SWMU-55 INTERIM ACTION PLAN
SHELL OIL PRODUCTS US
PUGET SOUND REFINERY
8505 SOUTH TEXAS ROAD
ANACORTES, WASHINGTON

prepared for:

Industrial Section
Washington Department of Ecology
PO Box 47600
Olympia, Washington 98504

October 11, 2018

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1.0 INTRODUCTION

This Interim Action Plan (IAP) has been prepared by Shell Oil Product US, Puget Sound Refinery (PSR) for the Non-Hazardous Land Treatment Facility also known as Solid Waste Management Unit (SWMU) 55. PSR ceased applying non-hazardous waste at SWMU-55 on August 11, 2017. Shell PSR is planning on implementing interim remedial actions at SWMU-55 which include capping the site with three above-ground petroleum storage tanks, asphalt coated containment berms, and a layer of clean soil. The construction is scheduled to begin in January 2019 and be completed by November 2020.

SWMU-55 was identified as a potentially contaminated site in the Texaco (now Shell) Refinery Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) prepared in 1988 (EPA, 1988). SWMU-55 was identified as a SWMU in Part V (Corrective Action for Continuing Releases) in the PSR Modified Permit for the Land Treatment of Dangerous Wastes (Permit No.: WAD009276197, modified October 17, 2000) (Permit) (Shell, 2000) Monitoring requirements for SWMU-55 are identified in Section V.B of the Permit. The Permit allowed PSR to land treat hazardous waste at the East Land Treatment Facility (ELTF) and the West Land Treatment Facility (WLTF) (located adjacent to SWMU-55).

The Washington Department of Ecology (Ecology) approved land treatment of non-hazardous and non-dangerous waste at SWMU-55 as long as the facility complied with the operational (Section III and IV) and monitoring (Section V) requirements for the WLTF and the ELTF described in the Permit. No hazardous or dangerous wastes have been treated at the SWMU-55 site. Soil sampling conducted in 2017 did not indicate the presence of any waste which would designate as dangerous or hazardous (Whatcom Environmental Services, 2018).

SWMU-55 is located adjacent to the West Land Treatment Facility (WLTF) which was used to treat hazardous waste. The WLTF is closed and is undergoing postclosure care. The waste which remains at the WLTF is capped with a vegetative cover. Final remediation of the WLTF will be undertaken at facility closure. The WTLF site has a restrictive covenant which prevents disturbance of the waste. Similar to the WLTF closure and postclosure plan, the SWMU-55 IAP provides for capping of waste, ongoing monitoring, a restrictive covenant, and financial assurance. Final remediation and closure of SWMU-55 is anticipated to occur in the future (likely when refinery operations cease).

The IAP addresses the direct exposure pathway for contaminants in waste residual soil beneath the tank footprint by requiring treatment and disposal of any soil beneath the tank footprint which exceeds the MTCA Method C industrial cleanup levels for the direct contact pathway. The IAP reduces potential human and terrestrial exposure to waste residual soil by capping the entire footprint of SWMU-55 with clean soil, tanks, asphalt coated berms, and roadways. The IAP also provides for continued monitoring of groundwater (with an expanded analyte list) in support of a future empirical demonstration that soil concentrations of waste residual constituents are protective of groundwater quality.

Pursuant to WAC 173-303-64630(1), this IAP will be implemented under the Model Toxics Control Act (MTCA) regulation (Ecology, 2014). The IAP includes remedial actions which will reduce exposure pathways for waste constituents at the SWMU-55 site. The tank construction project will include remedial actions which will constitute an interim cleanup action (in accordance with WAC 173-340-430) at SWMU-55.

2.0 SUMMARY OF SWMU-55

SWMU-55 is located in the northern portion of the refinery as shown on Figure 1. SWMU-55 consists of seven non-hazardous waste land treatment facility plots (plots 13, 14, 15, 16E, 16W, 17 and 18). The total area of SWMU-55 is approximately 9.4 acres, the total treatment area for the plots is approximately 6 acres (the remaining 3.4 acres consists of roads, berms, slopes, and other unused land).

2.1 SWMU-55 HISTORY

SWMU-55 was identified in the RCRA Facility Assessment prepared in 1988 (EPA, 1988). SWMU-55 has been used to land treat petroleum contaminated soil and refinery wastes since its construction in 1973. From 1973 to 1979, the facility received a variety of wastes from the refinery including API separator sludges, slop oil emulsion solids, and heat exchanger bundle cleaning sludges. In 1979, those waste were identified for future listing as hazardous wastes and all application of waste at SWMU-55 ceased. The site was dormant until 1985 when it was opened as a land treatment facility for non-hazardous wastes.

SWMU-55 has received non-hazardous wastes since 1985. In 2009, PSR petitioned to Ecology that the containment berms around SWMU-55 be raised to accommodate further treatment of non-hazardous waste. Ecology approved the request on December 8, 2009 provided that PSR continue to follow Permit No. WAD009276197 in the management of the individual plots. PSR has followed the operational and monitoring requirements of the Permit at SWMU-55.

2.2 TYPES AND QUANTITIES OF WASTES

Non-hazardous wastes which have been applied to SWMU-55 include: petroleum contaminated soil, biosolids, filter clays, polymerization catalyst (clay with phosphoric acid), wastewater treatment sludges, refinery scale, non-ignitable oily wastes, cooling tower sludges, cation exchange resins, and FCCU catalyst. Prior to 1979, SWMU-55 also received API separator sludges, slop oil emulsion solids, and heat exchanger bundle cleaning sludges. A test pit investigation conducted in 2017 indicated that average depth of treated waste residual at SWMU-55 is approximately 9.5 feet. The total treatment area is approximately 6 acres which would include approximately 92,000 cubic yards of waste residual at SWMU-55. Since 2010, approximately 21,138 cubic yards of non-hazardous and non-dangerous waste were treated at SWMU-55 including:

- 16,659 cubic yards of biosolids
- 3 cubic yards of polymerization catalyst
- 31 cubic yards of sandblast sand
- 120 cubic yards of water softener resin
- 83 cubic yards of air dryer desiccant
- 157 cubic yards of clay and sand filter media
- 4,036 cubic yards of petroleum contaminated soil
- 49 cubic yards of miscellaneous non-hazardous rust scale, debris, or sludges

2.3 SWMU-55 OPERATIONS AND MONITORING

PSR has been performing the monitoring described in Part V.B of the Permit since 1998. Soil-pore water from the porous cup lysimeters L90-13 and L90-16E and groundwater from wells W-46 and W-24 have been sampled annually. Groundwater and soil-pore water samples have been analyzed for benzene, toluene and naphthalene. Soil-pore water samples have also been analyzed for chromium, nickel and vanadium. A report describing the analytical results has been transmitted to Ecology annually. A summary of the sample results is provided in Table 1. There have been no detections of principal dangerous constituents (as defined in the Permit) above the MTCA Cleanup Levels in the groundwater and soil-pore water at the site.

The pH, ammonia nitrogen, nitrate nitrogen and available phosphorous in the upper soil surface (known as the zone of incorporation (ZOI)) have been determined on an annual basis and placed in the operating record. Soil amendments are made when analytical results indicate that the pH should be adjusted or the concentration of nitrogen or phosphorus is less than the desired amount. The ZOI is tilled at least twice per month during the months when wastes can be added, and a log of waste type, amounts applied, plot loading, and the date of application is maintained.

2.4 SOIL INVESTIGATION

In June 2017, fifteen test pits were excavated at the SWMU-55 site to characterize the treated waste residual soil (Whatcom Environmental Services, 2018). Test pit total depth varied with the depth to native soil which extended from 6 feet to 15 feet below ground surface. The test pits were terminated when field screening (no visible sheen when soil is placed in water and photoionization detector organic vapor reading less than 5 ppm) indicated no presence of hydrocarbon contaminants.

Waste residual samples were collected as composite samples from the intervals of the test pits that showed the most evidence of contamination (based on field screening observations). Samples were analyzed for volatile range, diesel range, and oil range total petroleum hydrocarbons, BTEX constituents (Benzene, Toluene, Ethylbenzene, and Xylenes), soil pH, priority pollutant metals, Toxicity Characteristic Leaching Procedure (TCLP) Resource Conservation and Recovery Act (RCRA) 8 metals, and Volatile Organic Compounds (VOCs). Four samples were selected for additional testing of Polychlorinated Biphenyls (PCBs,) dioxins, hexavalent chromium, TCLP VOCs, TCLP SVOCs, and a dangerous waste bioassay.

The waste residual soil contains petroleum compounds and metals. The waste residual samples did not contain hazardous or dangerous waste. The contaminants in the waste residual soil at SWMU-55 which may exceed MTCA cleanup levels include:

- Total Petroleum Hydrocarbons (TPH)
- Benzene, Toluene, Ethylbenzene, and Xylene (BTEX)
- Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)
- Mercury

All other analytes were not detected, detected in very low concentrations, or detected at concentrations below MTCA Method A cleanup levels. The soil investigation report is included as Appendix A.

2.5 GEOTECHNICAL INVESTIGATION

A geotechnical investigation was conducted at the SWMU-55 site in 2017. The geotechnical investigation report titled “RP&S New Crude Tank and Product Tanks Projects: Report of Geotechnical Investigation” dated October 12, 2017 was completed by AECOM. The geotechnical report describes, in detail, the geologic and hydrogeologic setting of the site as well as the site preparation and tank construction plans. A copy of the geotechnical report is included as Appendix B.

2.6 HYDROGEOLOGIC INVESTIGATION

A hydrogeologic investigation was conducted at the PSR site in 1988. The hydrogeologic investigation report titled "Hydrogeologic Investigation Texaco Puget Sound Plant" dated June 17, 1988 was completed by Landau Associates Inc. The hydrogeologic report describes, in detail, the geologic and hydrogeologic setting of the site. A copy of the hydrogeologic report is included as Appendix C.

2.7 GROUNDWATER AND SOIL-PORE WATER SAMPLING REPORT

A summary of groundwater and soil-pore water sampling at the site from 1998 to 2018 is included in Appendix D. Historical groundwater sampling and the expanded 2018 groundwater sampling at SWMU-55 have not detected any compounds above MTCA Method B Residential Groundwater Cleanup Levels. Historical soil-pore water sampling and the expanded 2018 soil-pore water sampling at SWMU-55 have not detected any compounds above MTCA Method B Residential Groundwater Cleanup Levels.

Based on the results of this investigation, there is no evidence of groundwater or soil-pore water impacts which exceed MTCA Method B residential groundwater cleanup levels at the SWMU-55 site.

3.0 TANK CONSTRUCTION INTERIM REMEDIAL ACTIONS

Shell PSR is proposing the implementation of interim cleanup actions at the SWMU-55 site. The interim actions will be implemented during the construction of three storage tanks at the SWMU-55 site. The construction is scheduled to begin in January 2019 and be completed by November 2020. Following implementation of the IAP, waste residual soil at the site will be capped with a layer of clean soil, tanks, asphalt coated berms, and roadways.

The IAP addresses the direct contact exposure pathway for contaminants in waste residual soil beneath the tank footprints by requiring removal of any soil beneath the tank footprints which exceeds the MTCA Method C industrial cleanup levels. The IAP reduces potential human and terrestrial exposure to waste residual soil by capping the entire footprint of SWMU-55 with clean soil, tanks, asphalt coated berms, and roadways. The IAP also provides for continued monitoring of groundwater (with an expanded analyte list) in support of a future empirical demonstration that soil concentrations of waste residual constituents are protective of groundwater quality.

The IAP does not assess soil outside the tank footprint which will not be disturbed by construction activities (grading or trenching). These areas will be capped with a layer of clean soil, asphalt coated berms, or roadways.

3.1 BENEFITS OF THE TANK CONSTRUCTION INTERIM ACTIONS

The SWMU-55 site was considered as a potential site for tank construction due to its elevation in relation to other storage tanks and to the operating process units. The elevation of the tanks will eliminate the need to install additional pumping infrastructure at the site. Additionally, redevelopment of the SWMU-55 site will reduce the need to expand the physical footprint of the refinery. Complete removal of waste residual soil at SWMU-55 would be cost prohibitive and would create a very large carbon footprint due to the waste residual soil transportation and treatment requirements.

Ongoing monitoring at SWMU-55 has not indicated any release of compounds from the site and the geology at SWMU-55 is well suited to contain the waste in the future.

Construction of a clean soil and asphalt cap at the site will prevent worker and wildlife contact with remaining waste residual soil and will eliminate the potential for wind transportation of waste constituents.

The tank construction interim actions proposed for SWMU-55 will minimize the migration of contaminants at the site. The IAP addresses the direct exposure pathway for contaminants in waste residual soil beneath the tank footprint by requiring offsite disposal (at a permitted facility) of any soil beneath the tank footprint which exceeds the MTCA Method C industrial cleanup levels. The IAP reduces potential human and terrestrial exposure to waste residual soil by capping the entire footprint of SWMU-55 with clean soil, tanks, asphalt coated berms, and roadways. The IAP also provides for continued monitoring of groundwater (with an expanded analyte list) in support of a future empirical demonstration that soil concentrations of waste residual constituents are protective of groundwater quality.

