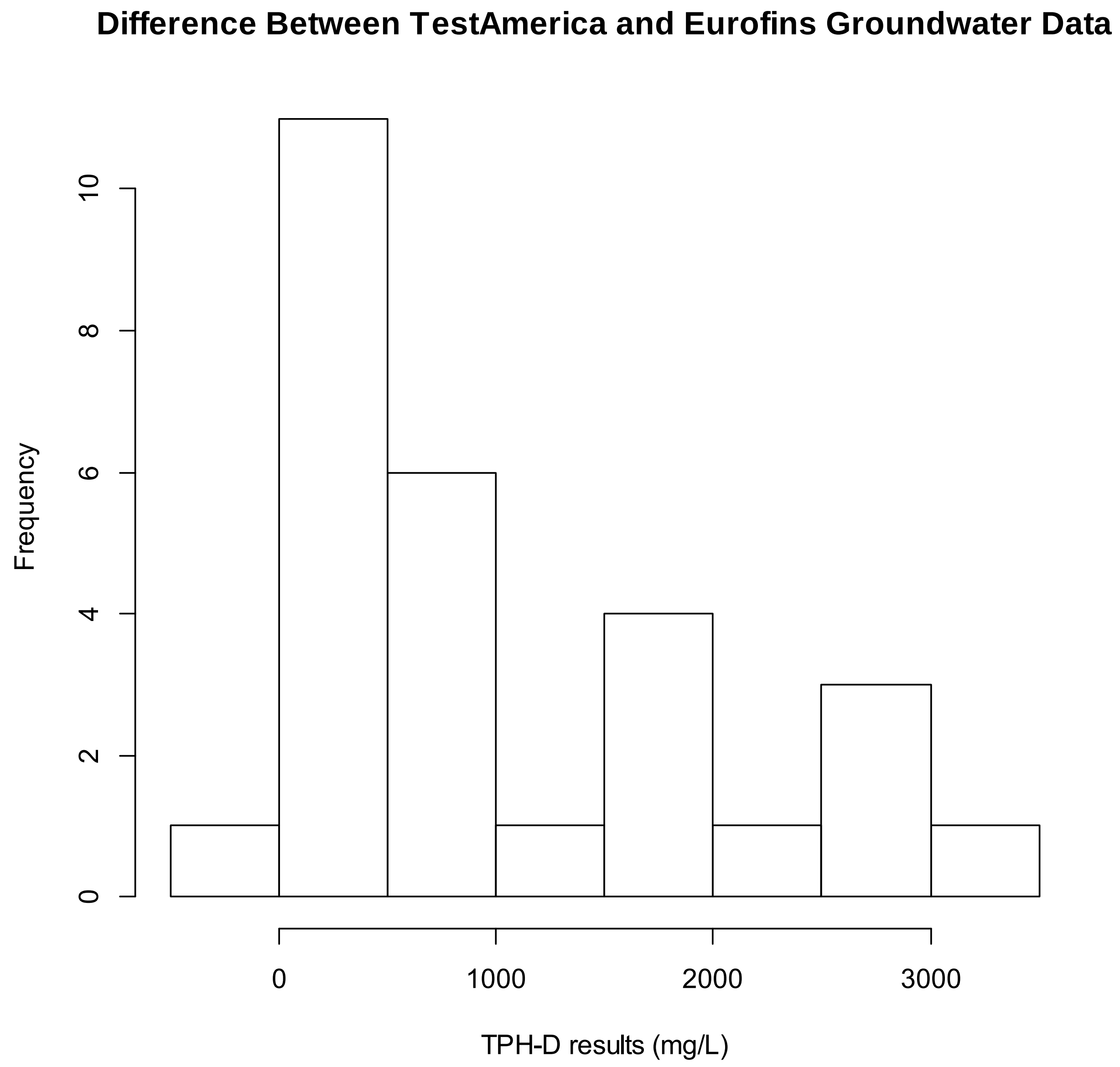
The Eurofins data are not normally distributed, as is typical of environmental data.