3.2 INTERIM ACTION PLAN

Permanent storage tanks (known as Tank 503, Tank 504, and Tank 505) will be constructed at the SWMU-55 site in accordance with the requirements of this section. Tank 503 will be a 190-foot diameter and 72-foot-tall steel walled tank with a nominal storage capacity of 335,000 barrels (14,070,000 gallons). Tanks 504 and 505 will be 134-foot diameter and 44-foot-tall with a nominal storage capacity of 100,000 barrels (4,200,000 gallons) each. Soil berms will be constructed around the tanks to create a containment area in accordance with Spill Prevention, Control, and Countermeasure (SPCC) requirements as found in 40 CFR 112 and WAC 173-180.

The tanks that will be constructed at SWMU-55 are shown on Figure 2. The areas where the tanks will be constructed will be graded to create a level surface for the tanks and the containment areas. In order to grade the site for tank construction, approximately 21,200 cubic yards will be excavated and reused to construct the tank farm dikes and fill lower areas onsite if the soil meets the Method C industrial soil cleanup levels in a direct contact exposure scenario. Excavated soil which exceeds the Method C industrial soil cleanup levels for direct contact will be removed and transported to a permitted facility for offsite disposal. Cross-sections showing the cut and fill profile at the proposed tank locations are shown on Figure 3 and Figure 4. Soil beneath the tank footprints will be sampled to a depth of 15 feet below ground surface. Any soil which exceeds the Method

C industrial soil cleanup levels for direct contact up to a depth of 15 feet below ground surface will be excavated and disposed of offsite at a permitted facility.

After tank construction is completed, all waste residual soil at SWMU-55 will be capped with a one-foot thick layer of clean soil, gravel, or a sprayed-on coating of asphalt binder. The cap will prevent waste constituents from contaminating surface water or escaping due to wind dispersal. The cap will also prevent worker or wildlife contact with residual waste constituents. The cap will reduce the potential threat to human health and the environment by reducing multiple pathways for exposure at the site.

3.3 TANK CONSTRUCTION ACTIVITIES

Waste residual soil will need to be excavated to facilitate tank construction. The excavated soil will be used to construct the earthen tank containment dikes if it meets MTCA Method C industrial cleanup levels. Prior to excavation and grading, the excavated soil will be sampled and characterized in accordance with the soil sampling and analysis plan which is included in Section 4.0.

If the excavated waste residual soil does not meet Method C industrial cleanup levels, the waste residual soil will be hauled offsite to a permitted solid waste treatment and disposal facility (in accordance with the Solid Waste Handling Standards WAC 173-350).

Soil located beneath the proposed tanks will be tested and any soil (up to 15 below ground surface) that exceeds MTCA Method C industrial cleanup levels will be removed from the tank footprint prior to construction.

3.3.1 Tank Containment Berms

Excavated soil which meets MTCA Method C industrial cleanup levels and which is deemed suitable for use in the containment berms by a geotechnical engineer will be used to construct the tank containment berms. Suitable materials used to construct the tank containment berms must be “sufficiently impervious” per Shell standard DEP 34.11.00.11 or 34.51.01.31, 40CFR112.8(c)(2), and WAC 173-180-320(1) to prevent product released from the tank from migrating out of the system to surrounding soil, surface water, or groundwater before spill cleanup occurs.

A geotechnical investigation report titled "RP&S New Crude Tank and Product Tanks Projects: Report of Geotechnical Investigation" was prepared by AECOM for the SWMU-55 site (dated October 12, 2017). The geotechnical investigation determined that the soil that will be excavated from the tank area meets the "sufficiently impervious" requirement (Appendix B).

The final slopes of the berms will be 1.5H:1V. The surface of the berms will be covered with a sprayed-on coating of asphalt binder (approximately 0.25 inches thick) which has been found to be effective at reducing erosion and infiltration at similar berm slopes at PSR. The 2017 geotechnical report also provided subgrade preparation and fill placement recommendations for construction of the berms including:

- Stripping areas of any vegetation, debris, organic topsoil, and deleterious materials that might be encountered. These materials will be sampled and disposed of in accordance with MTCA and Solid Waste regulations.
- After stripping of materials, the subgrade will be compacted to 95 percent of its maximum dry density (AECOM, 2017).
- Soft and wet zones identified during initial compaction will be cut to firm bearing soils, backfilled with suitable material, and re-compacted.
- Material used to construct the containment berms will be placed with 1.5H:1V side slopes in lifts up to 12 inches thick prior to compaction. Berms up to 10 feet high will be compacted to 93 percent of the maximum dry density and berms 10 to 28 feet high will be compacted to 95 percent of the maximum dry density (AECOM, 2017).
- A geotechnical engineer will be onsite to observe subgrade preparation, fill placement, compaction, and final grading.

3.3.2 Storage Tank Construction

The storage tanks will be constructed at grade and will be supported by at-grade support and concrete perimeter ringwalls. The ringwalls are expected to measure approximately 4 feet wide by 4 feet thick and extend approximately 3 feet below finish grade. Soil beneath the tanks will be sampled to verify that any waste residual soil left beneath the tanks meets MTCA Method C industrial cleanup levels (to a depth of 15 feet).

Tank ringwall and tank floor subgrade preparation will be conducted in accordance with the October 12, 2017 Geotechnical Report section 7.10 which is provided in Appendix B.

3.3.3 Access Roads

Access roads shown on Figure 2 will consist of gravel surfacing and will be designed in accordance with Federal Highway Administration guidance for gravel roads. A geotextile will be installed over the subgrade prior to placement of the base course. Access road construction will be conducted in accordance with the October 12, 2017 Geotechnical Report section 7.8 which is provided in Appendix B.

3.3.4 Soil Cap

Waste residual soil around the footprint of the tank and inside the earthen containment berms will be graded, compacted to 90% maximum dry density, and covered with a one-foot thick clean soil cap. The soil cap will be constructed from clean soil from the Clean Soil Pile. The soil in the Clean Soil Pile has been determined to be “sufficiently impervious” by a geotechnical engineer with a hydraulic conductivity of less than 10^{-5} centimeters per second. The clean soil cap will be placed in lifts no higher than 9-inches before it is compacted to 95% of the maximum dry density (AECOM, 2017).

The clean soil cap will prevent the waste residual soil from being exposed to workers and wildlife and will also eliminate the potential for wind movement of the waste residual soil. The clean soil cap will also prevent the waste residual soil from being exposed to surface water and the cap will reduce the infiltration of precipitation. All waste residual material will be covered by the soil cap, tank containment berms, or the tank itself. All stormwater collected inside the tank containment area will be routed to the PSR waste water treatment plant.

3.4 WASTE RESIDUAL SOIL EVALUATION - USE OF METHOD C

Tank construction at the SWMU-55 site will require that waste residual soil be excavated during the project. The waste material generated will be characterized for potential reuse at SWMU-55 (as fill or in the construction of the tank containment berms) or sent offsite for disposal at a permitted facility. Waste residual soil located outside the tank footprint that will not be disturbed during the tank construction project will not be characterized as part of the interim remedial action. This soil will be investigated later during the final cleanup of the site.

Ecology has established the MTCA Method C soil cleanup levels for industrial sites meeting the criteria for establishing industrial soil cleanup levels under WAC 173-340-745. These criteria include:

- The site meets the definition of an industrial property
- Appropriate institutional controls are in place including a restrictive covenant on the portions of the site where Method C cleanup levels are used
- Hazardous substances remaining onsite would not pose a threat to human health or the environment at the site or in adjacent non-industrial areas. This may be achieved by limiting access to the site, capping materials onsite, evaluating the potential for transport of hazardous substances, and evaluating the potential for impacts on wildlife

Soil cleanup levels established under Method C shall not result in significant adverse acute or chronic toxic effects on human health using the procedures in WAC 173-340-720 through WAC 173-340-760 and for known or suspected carcinogens, concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to one in one hundred thousand using the procedures in WAC 173-340-720 through WAC 173-340-760.

Soil meeting the Method C standards will be used as fill or in the construction of the tank containment berms constructed on the SWMU-55 site. By meeting the Method C standards, the soil would not pose a risk to human health in an industrial worker direct contact exposure scenario. The tank containment berms will be covered by a layer of asphalt which will limit the leaching potential of the waste residual soil present in the tank berms and below the tank berms.

3.4.1 Contaminants of Concern at SWMU-55

Based on the comprehensive soil sampling conducted at SWMU-55 in June 2017 (included as Appendix A), the contaminants at SWMU-55 which may exceed MTCA Method C industrial cleanup levels include:

- Petroleum Hydrocarbons
- Benzene, Toluene, Ethylbenzene, and Xylene (BTEX)
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs)
- Mercury

All other analytes were not detected, detected in very low concentrations, or detected at concentrations below MTCA Method A Residential Cleanup Levels.

3.4.2 Protection of Human Health - Soil Direct Contact

Each soil sample collected at SWMU-55 will be analyzed for Volatile Petroleum Hydrocarbons (VPH), Extractable Petroleum Hydrocarbons (EPH), BTEX, cPAHs, naphthalenes, and mercury in order to determine if the soil meets the Method C industrial soil cleanup levels for direct contact exposure. The Method C industrial soil cleanup levels for direct contact exposure are set using the procedures specified in WAC 173-340-745(5)(b). The Method C industrial cleanup levels will be set such that direct contact exposure to the soil will result in no acute or chronic non-carcinogenic toxic effects to human health using a hazard quotient of 1.0 and the concentration with the upper bound on the estimated excess cancer risk is less than or equal to one in one-hundred thousand. Equations 745-1, 745-2, 745-3, 745-4, and 754-5 in MTCA (WAC 173-340-745) and the associated default assumptions will be used to conduct this calculation. For carcinogenic effects, the requirements of WAC 173-340-745(5)(b)(iii)(B)(II) will be followed to determine if the soil meets the MTCA Method C industrial cleanup level. For non-carcinogenic effects, the requirements of WAC 173-340-745(5)(b)(iii)(B)(III) will be followed to determine if the soil meets the MTCA Method C industrial cleanup level. Soil MTCA Method C industrial cleanup levels for this interim action plan include:

- Site Hazard Quotient = 1.0
- Excess Cancer Risk = 1.0×10^{-5}
- Benzo(a)pyrene = 4.27 mg/kg
- Total cPAHs using toxicity equivalency factors = 4.27 mg/kg
- Mercury = 252 mg/kg
- Benzene = 2,390 mg/kg
- Ethylbenzene = 350,000 mg/kg
- Toluene = 280,000 mg/kg
- Xylenes = 700,000 mg/kg

- Naphthalenes = 70,000 mg/kg

To assist with the calculation of the site hazard quotient and excess cancer risk, the MTCATPH11.1 Microsoft Excel spreadsheet (available on the Department of Ecology website) or an equivalent methodology will be used. The MTCATPH11.1 model calculates the direct contact human health hazard index (quotient) and the excess cancer risk using the EPH, VPH, BTEX, and cPAH site specific analytical data.

Each soil sample collected in accordance with this section will be evaluated using the MTCATPH11.1 spreadsheet to determine if the sample meets the MTCA Method C Site Hazard Quotient, Excess Cancer Risk, and individual constituent cleanup levels provided in this section. Soil not meeting the Hazard Quotient, Excess Cancer Risk in the MTCATPH11.1 spreadsheet or the individual constituent cleanup levels provided in this section will require offsite disposal at a permitted facility.

3.4.3 Protection of Human Health - Groundwater Protection

During initial permitting, groundwater monitoring wells W-24 and W-46 were installed to characterize the groundwater at SWMU-55. Both wells were installed downgradient of SWMU-55. The location of the wells and the groundwater flow direction are shown on Figure 5. Groundwater samples collected from wells W-24 and W-46 have not contained concentrations of contaminants of concern above MTCA Method B Residential Cleanup Levels. A summary of the groundwater sampling is provided in Appendix D.

During initial permitting, Lysimeters L90-13 and L90-16E (locations shown on Figure 5) were installed to collect the soil-pore water at SWMU-55. Soil-pore water samples collected from lysimeters L90-13 and L90-16E have not contained concentrations of contaminants of concern above MTCA Method B residential cleanup levels. A summary of the soil-pore water sampling is provided in Appendix D.

Based on the historical groundwater data provided in Appendix D, there have been no detections of contaminants of concern above MTCA Method B residential cleanup levels in the groundwater at the site. This empirical demonstration (as specified in WAC 173-340-747(9)) shows that the waste residual soil at SWMU-55 has not caused an exceedance of applicable groundwater cleanup levels.

Groundwater and soil-pore water will be analyzed for Volatile Petroleum Hydrocarbons (VPH), Extractable Petroleum Hydrocarbons (EPH), BTEX, cPAHs, naphthalenes, mercury, chromium, nickel, and vanadium. Groundwater concentrations which are protective of human health (MTCA Method B) are also included in the list:

- Site Hazard Quotient = 1.0
- Excess Cancer Risk (single substance) = 1.0×10^{-6}
- Excess Cancer Risk (total for all substances) = 1.0×10^{-5}
- Benzo(a)pyrene = 0.2 μg/L
- Total cPAHs using toxicity equivalency factors = 0.2 μg/L
- Mercury = 2 μg/L
- Chromium = 100 μg/L
- Nickel = 320 μg/L
- Vanadium = 80 μg/L
- Benzene = 5 μg/L
- Ethylbenzene = 700 μg/L
- Toluene = 1,000 μg/L
- Xylenes = 1,600 μg/L
- Naphthalenes = 160 μg/L

Groundwater sampling will be conducted in the third and fourth quarters of 2018, annually during tank construction, and in years 1, 2, 4, 8, and 12 following completion of the tank construction.

Soil-pore water sampling will be conducted in the third and fourth quarters of 2018, annually during tank construction, and in years 1 and 2 following completion of the tank construction.

3.4.4 Protection of Human Health - Soil Vapor

No occupied buildings will be constructed on SWMU-55 during the tank construction project. Therefore, there is no potential risk from long-term exposure to vapors from the soil at SWMU-55.

3.4.5 Institutional Controls

In accordance with WAC 173-340-745(1)(a)(ii), PSR will implement institutional controls in accordance with WAC 173-340-440 at the site.

Signage: Signs will be posted at the entrances to the tank containment area that indicate that the site was formerly used to treat waste and subsurface work is prohibited without Ecology approval.

Clean Soil Cap and Containment Berm Maintenance: PSR will conduct monthly inspections of the gravel, clean soil cap and asphalt liner on the containment berms. Records of the inspections will be kept by the facility for a period of 5 years. If damage to the cap or the containment berm asphalt cover is discovered during the inspection or at any time, a maintenance notification will be written within 24 hours and repair will be completed in a timely manner. Any escape of waste constituents from the SWMU-55 site will be immediately reported to Ecology and spill control and cleanup measures will be immediately implemented.

Restrictive Covenant: A restrictive covenant will be placed on the property deed for all of SWMU-55. The restrictive covenant will be similar to the covenant placed on the property deed for the adjacent West Land Treatment Facility (located immediately north of SWMU-55). The purpose of this notification is to provide information during a title search to notify a prospective purchaser that the land has been used to manage waste. PSR will comply with WAC 173-340-440 (9) and (10) in this regard.

Financial Assurance: PSR has financial assurance in place for SWMU-55. Preparation of the cost estimates, recordkeeping, and any submittals to Ecology will be performed in accordance with WAC 173-340-440(11). The corrective action and ongoing monitoring cost estimates are provided in Table 2.

Ongoing Groundwater and Soil-Pore Water Monitoring: Groundwater in wells W-24 and W-46 will be sampled in years 1, 2, 4, 8, and 12 following implementation of this interim action plan using the expanded list provided in Section 3.4.3. Following the implementation of this interim action plan, soil-pore water in lysimeters L90-13 and L90-16E will continue to be monitored for the expanded list provided in Section 3.4.3 once per year for 2 years. An annual report summarizing the sampling will be provided to Ecology. If groundwater or soil-pore water contains concentrations of contaminants above levels which are protective of human health (MTCA Method B WAC-173-340-720(4) and

WAC 173-340-705), Shell PSR will investigate the cause of the detections and conduct additional sampling as necessary. After 12 years, PSR will submit a report summarizing the ongoing monitoring efforts. Ecology will review the data and determine if the monitoring can be discontinued or if the monitoring needs to be extended.

3.5 NOTIFICATION

Shell PSR will notify Ecology and the Skagit County Health Department when tank construction activities at the SWMU-55 plots have been initiated.

3.6 RUN-ON AND RUNOFF CONTROLS

The run-on and runoff controls will remain in place during and after the tank construction. Run-off collected from the land treatment facility will be treated at the PSR wastewater treatment facility. As part of the requirements for tank operation, the run-off and run-on berms at SWMU-55 will be expanded to accommodate the needed containment capacity of the tank(s). Containment berms will be constructed in accordance with the geotechnical design report for the site (AECOM, 2017).

3.7 LYSIMETER RELOCATION

Tank construction will occur in the general area of lysimeter L90-13 as shown on Figure 2. The lysimeter will be moved to a location which is not impacted by the tank construction activities as shown on Figure 2. Lysimeter installation will comply with the standards used to initially construct L90-13 (KW Brown, 1988).

4.0 SAMPLING AND ANALYSIS PLAN

The objective of this sampling and analysis plan (SAP) is to determine whether the soil and groundwater encountered during the tank construction project at SWMU-55 meets selected cleanup levels. This SAP was created to ensure quality control and consistency in the field work during soil sample collection. This SAP has been designed following requirements provided in MTCA (WAC 173-340-820) (Ecology, 2013) and the Guidance for Remediation of Petroleum Contaminated Sites (Ecology, 2016).

4.1 SOIL SAMPLING- OUTSIDE OF THE TANK FOOTPRINTS

Soil sampling will be conducted prior to commencement of soil excavation activities. Soil samples will be analyzed in accordance with the analyte list provided in Section 4.9.1 of this report. One sample will be collected for every 500 cubic yards (approximately) in accordance with the stockpile sampling recommendation in Table 6.9 in the Ecology Guidance for Remediation of Petroleum Contaminated Sites. For a two-foot thick soil profile, one sample will be collected from each grid cell of 6,750 square feet. A composite sampling methodology will be used to determine the bulk concentration and disposition of the soil in each 500-cubic-yard cell (6,750 square feet at two-foot thickness). As the waste will be mass excavated, composite samples will be used to characterize each grid segment. Accordingly, the sample from each cell will be a composite sample consisting of 3 subsamples.

The grading plan for the tank construction requires that waste residual soil be excavated from plots 13, 14, 15, and 17. Plots 16E, 16W, and 18 will need to be filled to reach the proper grade. Therefore, soil sampling will be conducted at plots 13, 14, 15, and 17. The proposed pre-grading soil sampling locations are shown on Figure 6.

Grading for Tank 503:

- At the Tank 503 site, the site grading plan requires that approximately 4 feet of waste residual soil will be excavated from plots 13, 14, and 15.
- The soil at plots 13, 14, and 15 will be profiled in two layers. In the first profile, samples will be collected from 0 to 2 feet below ground surface. The second profile will consist of samples collected from 2 to 4 feet below ground surface.

- At the Tank 503 site, fifteen composite samples will be collected from the 0-2-foot profile and 15 composite samples will be collected from the 2-4-foot profile.
- The total number of samples at the Tank 503 site (not including duplicates or blanks) will be 30 samples.

Grading for Tanks 504 and 505:

- At the Tank 504 and 505 sites, approximately 2 feet of soil will need to be excavated from a portion of plot 17.
- The soil which will be excavated from plot 17 will be profiled in one layer.
- At the Tank 504 and 505 sites, ten samples (some composite and some grab samples from the smaller grid sections) will be collected from the 0-2-foot profile.

Soil with concentrations of waste residual constituents which exceed the MTCA Method C industrial cleanup levels for direct contact will require the soil to be disposed of offsite at a permitted facility. In order to determine if waste residual soil exceeds the MTCA Method C industrial cleanup level for direct contact, each individual soil sample will be evaluated using the MTCATPH11.1 Microsoft Excel spreadsheet (available on the Department of Ecology website). Soil not meeting the Hazard Quotient, Excess Cancer Risk in the MTCATPH11.1 spreadsheet or the individual constituent cleanup levels provided in Section 3.4.2 will require offsite disposal at a permitted facility.

In the case of a failed sample, Shell PSR will have two options. Shell may choose to excavate the soil from the entire cell (approximately 500 cubic yards or 6,750 square feet) and transport the soil to an offsite facility for disposal or Shell may further evaluate the soil in the cell by dividing the cell into 5 subcells (100 cubic yards each) and collecting one discrete grab sample from each subcell to determine if soil in each subcell meets the MTCA Method C industrial cleanup level for direct contact. Soil in subcells which have concentrations of waste residual constituents below the MTCA Method C industrial cleanup levels for direct contact may be used onsite in the tankfarm berm construction. Soil in subcells which have concentrations of waste residual constituents above the MTCA Method C industrial cleanup levels for direct contact will be transported offsite to a permitted disposal facility.

4.2 SOIL SAMPLING- INSIDE THE TANK FOOTPRINTS

Discrete grab soil samples will be collected from inside each tank footprint to verify that all waste residual soil remaining beneath the tanks to a depth of 15 below ground surface meets MTCA Method C industrial cleanup levels for direct contact (the soil point of compliance per MTCA). Per Table 6.8 in the Ecology Guidance for Remediation of Petroleum Contaminated Sites, fifty samples will be collected per acre to evaluate the soil beneath the tanks. Tank 503 will have an area of approximately 0.65 acres which will require 33 samples (per Ecology guidance). Tank 504 and 505 each have an area of approximately 0.32 acres which will require 16 samples each. Soil samples will be analyzed in accordance with the analyte list provided in Section 4.9.1 of this report.

Discrete grab samples will be collected at the ground surface, and 3, 6, 9, 12, and 15 feet below ground surface at the locations shown on Figure 7. Cross-sections of the grab sampling are provided on Figures 8 and 9. To summarize:

Soil Beneath Tank 503:

- Tank 503 is a 190-foot diameter tank.
- The tank footprint will be divided into 6 grid sections for sampling purposes (Figure 7).
- One grab sample will be collected from each 3-foot thick grid section beneath Tank 503 to a depth of 15 feet or until native soil is encountered (Figure 8).
- Native soil is expected to be encountered at depths ranging from 6 to 15 feet below ground surface.
- Up to 36 samples will be collected beneath Tank 503.

Soil Beneath Tanks 504 and 505

- Tanks 504 and 505 are 134-foot diameter tanks.
- Each tank footprint will be divided into three grid sections for sampling purposes (Figure 7).
- One grab sample will be collected from each 3-foot thick grid section beneath Tank 504 and 505 to a depth of 15 feet or until native soil is encountered (Figure 9).
- Native soil is expected to be encountered at depths ranging from 6 to 15 feet below ground surface.

- Up to 18 samples will be collected beneath Tank 504 and up to 18 samples will be collected beneath Tank 505.

Soil beneath the tank footprints which contains concentrations of waste residual constituents that exceed the MTCA Method C industrial cleanup levels for direct contact will be excavated and disposed of offsite at a permitted facility. In order to determine if waste residual soil exceeds the MTCA Method C industrial cleanup level for direct contact, each individual soil sample will be evaluated using the MTCATPH11.1 Microsoft Excel spreadsheet (available on the Department of Ecology website). Soil not meeting the Hazard Quotient, Excess Cancer Risk in the MTCATPH11.1 spreadsheet or the individual constituent cleanup levels provided in Section 3.4.2 will require offsite disposal at a permitted facility.

In the case of a failed sample, Shell PSR will have two options. Shell may choose to excavate the soil from the entire three foot thick grid section and transport the soil to an offsite facility for disposal or Shell may further evaluate the soil in the grid section by dividing the grid section into 5 subcells (approximately 100 cubic yards each) and collecting one discrete grab sample from each subcell to determine if soil each subcell meets the MTCA Method C industrial cleanup level for direct contact. Soil in subcells which have concentrations of waste residual constituents below the MTCA Method C industrial cleanup levels for direct contact may be left in place. Soil in subcells which have concentrations of waste residual constituents above the MTCA Method C industrial cleanup levels for direct contact will be excavated and transported offsite to a permitted disposal facility.

4.3 COMPOSITE SOIL SAMPLE COLLECTION PROCEDURE

Samples will be collected using stainless steel sample collection tools. Sampling implements will be thoroughly decontaminated between sampling locations. Samples will be collected by a field technician using a hand auger, from a spilt spoon sampling device, or using a stainless-steel trowel to collect sample from the sidewall of a test pit.

Appropriate personal protective equipment will be worn by all personnel when collecting and handling samples. All disposable sampling materials and supplies, including personal protective equipment, will be placed in garbage bags and placed in municipal garbage collection containers for disposal as solid waste.

The field technician will use the following procedure to collect the composite soil samples:

- The technician will move to the general sample location (guided by GPS).
- The sample location will be recorded using a GPS.
- The technician will us a pre-cleaned stainless-steel hand auger, split spoon, or stainless-steel hand trowel to recover soil from the specified depth.
- The soil will be placed into a pre-cleaned stainless-steel bowl. The technician will repeat the sampling for each subsample in the grid cell. Materials in the soil more than 1 inch in diameter and debris will not be included in the samples.
- The soil from the subsamples will be thoroughly mixed in the stainless-steel bowl using a hand trowel and the technician will immediately fill the sample containers provided by the laboratory. Samples for volatile compounds will be collected using EPA Method 5035 procedures to minimize the loss of volatiles during the soil sampling.
- Excess soil will be removed from the bowl and returned to the original sample location.
- The containers will be processed for shipment.
- The sampling equipment (auger, bowl, trowel, etc.) will be decontaminated.