Histogram of log of Eurofins Groundwater Data

```
	Shapiro-Wilk normality test

data:  ExxonInput$EU2
W = 0.9446, p-value = 0.1443
```

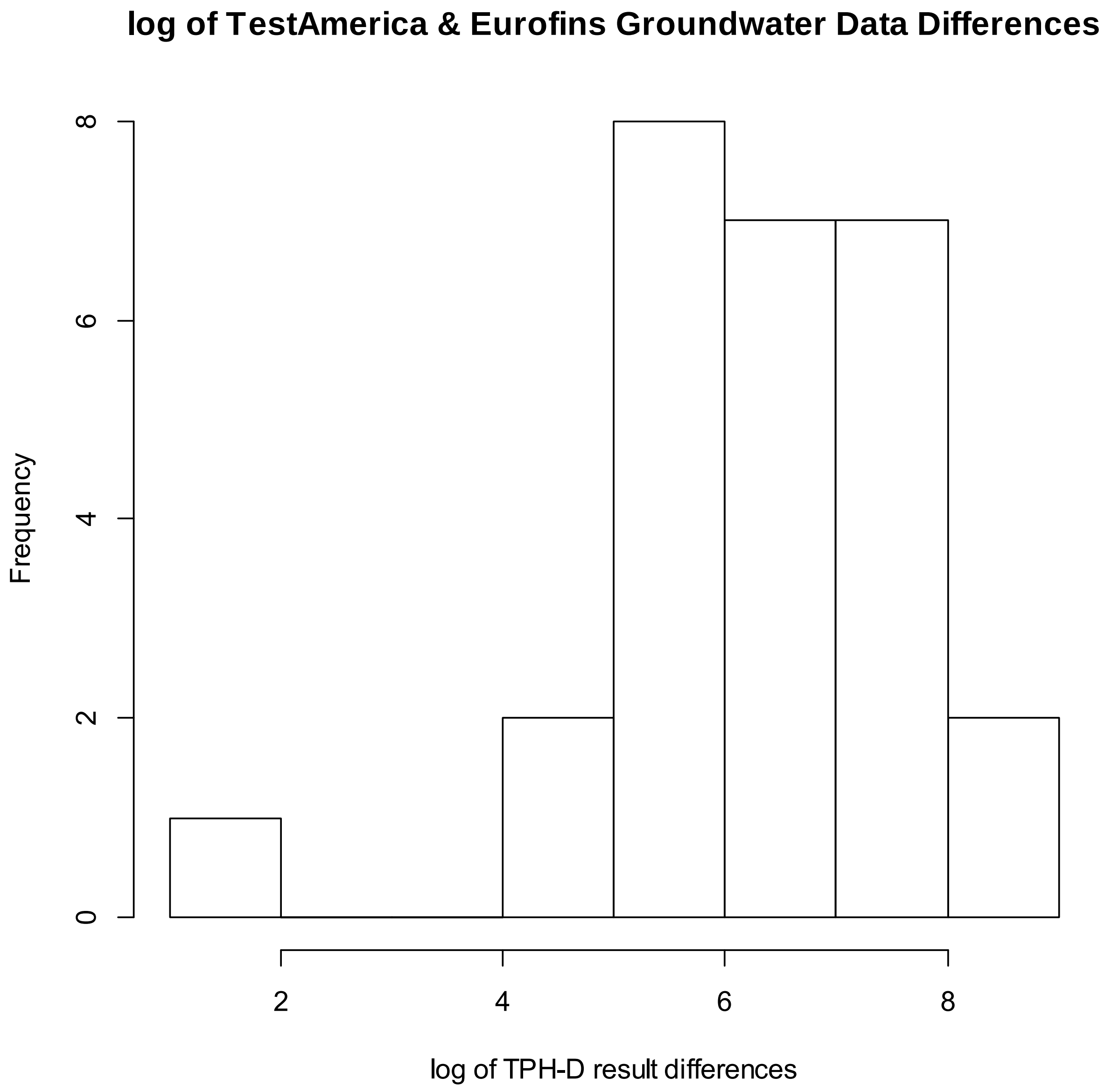
The log-transformed Eurofins data are also more nearly normally distributed.



```
        Shapiro-Wilk normality test

data:  ExxonInput$Diff
W = 0.8605, p-value = 0.001534
```

The paired differences between the TestAmerica and Eurofins results are not normally distributed.



```
        Shapiro-Wilk normality test

data:  ExxonInput$Diff2
W = 0.8683, p-value = 0.002708
```

The log of the paired differences between the TestAmerica and Eurofins results are better, but still not normally distributed.

```
	Bartlett test of homogeneity of variances

data:  list(ExxonInput$EU2, ExxonInput$TA2)
Bartlett's K-squared = 2.2935, df = 1, p-value = 0.1299
```

The two sets of log-transformed groundwater data have reasonably homogenous variance.

```
	Paired t-test

data:  ExxonInput$TA2 and ExxonInput$EU2
t = 7.3013, df = 27, p-value = 7.465e-08
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.9519751 1.6961636
sample estimates:
mean of the differences
               1.324069
```

Using the log-transformed results, there is a highly significant difference between the two sets of data. This is a better check of the difference significance than in the original units, because the log transformation adjusts for skewed distributions.