4.4 GRAB SOIL SAMPLE COLLECTION PROCEDURE

Samples will be collected using stainless steel sample collection tools. Sampling implements will be thoroughly decontaminated between sampling locations. Samples will be collected by a field technician using a hand auger, from a spilt spoon sampling device, or using a stainless-steel trowel to collect sample from the sidewall of a test pit.

Appropriate personal protective equipment will be worn by all personnel when collecting and handling samples. All disposable sampling materials and supplies, including personal protective equipment, will be placed in garbage bags and placed in municipal garbage collection containers for disposal as solid waste.

The field technician will use the following procedure to collect the grab soil samples:

- The technician will move to the general sample location (guided by GPS).

- The sample location will be recorded using a GPS.
- The technician will us a pre-cleaned stainless-steel hand auger, split spoon, or stainless-steel hand trowel to recover soil from the specified depth.
- The soil will be immediately placed into the sample containers provided by the laboratory. Samples for volatile compounds will be collected using EPA Method 5035A procedures to minimize the loss of volatiles during the soil sampling.
- Excess soil will be removed from the bowl and returned to the original sample location.
- The containers will be processed for shipment.
- The sampling equipment (auger, trowel, etc.) will be decontaminated.

4.5 WATER SAMPLING

Groundwater in wells W-24 and W-46 and soil-pore water in lysimeters L90-13 and L90-16E will be sampled per the sampling schedule provided below. Groundwater samples will be collected using the low-flow methodology. Soil-pore water samples will be collected using the porous cup lysimeter sampling methodology described below.

All water samples will be analyzed at an Ecology-accredited laboratory and compared to the MTCA Method B residential cleanup levels. If water samples contain concentrations of contaminants above levels which are protective of human health (MTCA Method B WAC-173-340-720(4) and WAC 173-340-705), Shell PSR will investigate the cause of the detections and conduct additional sampling as necessary.

Historic water samples from wells W-24 and W-46, and from lysimeters L90-13 and L90-16E have not contained concentrations of contaminants of concern above MTCA Method B residential cleanup levels. A summary of historic groundwater and soil-pore water sampling is provided in Appendix D.

4.5.1 Sampling Schedule

Pre-construction sampling: Groundwater in wells W-24 and W-46 and soil-pore water in lysimeter L90-13 and L90-16E will be sampled in the third and fourth quarters of 2018 and annually in accordance with the analyte list provided in Section 4.9.2 of this report until the interim action plan is implemented (tanks are constructed, soil containment berms are completed, and the clean soil cap is in place).

Post-construction sampling: Following the implementation of this interim action plan, groundwater will be sampled from wells W-24 and W-46 in years 1, 2, 4, 8, and 12 using the expanded analyte list provided in Section 4.9.2. Soil-pore water in lysimeters L90-13 and L90-16E will continue to be monitored for the expanded analyte list provided below once per year for 2 years.

4.5.2 Groundwater Sample Collection

Groundwater samples will be collected from monitoring wells W-24 and W-46 using the low-flow sampling technique. The low-flow sampling technique is recommended and approved by the U.S. Environmental Protection Agency (USEPA, 1998). The low-flow sampling technique minimizes the impact of the purging process on groundwater chemistry and provides an accurate representation of the groundwater's condition at the time of sampling.

Water samples will be analyzed in the field during the purging process using a YSI Model 556 or equivalent multi probe meter in conjunction with a flow-through cell to monitor groundwater chemistry parameters including pH, temperature, dissolved oxygen (DO), oxidation reduction potential (Eh), and electrical conductivity (EC). Purging will be considered adequate and groundwater samples will be collected when the water chemistry parameters have stabilized. Samples will be collected in sample bottles provided by the analytical laboratory and stored on ice in a cooler immediately after collection.

Sampling implements will be thoroughly decontaminated between sampling locations. All disposable sampling materials and supplies, including personal protective equipment, will be placed in garbage bags and placed in municipal garbage collection containers for disposal as solid waste.

4.5.3 Soil-Pore Water Sample Collection

Soil-pore water samples will be collected from lysimeters L90-13 and L90-16E (and/or equivalent replacement lysimeters) utilizing the following porous cup lysimeter sample collection methodology. Samples will be collected in sample bottles provided by the analytical laboratory and stored on ice in a cooler immediately after collection.

Twenty-four hours prior to sampling, the old water in the lysimeter will be removed and disposed of and vacuum will be applied to the lysimeter. The data and amount of water removed will be entered in the field notebook. The vacuum will be maintained in the lysimeter by clamping the lysimeter lines.

At least twenty-four hours after applying vacuum, the lysimeters will be sampled. The black tube will be attached to the vacuum side of the pump, the clamp removed, and the residual vacuum measured. The red clamp will be removed, the black tube attached to the pressure side of the pump and pressure gently applied. The lysimeter water will be collected directly in the sample containers. The volume of water will be estimated from the total water in all of the sample containers. The red tube will then be clamped, the black tube connected to the vacuum side of the pump, vacuum applied to give between 70 and 80 centibars, the system checked for leaks, and the black tube will be clamped and removed from the pump.

Samples will be collected in sample bottles provided by the analytical laboratory and stored on ice in a cooler immediately after collection When sampling for dissolved metals, samples will be filtered through a 0.45-um filter and collected in plastic bottles which contain nitric acid as a preservative.

When sampling for organics, samples will be collected in glass containers with Teflon lined caps. The water stream will be directed into the vial in a manner that produces minimum aeration and the containers will slowly be filled to overflowing. Entrained air bubbles will be allowed to rise, and the cap will then be placed on the container in a manner that excludes all air bubbles. The container will be inverted to check for air. If air is present, the cap will be removed and refilled.

Sampling implements will be thoroughly decontaminated between sampling locations. All disposable sampling materials and supplies, including personal protective equipment, will be placed in garbage bags and placed in municipal garbage collection containers for disposal as solid waste.

4.6 SAMPLE IDENTIFICATION AND LABELING

Each sample will be identified with a unique sample designation. The sample designation will be included on the sample label. Sample labels will be completed in permanent ink. Sample labels and/or chain-of-custody forms will include the following information:

- Site ID
- Sample ID
- Date and time of sample collection
- Chemical analysis to be conducted
- Sample preservation information

4.7 SAMPLE STORAGE AND SHIPMENT

Immediately after samples are collected, they will be stored on ice or in a refrigerator until they are delivered to the analytical laboratory. Standard chain-of-custody procedures will be followed for all samples collected. The following protocol will be used to ship samples:

- Sample containers will be packed to prevent breakage and transported in a sealed, iced cooler.
- Glass bottles will be separated in the shipping container by cushioning material.
- Blue ice or bagged bulk ice will be used to maintain a temperature of 4 degrees Celsius in each cooler.
- The chain-of-custody form will be sealed in a plastic bag and placed on top of the samples inside the cooler.
- Samples will be delivered in-person to the selected laboratories. If in-person delivery is not feasible, UPS or Fed-Ex will be used to deliver the samples.

4.8 FIELD DOCUMENTATION PROCEDURES

Daily field activities will be recorded on appropriate field forms and/or in the project field notebook. Original field notebooks and field forms will be stored with the project file upon completion of the project. Photographic documentation of field activities will be completed as appropriate.

The daily log of field activities will include the following:

- Date
- Time of arrival and departure
- Weather conditions
- Field team members

- List of daily activities and times concluded
- Observation descriptions
- List of samples collected with sample designations, locations, descriptions, and collection times. Sample descriptions will include the following as appropriate:
    - Physical soil description in accordance with the Unified Soil Classification System (soil type, density/consistency, and color)
    - Substantial product and sheens
    - Odor (e.g., hydrogen sulfide or petroleum)
    - Vegetation
    - Man-made debris
    - Any other distinguishing characteristics or features
    - Photographs may be taken to document unusual circumstances
- Field monitoring data including health and safety monitoring
- Calibration records for field equipment
- Site visitors
- Maps or sketches
- Signature of person completing field record

Site conditions may make it necessary to modify these procedures as needed. Any additions of field information after the record is complete should be followed by the initials or the person who altered the record and date the changes occurred. Any deletions to field records should be indicated by crossing out the information using a single line and noted with the initials of the person who altered the record and date.

4.9 LABORATORY ANALYTICAL METHODS

Chemical and physical testing will be conducted by ALS Environmental Laboratory, located in Everett, Washington. The selected laboratory maintains applicable Ecology accreditation and will adhere to the methods outlined in this SAP and adhere to EPA and Ecology protocols and requirements.

The contract laboratory is expected to meet the following minimum requirements:

- Adhere to the methods outlined in this SAP, including methods referenced for each analytical procedure and use method detection levels which are below MTCA Method C industrial cleanup levels.
- Deliver electronic data reports, as specified.
- Meet reporting requirements for deliverables.
- Meet turnaround times for deliverables.
- Implement adequate QA/QC procedures.
- Notify the project manager of any QA/QC problems when they are identified to allow for quick resolution.
- Allow laboratory and data audits to be performed, if deemed necessary.

The laboratory will use the corrective actions and quality control procedures specified by EPA (EPA, 2017a and 2017b). All calibrations shall be preserved in electronic media. All laboratory data will be reviewed and verified to determine that all data quality objectives have been met and that appropriate corrective actions have been taken, where necessary.

4.9.1 Soil Analytes and Methods

Soil samples will be analyzed for the following:

- Volatile Petroleum Hydrocarbons and Hexane (Method NWVPH)
- Extractable Petroleum Hydrocarbons (Method NWEPH)
- Benzene, Toluene, Ethylbenzene, and Xylene (Method EPA-8021)
- Naphthalene, 1- and 2-Methylnaphthalene, and Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) (Method EPA-8270 SIM)
- Mercury (EPA-7471)

4.9.2 Water Analytes and Methods

Groundwater and soil-pore water samples will be analyzed for the following:

- Volatile Petroleum Hydrocarbons and Hexane (Method NWVPH)
- Extractable Petroleum Hydrocarbons (Method NWEPH)
- Total cPAHs, Benzo(a)pyrene, and Naphthalenes (Method EPA 8270 SIM)
- Benzene, Toluene, Ethylbenzene, and Xylene (Method EPA-8021)
- Mercury (Method EPA 7471)

- Chromium, Nickel, and Vanadium (Method EPA 6020)

4.10 QA/QC REQUIREMENTS

Field activities will be conducted in a manner such that results meet specified quality objectives and are fully defensible. Guidance for QA/QC is derived from the EPA Test Methods. One field duplicate sample will be collected and analyzed for every 20 samples collected. The field duplicate will involve the collection of additional material from one location (split sample) and submitting the split sample to the laboratory.

ALS Environmental Laboratory is accredited by the Department of Ecology to perform the EPA analytical methods required by this project. The EPA analytical methods include specific instructions for the analysis of QC samples and the completion of QC procedures during sample analysis. The QC samples and procedures verify that the analytical instruments have been calibrated properly and that the instruments remain in calibration throughout the analytical sequence.

The QC samples also verify that the sample preparation procedures have been effective and have not introduced contaminants into the samples. Additional QC samples are used to identify and quantify interference caused by the sample matrix.

The laboratory project managers are responsible for maintaining laboratory instruments in the proper working order, including maintenance and calibration and training of personnel.

All reports from the laboratory will be accompanied by QC results and any other necessary analytical information to enable the project manager to determine the quality of the data. Analytical data for the specific tasks will be reported in the units specified by the quantification limits.

4.10.1 Calibration Validation

Initial calibration of laboratory instruments is performed at the start of the project or sample run (as required) and when any ongoing calibration does not meet control criteria. The number of points used in the initial calibration is defined by the analytical method. Calibration checks, conducted during testing, are performed as specified in the analytical method to track instrument performance.

If a continuing calibration does not meet control limits, analysis of project samples will be suspended until the source of the control limit failure is eliminated or reduced to within control specifications. All project samples analyzed while the instrument was outside the control limits will be reanalyzed.

4.10.2 Method Blanks

Method blanks are used to assess possible laboratory contamination of samples associated with the preparation and analysis of the samples and/or extracts. The laboratory will not apply corrections to the original data. A minimum of one method blank will be analyzed for every sample group or for every 20 samples, whichever is more frequent.

4.10.3 Surrogate Recovery

Surrogate recovery samples are used to evaluate the recovery of an analyte from project samples. All project samples to be analyzed for organic compounds will be spiked with appropriate surrogate compounds as identified in the EPA analytical method. Recoveries of these surrogate compounds will be reported by the laboratory in the analytical report. The laboratory will not correct sample results using the surrogate recoveries. Deviations for the EPA recommended surrogate recoveries will be flagged in the analytical report.

4.10.4 MS and MSD Samples

MS and MSD samples are analyzed to assess the matrix effects on the accuracy of analytical instruments. A minimum of one MS and one MSD will be analyzed for every sample group or for every 20 samples, whichever is more frequent.

4.10.5 Laboratory Control Samples

The laboratory will perform the laboratory control sample analyses at a frequency specified in the analytical method.

4.10.6 Quality Assurance Review

All laboratory data will be reviewed and verified to determine whether all data quality objectives have been met and that appropriate corrective actions have been taken (if necessary). Data review will include an evaluation of:

- Field collection and handling
- Completeness
- Data presentation
- Reporting limits
- Acceptability of test results for:
  - Method blanks
  - Certified reference materials
  - Analytical replicates
  - Laboratory control samples (blank spikes)
  - Matrix spikes and surrogate recoveries

4.11 DATA ANALYSIS, RECORDKEEPING, AND REPORTING

This section describes data validation procedures, recordkeeping, and data reporting requirements. The data will be summarized and presented in tables indicating detected contaminant concentrations at each sampling station, along with any data qualifiers assigned by the laboratory or during data validation. Sampling station locations will be shown on a map indicating any areas which exceeded the selected Cleanup Levels.

4.11.1 Data Management

The field activities will be documented using a field notebook and if necessary will be transferred to an electronic format such as a spreadsheet or PDF file. Transferred data will be checked by the project manager. The field documentation will be kept in the project file after data entry and data QA/QC checks are completed.

Laboratory data will be provided in a PDF report format. The laboratory data reports will be reviewed for completeness and QA/QC criteria. Data will be transferred from the PDF laboratory reports into a Microsoft Excel spreadsheet. The transferred data will be reviewed by the project manager.

4.11.2 Data Review

All data will undergo a Level 2 validation consistent with EPA protocols. During the review process, laboratory analytical data will be evaluated for EPA method QC compliance. During the review, data qualifiers will be assigned to project data as needed. The most common data qualifiers are: J (Estimate, qualitatively correct but quantitatively suspect); R (Rejected data); and U (Not detected at the listed reporting limit).

4.11.3 Data Validation and Verification

All laboratory data will be reviewed and verified to determine if the sampling analytical objectives have been met and appropriate laboratory corrective actions have been taken when necessary. The project manager will be responsible for the final review of all laboratory data generated during the project.

The first level of review will be conducted by the laboratory as the data are generated. The laboratory manager will be responsible for ensuring that data meets minimum QA/QC requirements and that the laboratory instruments were operating properly.

Laboratory data reports will be reviewed for completeness when they are received. The following criteria will be reviewed:

- Holding times
- Calibration information
- Method blanks
- Surrogate recovery
- Detection and reporting limits
- Laboratory control samples
- MS/MSD samples

4.11.4 Corrective Actions

If data do not meet the quality objectives, the project manager will review the errors and determine the source of the problem(s). The project manager will recommend appropriate action to resolve the problem and have the sample reanalyzed if necessary. Data which are rejected will be given an “R” qualifier and will not be used.

4.11.5 Recordkeeping

Copies of the following documents will be retained onsite for at least 10 years:

- Final Ecology-approved SAP
- Field records that document any departures from the SAP and/or QA project plan
- Analytical results, including laboratory reports, summary tables, and data reports
- Original field notebooks and field forms

5.0 REPORTING

The groundwater and soil pore water sample results for the third and fourth quarter of 2018 will be reported to Ecology within 60 days of the receipt of validated data.

At the conclusion of the tank construction project, a summary report will be prepared. The report will be submitted to Ecology with 60 days of the completion of the project. The summary report will include:

- A brief summary of the field sampling and laboratory analytical procedures, noting any deviations from the SAP.
- A general vicinity map showing the location of the site and sampling stations.
- Coordinate values for all sampling stations (i.e., latitude and longitude) and their datum.
- Tables summarizing the data results, as well as pertinent QA/QC data.
- A discussion of the interpretation of the results including any exceedances of the MTCA Method C industrial cleanup levels.
- A map indicating the areal extent and depth of soils exceeding MTCA Method C industrial cleanup levels
- A discussion on how the soil sample results affected the project design.
- A discussion on the final disposition of any waste residual soil that was removed and transported offsite.
- Copies of complete laboratory data reports and signed chain-of-custody forms as an appendix.
- Quality assurance report as an appendix.
- Copies of field logs as an appendix.
- Data will be submitted to the Ecology Environmental Information Management (EIM) database.

An annual report summarizing the water sampling and results will be provided to Ecology. If groundwater or soil-pore water contains concentrations of contaminants above levels which are protective of human health (MTCA Method B WAC-173-340-720(4) and

WAC 173-340-705), Shell PSR will investigate the cause of the increase in contaminants and conduct additional sampling as necessary.

After 12 years, PSR will submit a report summarizing the ongoing water monitoring efforts. Ecology will review the report and determine if the monitoring can be discontinued or if the monitoring needs to be extended.

6.0 REFERENCES

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APPENDIX A

Soil Data Report

APPENDIX B

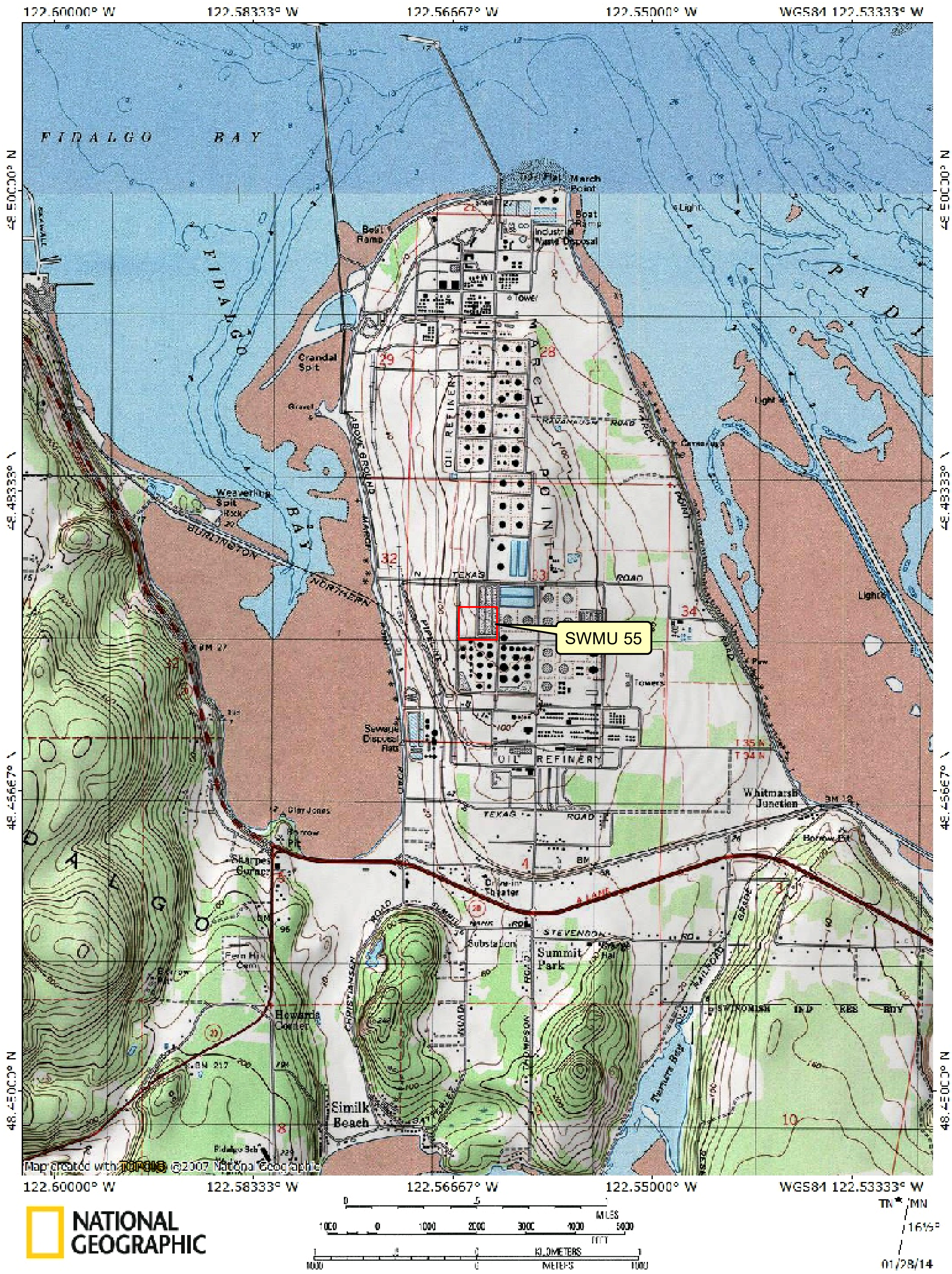
Geotechnical Report

APPENDIX C

Hydrogeologic Report

APPENDIX D

Groundwater and Soil-Pore Water Monitoring Report



Prepared for:

Shell PSR

Prepared by:

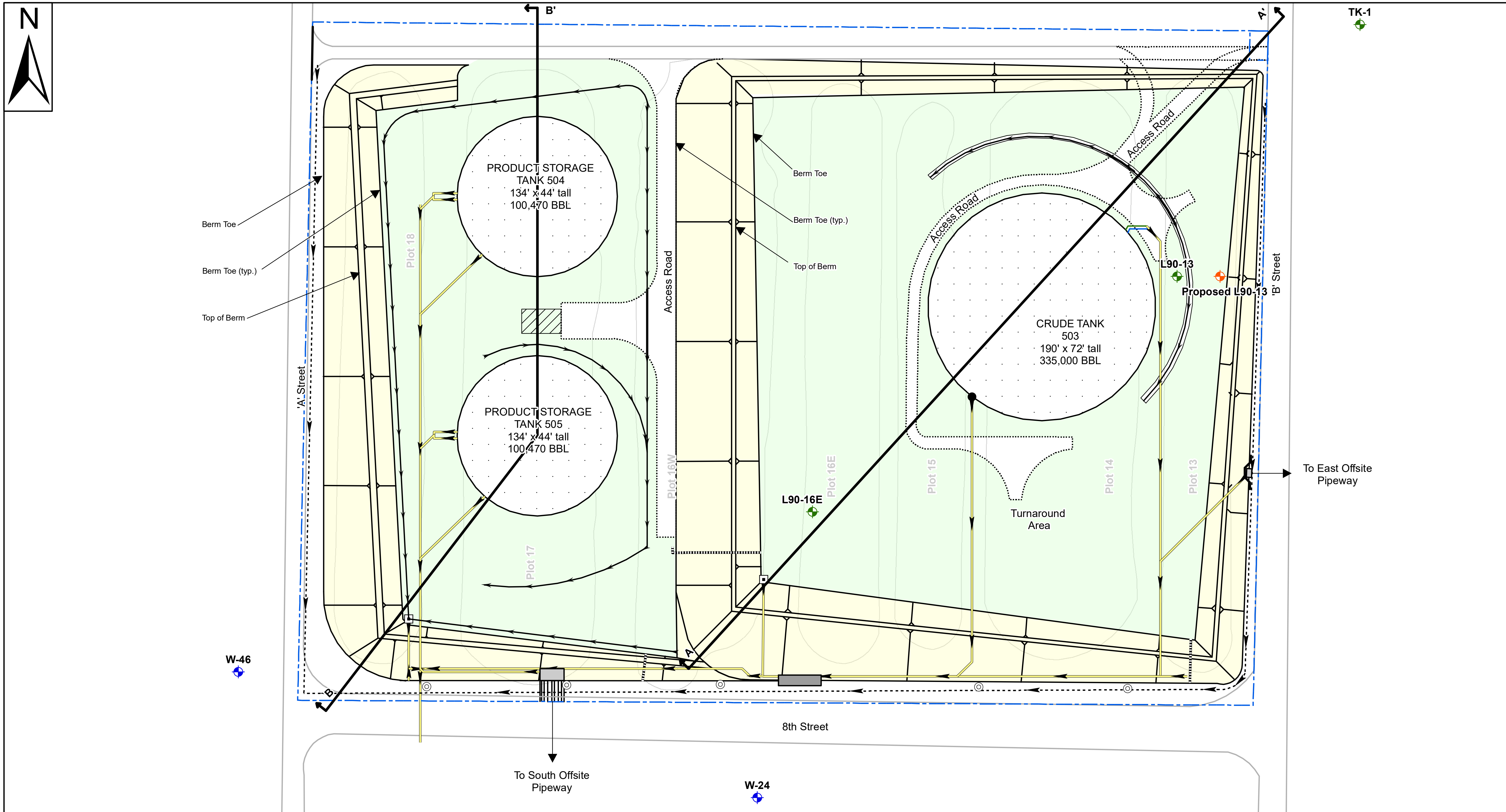
whatcom ENVIRONMENTAL

Site Location Map

SWMU 55

01/31/18

Figure 1



Groundwater Well	Proposed Culverts	Proposed Stair Stile	Proposed Vapor Recovery Equipment
Lysimeter	Proposed Roads	Proposed Tank	Existing Roads
Proposed Lysimeter Relocation	Proposed Fire Water	Proposed Containment Berm and Contours	Existing Plots
Proposed Catch Basin	Proposed Gunite Ditch	Proposed Clean Soils Cap	Power Pole
Proposed Sample Station and Drain	Proposed OWS	Proposed Electrical Equipment	
Cross Section	Proposed Roof Drain (6" dia.)	Proposed Pipe Vault Road Crossing	
Drainage Direction	Proposed Water Draw (8" dia.)	Proposed Drainage Ditch	

All data are approximate and should be used for relative location reference only. Adapted from AECOM 2017.

0 20 40 80 Feet

1 inch = 80 feet

Prepared for:

Shell PSR

Prepared by:

whatcom ENVIRONMENTAL

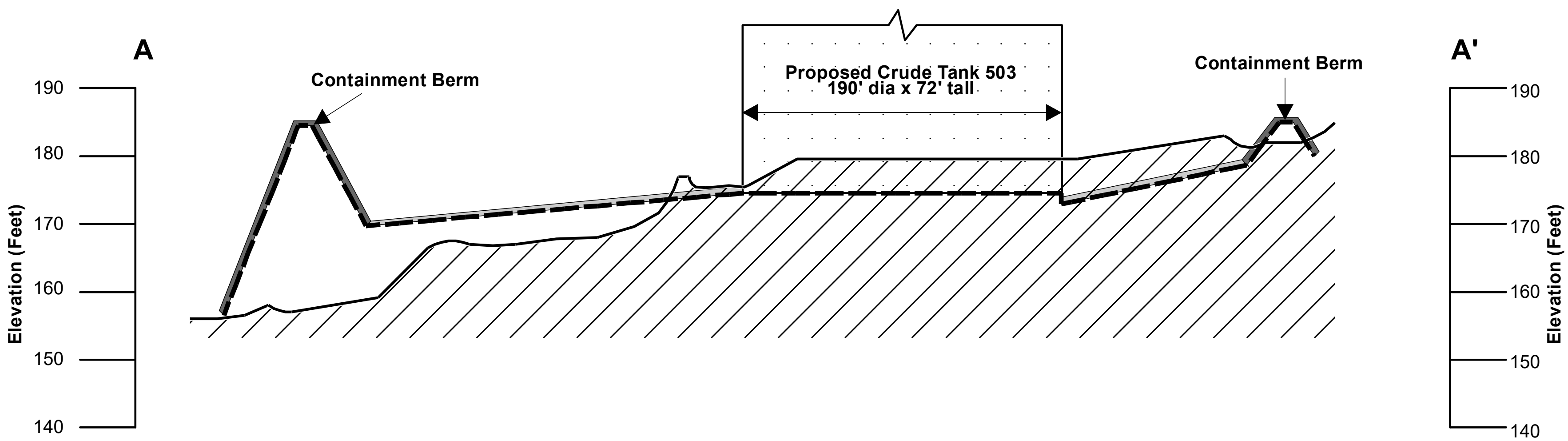
Site Plan

Shell Puget Sound Refinery
Anacortes, WA 98221

SWMU 55

08/17/18

Figure 2



Vertical Exagerage = 4x

0 25 50 100 Feet

1 inch = 100 feet

Cross-Section A-A'

- Approx. Proposed Finish Grade
- Existing Ground Surface
- Clean Soil Cap
- Asphalt Coating
- Tank

All data are approximate and should be used for relative location reference only.

Adapted from AECOM 2017.

Prepared for:

Shell PSR

Prepared by:

whatcom ENVIRONMENTAL

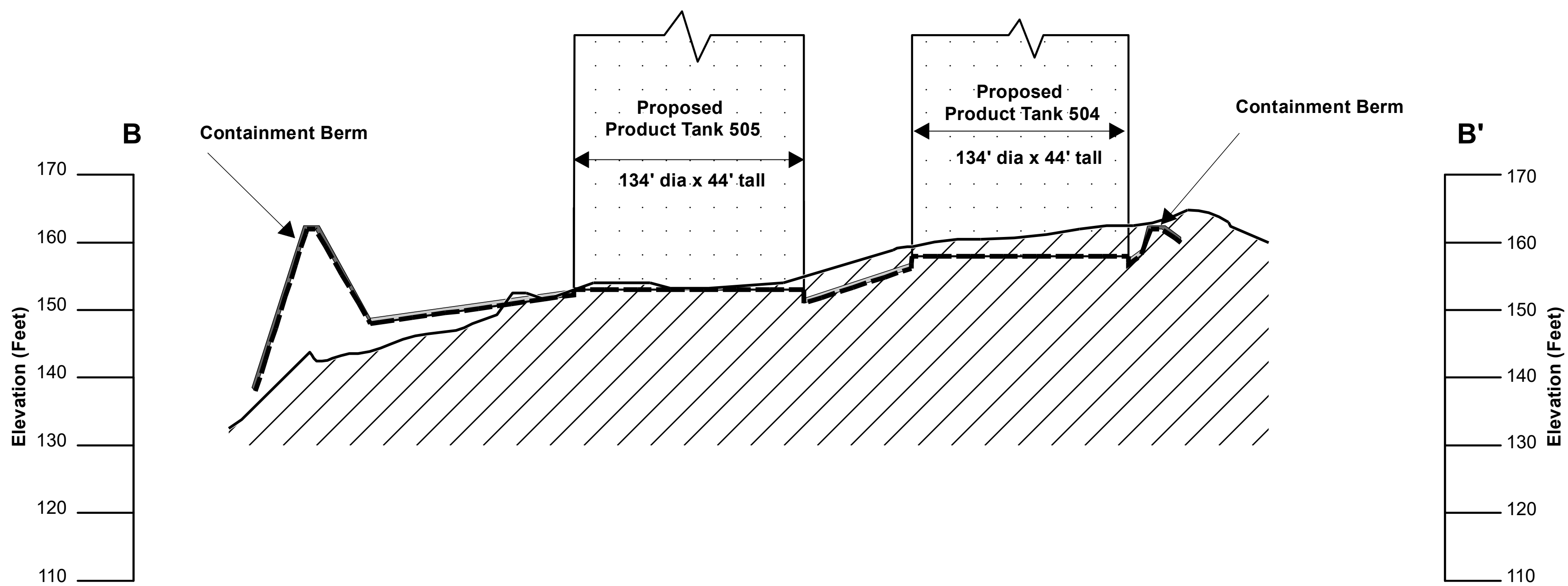
Shell Puget Sound Refinery
Anacortes, WA 98221

SWMU 55

01/31/18

Figure 3

N



Vertical Exageration = 4x

0 25 50 100 Feet

1 inch = 100 feet

Cross-Section B-B'

- Approx. Proposed Finish Grade
- Existing Ground Surface
- Clean Soil Cap
- Asphalt Coating
- Tank

All data are approximate and should be used for relative location reference only.

Adapted from AECOM 2017.

Prepared for:

Shell PSR

Prepared by:

whatcom ENVIRONMENTAL

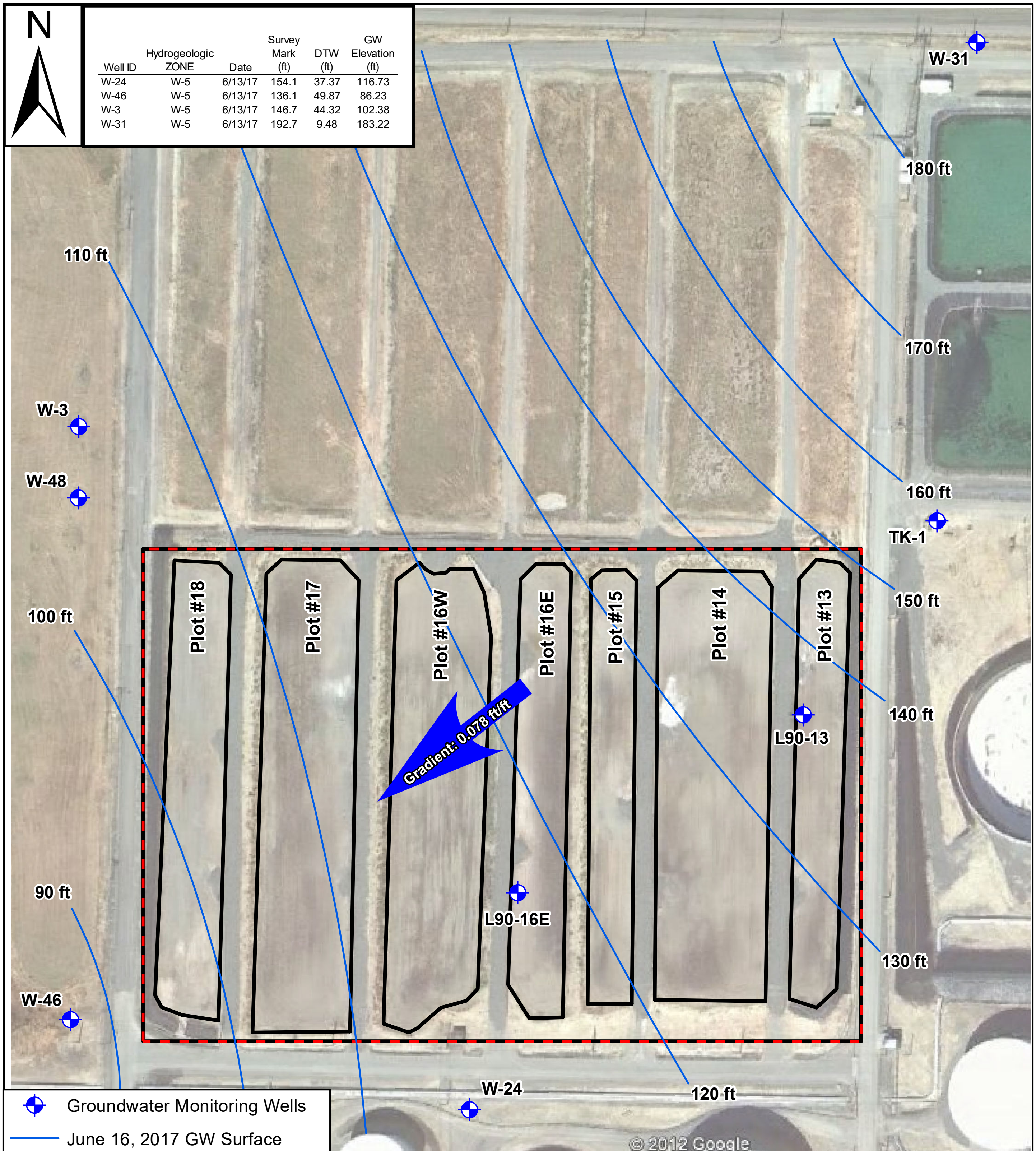
Shell Puget Sound Refinery
Anacortes, WA 98221

SWMU 55

01/31/18

Figure 4

Well ID	Hydrogeologic ZONE	Date	Survey Mark (ft)	DTW (ft)	GW Elevation (ft)
W-24	W-5	6/13/17	154.1	37.37	116.73
W-46	W-5	6/13/17	136.1	49.87	86.23
W-3	W-5	6/13/17	146.7	44.32	102.38
W-31	W-5	6/13/17	192.7	9.48	183.22



Groundwater Monitoring Wells

June 16, 2017 GW Surface

SWMU-55 Plots

SWMU-55 Area

All data are approximate and should be used as relative location reference only.
2011 Aerial Photograph (GoogleEarth)

150 75 0 150 Feet

1 inch = 150 feet

Prepared for:

Shell PSR

Prepared by:

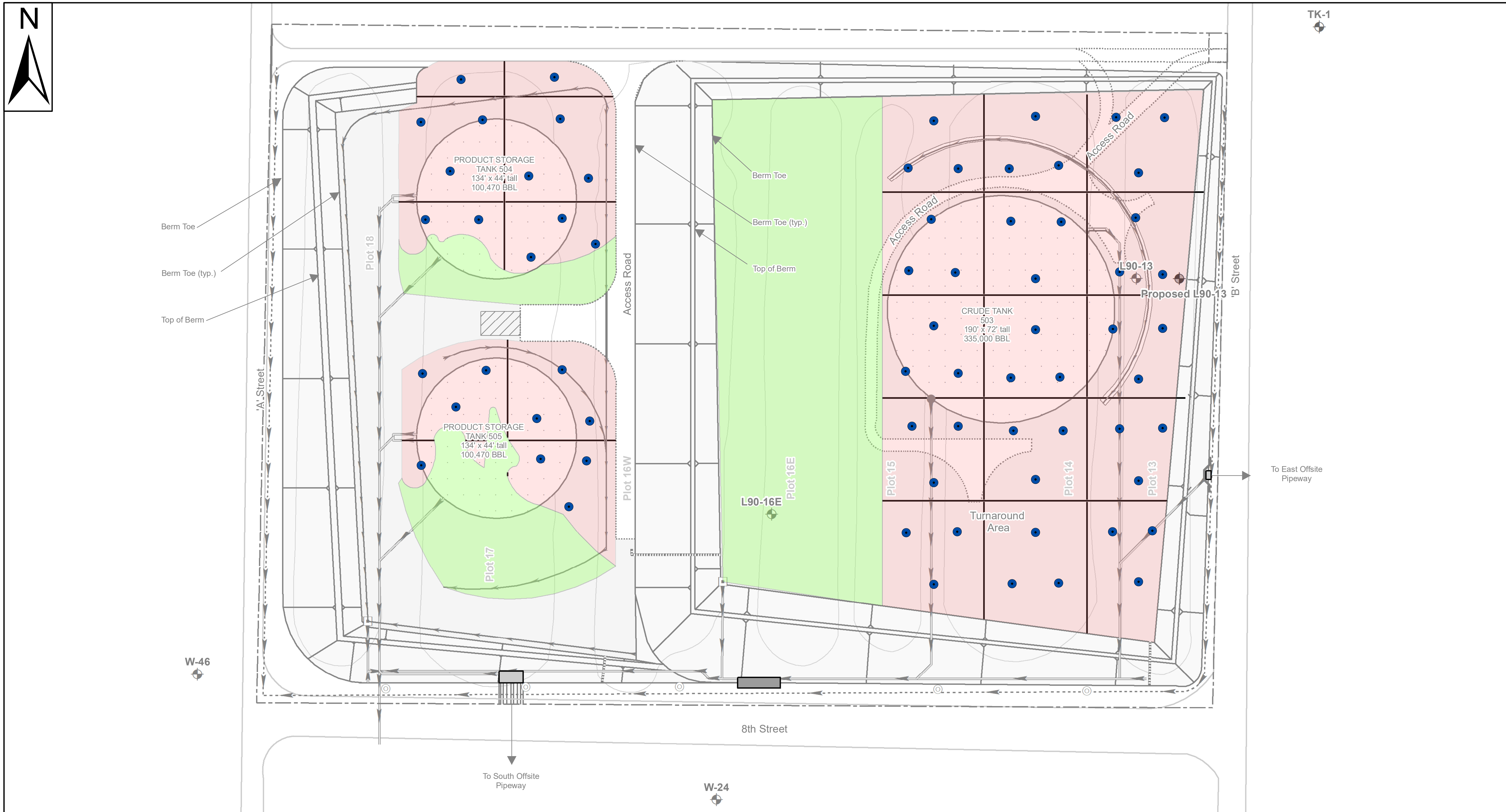
whatcom ENVIRONMENTAL

June 2017 Groundwater Surface Elevations and Gradient

SWMU-55

1/15/18

Figure 5



- Proposed soil samples
- Sample Cell Divisions
- Excavated Area
- Filled Area
- Groundwater Well
- Lysimeter
- Proposed Lysimeter Relocation
- Proposed Catch Basin
- Proposed Sample Station and Drain
- Drainage Direction
- Proposed Culverts
- Proposed Roads
- Proposed Fire Water
- Proposed Gunite Ditch
- Proposed OWS (6" dia.)
- Proposed Roof Drain (6" dia.)
- Proposed Water Draw (8" dia.)
- Proposed Stair Stile
- Proposed Tank
- Proposed Containment Berm and Contours
- Proposed Clean Soils Cap
- Proposed Electrical Equipment
- Proposed Pipe Vault Road Crossing
- Proposed Drainage Ditch
- Proposed Vapor Recovery Equipment
- Existing Plots
- Existing Roads
- Power Pole

Three soil samples are randomly placed within each cell.

All data are approximate and should be used for relative location reference only. Adapted from AECOM 2017.

0 20 40 80 120 160 Feet

1 inch = 80 feet

Prepared for:

Shell Products U.S.
Puget Sound Refinery

Prepared by:

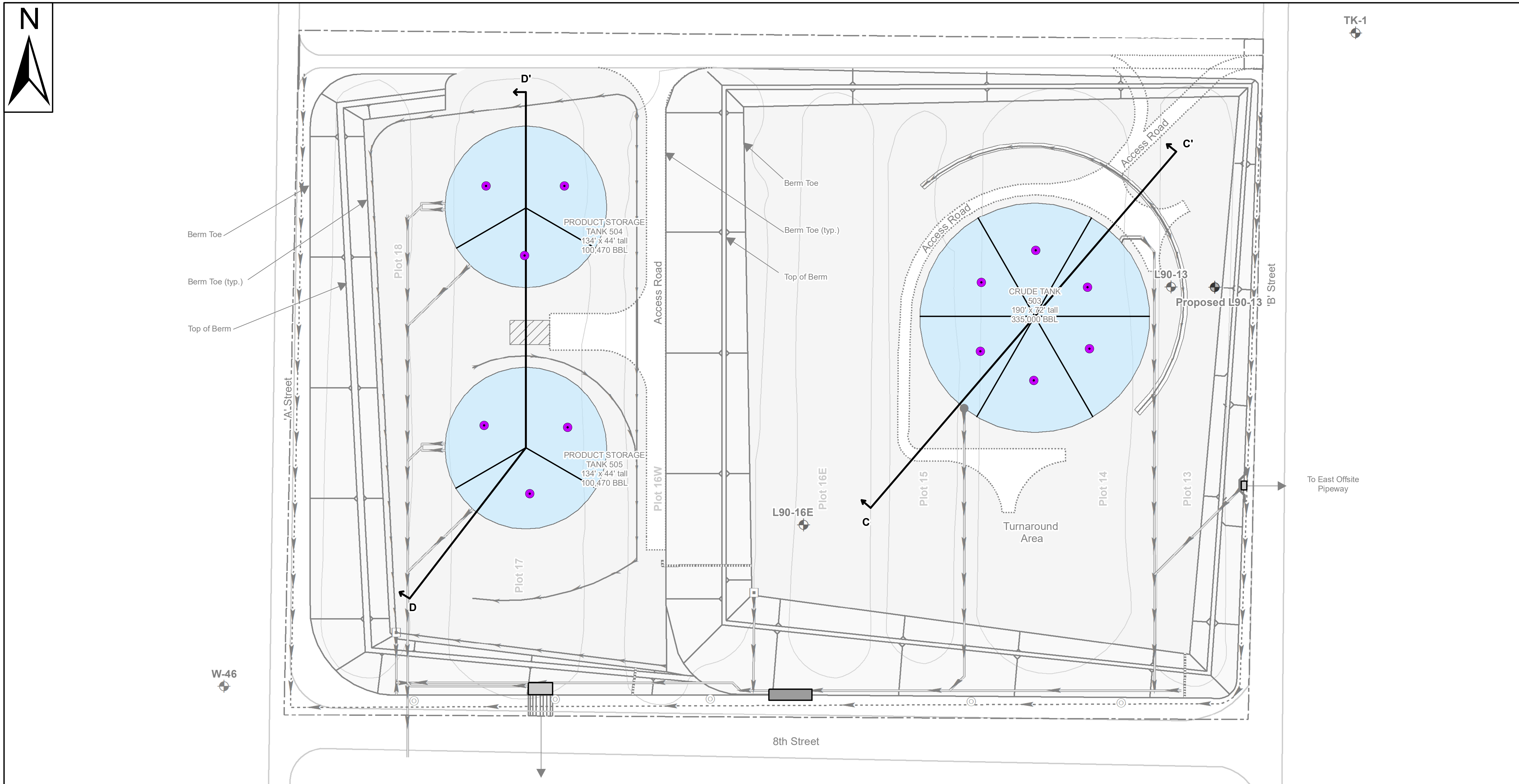
whatcom ENVIRONMENTAL

Pre-Grading Sample Locations

SWMU-55

01/29/18

Figure 6



Tank 503: each quadrant will have a three-point composite sample, locations randomly chosen.
Tanks 504/505: each half will have a three-point composite sample, locations randomly chosen.

- Tank Footprint Sample Locations
- Sample Cell Divisions
- Proposed Lysimeter Relocation
- Drainage Direction
- Proposed Catch Basin
- Proposed Sample Station and Drain
- Proposed Culverts
- Proposed Roads
- Proposed Fire Water
- Proposed Gunite Ditch
- Proposed OWS (6" dia.)
- Proposed Roof Drain (6" dia.)
- Proposed Water Draw (8" dia.)
- Proposed Stair Stile
- Proposed Tank
- Proposed Containment Berm and Contours
- Proposed Clean Soils Cap
- Proposed Electrical Equipment
- Proposed Pipe Vault Road Crossing
- Proposed Drainage Ditch
- Proposed Vapor Recovery Equipment
- Existing Plots
- Existing Roads
- Power Pole
- C-C' Cross Section
- D-D' Cross Section

All data are approximate and should be used for relative location reference only. Adapted from AECOM 2017.

0 20 40 80 Feet
1 inch = 80 feet

Tank Footprint Sample Locations

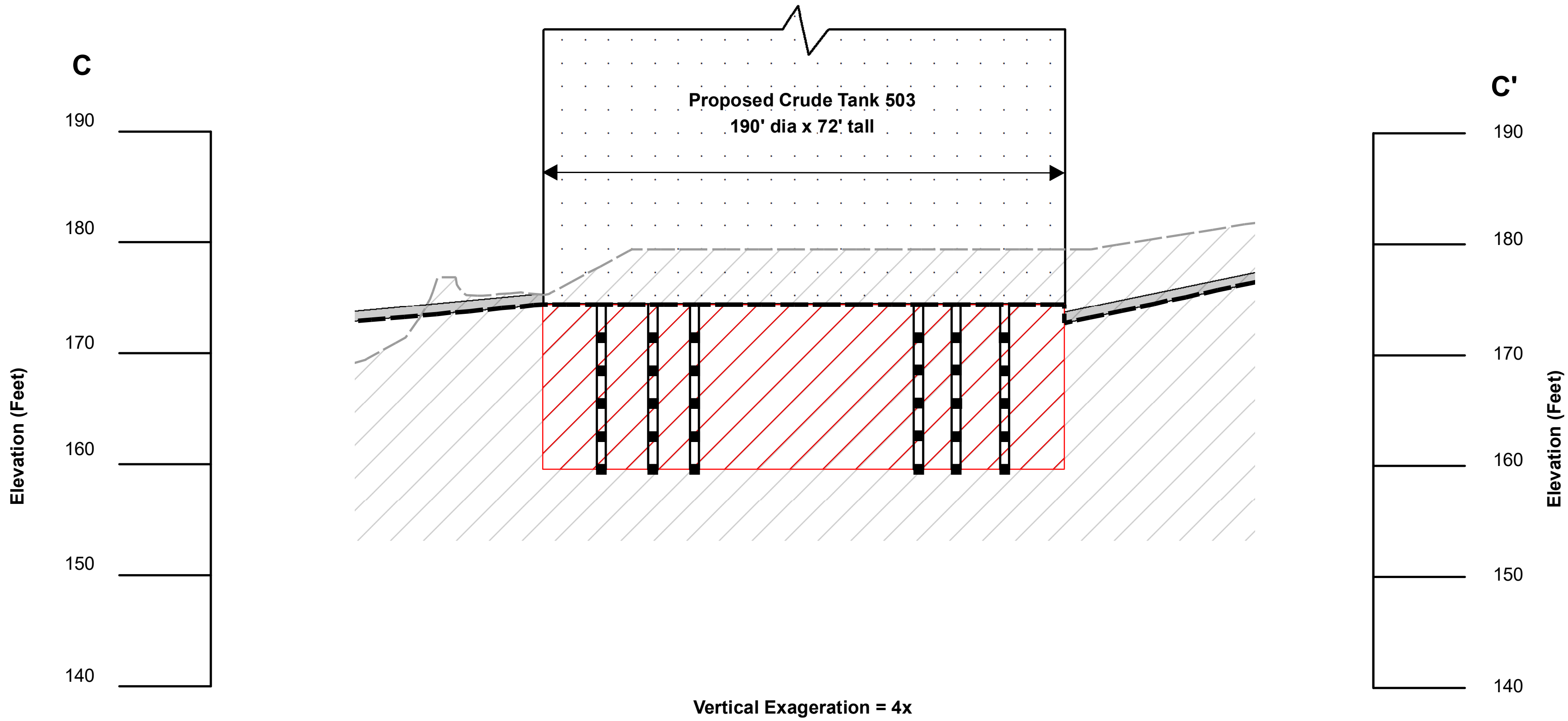
Prepared for:
Shell PSR

Prepared by:
whatcom ENVIRONMENTAL

Shell Puget Sound Refinery
Anacortes, WA 98221

SWMU 55
08/17/2018

Figure 7



Soil Samples
Approx. Proposed Finish Grade
Borings
Tank Footprint
Existing Ground Surface
Clean Soil Cap
Asphalt Coating
Tank

0 10 20 40 60 Feet

1 inch = 60 feet

All data are approximate and should be used for relative location reference only.

Adapted from AECOM 2017.

Prepared for:

Shell PSR

Prepared by:

whatcom ENVIRONMENTAL

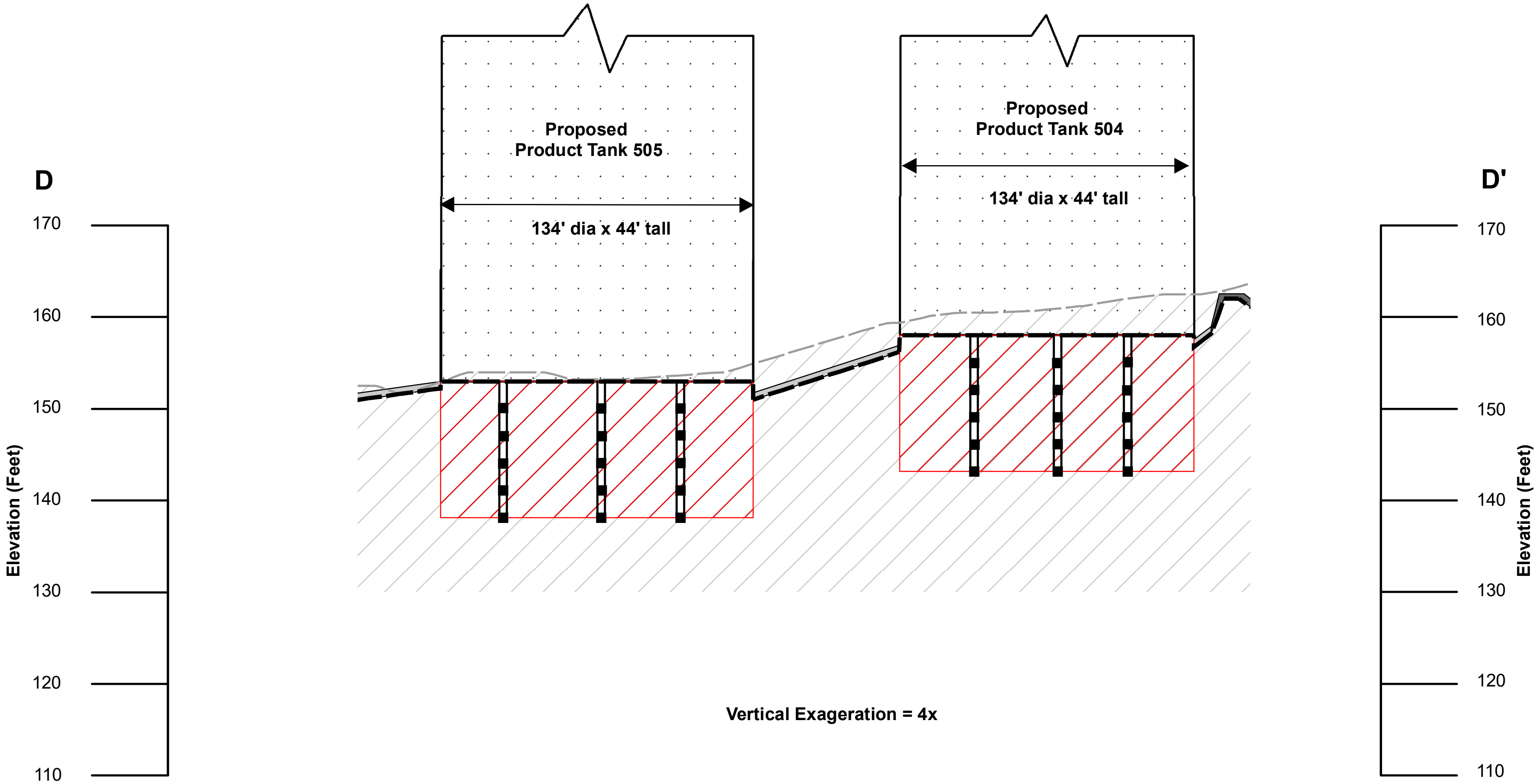
Cross-Section C-C'
Tank Footprint Borings

Shell Puget Sound Refinery
Anacortes, WA 98221

SWMU 55

08/17/18

Figure 8



- Soil Samples
- Borings
- Approx. Proposed Finish Grade
- Existing Ground Surface
- Tank Footprints
- Asphalt Coating
- Clean Soil Cap
- Tank

All data are approximate and should be used for relative location reference only.

Adapted from AECOM 2017.

Prepared for: Shell PSR

Prepared by: whatcom ENVIRONMENTAL

0 17.5 35 70 Feet

1 inch = 70 feet

Cross-Section D-D'
Tank Footprint Borings

Shell Puget Sound Refinery
Anacortes, WA 98221

SWMU 55

08/17/18

Figure 9

Table 1. Groundwater and Soil-Pore Water Data

ID Sample Date	Benzene 8021B/8260B* (μg/L)	Toluene 8021B/8260B* (μg/L)	Napthalene 8270C/8260B* (μg/L)	Chromium 6020 (μg/L)	Nickel 6020 (μg/L)	Vanadium 6020 (μg/L)
Permit PQL	2	2	10	70	50	80
MTCA Method A	5	1000	160	50	320**	112**
Well 46						
1/19/1998	NA	NA	NA	ND(<10.0)	ND(<40.0)	ND(<10.0)
12/28/1998	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/8/1999	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/5/2000	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/4/2001	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/3/2002	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/2/2003	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/7/2004	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/6/2005	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/19/2006	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/4/2007	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/3/2008	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/8/2009	ND(<1.0)	ND(<1.0)	ND(<2.0)	NA	36	NA
12/8/2010	ND(<0.5)	ND(<0.5)	ND(<2.0)	NA	7.2	NA
12/1/2011	ND(<0.50)	ND(<0.50)	ND(<1.9)	NA	NA	NA
11/27/2012	ND(<1.0)	ND(<1.0)	ND(<1.9)	NA	NA	NA
11/20/2013	ND(<1.0)	ND(<1.0)	ND(<1.0)	NA	NA	NA
11/20/2014	ND(<1.0)	ND(<1.0)	ND(<3.0)	NA	NA	NA
10/29/2015	ND(<2.0)	ND(<2.0)	ND(<2.0)	NA	NA	NA
11/8/2016	ND(<2.0)	ND(<2.0)	ND(<2.0)	NA	NA	NA
10/25/2017	ND(<2.0)	ND(<2.0)	ND(<4.0)	NA	NA	NA
Well 24						
1/19/1998	NA	NA	NA	ND(<10.0)	ND(<40.0)	ND(<10.0)
12/28/1998	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/8/1999	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/5/2000	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/4/2001	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/3/2002	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/2/2003	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/7/2004	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/6/2005	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/19/2006	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/4/2007	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/3/2008	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/8/2009	ND(<1.0)	ND(<1.0)	ND(<2.2)	NA	48	NA
12/8/2010	ND(<0.5)	ND(<0.5)	ND(<2.0)	NA	46	NA
12/1/2011	ND(<0.50)	ND(<0.50)	ND(<1.9)	NA	NA	NA
11/27/2012	ND(<1.0)	ND(<1.0)	ND(<1.9)	NA	NA	NA
11/20/2013	ND(<1.0)	ND(<1.0)	ND(<1.0)	NA	NA	NA
11/20/2014	ND(<1.0)	ND(<1.0)	ND(<3.0)	NA	NA	NA
10/29/2015	ND(<2.0)	ND(<2.0)	ND(<2.0)	NA	NA	NA
11/8/2016	ND(<2.0)	ND(<2.0)	ND(<2.0)	NA	NA	NA
10/25/2017	ND(<2.0)	ND(<2.0)	ND(<4.0)	NA	NA	NA

Table 1. Groundwater and Soil-Pore Water Data

ID Sample Date	**Benzene** 8021B/8260B* (µg/L)	**Toluene** 8021B/8260B* (µg/L)	**Napthalene** 8270C/8260B* (µg/L)	**Chromium** 6020 (µg/L)	**Nickel** 6020 (µg/L)	**Vanadium** 6020 (µg/L)
Permit PQL	2	2	10	70	50	80
MTCA Method A	5	1000	160	50	320**	112**
L-13						
12/10/1998	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.16	*67.5*	2.03
12/7/1999	ND(<2.0)	ND(<2.0)	ND(<10.0)	2.66	*253*	6.75
12/6/2000	1.19	ND(<2.0)	ND(<10.0)	2.32	*83.5*	2.22
12/4/2001	0.767	ND(<2.0)	ND(<10.0)	1.21	*105*	2.26
12/3/2002	1.35	ND(<2.0)	NA	1.22	*101*	2.54
12/2/2003	0.791	ND(<2.0)	NA	1.65	*139*	16.4
12/7/2004	ND(<2.0)	ND(<2.0)	NA	1.06	*88.2*	1.8
12/7/2005	1.75	ND(<2.0)	ND(<10.0)	1.77	*93*	2.41
12/19/2006	ND(<2.0)	ND(<2.0)	NA	1.39	*94.6*	2.04
12/4/2007	1.03	ND(<2.0)	NA	1.15	*97.6*	2.05
12/2/2008	1.54	ND(<2.0)	ND(<10.0)	ND(<70.0)	*104*	2.1
12/9/2009	ND(<1.0)	ND(<1.0)	ND(<4.4)	ND(<2.0)	*130*	5
12/8/2010	ND(<0.5)	ND(<0.5)	ND(<1.9)	3.9	*120*	19
12/1/2011	*3.2*	ND(<0.50)	ND(<1.9)	ND(<25)	45	30
11/27/2012	1.9	ND(<1.0)	ND(<1.0)	ND(<2)	*92*	ND(<10)
11/20/2013	2	ND(<1.0)	ND(<1.9)	ND(<25)	*86*	ND(<20)
11/20/2014	1.8	ND(<1.0)	ND(<3.0)	ND(<2)	*80*	ND(<10)
10/29/2015	*2.7*	ND(<2.0)	ND(<2.0)	ND(<2)	*83*	ND(<20)
11/8/2016	*2.4*	ND(<2.0)	ND(<2.0)	ND(<2)	*76*	ND(<20)
10/25/2017	*2.9*	ND(<2.0)	ND(<4.0)	ND(<25)	*70*	ND(<30)
L-16E						
12/10/1998	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.3	44.6	ND(<80)
12/7/1999	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.55	*108*	6.13
12/6/2000	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.49	47.9	11.6
12/4/2001	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.59	56.6	3.56
12/3/2002	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.45	*90.1*	6.55
12/2/2003	ND(<2.0)	ND(<2.0)	NA	3.74	*211*	21.2
12/7/2004	ND(<2.0)	ND(<2.0)	NA	2.43	*138*	13.3
12/7/2005	ND(<2.0)	ND(<2.0)	NA	1.65	*115*	8.88
12/19/2006	ND(<2.0)	ND(<2.0)	NA	1.38	*99.7*	8.18
12/4/2007	ND(<2.0)	ND(<2.0)	NA	1.3	*119*	7.37
12/2/2008	ND(<2.0)	ND(<2.0)	ND(<10.0)	ND(<70.0)	*116*	8.73
12/9/2009	ND(<1.0)	ND(<1.0)	ND(<3.3)	ND(<2.0)	*110*	8.3
12/8/2010	ND(<0.5)	ND(<0.5)	ND(<1.9)	5.1	*85*	24
12/1/2011	ND(<0.50)	ND(<0.50)	ND(<1.9)	ND(<25)	*66*	24
11/27/2012	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<2)	*130*	19
11/20/2013	ND(<1.0)	ND(<1.0)	ND(<1.9)	ND(<25)	*70*	ND(<20)
11/20/2014	ND(<1.0)	ND(<1.0)	ND(<1.9)	ND(<2)	*73*	20
10/29/2015	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2)	*89*	ND(<20)
11/8/2016	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2)	*67*	27
10/25/2017	ND(<2.0)	ND(<2.0)	ND(<4.0)	ND(<25)	*61*	31

* - Samples collected after 2011 sampling event were analyzed using EPA Method 8260B for benzene, toluene, and naphthalene.

ND indicates analyte was Not Detected at level above reporting limit. Reporting limit is given in parentheses.

NA indicates that the specified analyte was Not Analyzed
Italics indicates samples that exceed the Permit PQL

** - No Method A value- used Method B value instead

Table 2. Interim Action Plan and Ongoing Monitoring Cost Estimate

Corrective Action Costs

Cost Element	Unit Cost	Total Units	Total Cost
Sampling (in accordance w/Sampling Plan)	$100,000	1	$100,000
Excavation (cubic yards)	$10.00	27,000	$270,000
Berm Construction (cubic yards)	$15.00	38,000	$570,000
Soil Cap Construction (cubic yards)	$15.00	8,650	$129,750
Berm Coating (square feet)	$1.00	160,000	$160,000
Disposal of Soil >Method C	$100.00	3,750	$375,000
Disposal of Debris	$75.00	2,500	$187,500
Project Management/Consulting	$100,000	1	$100,000
Lysimeter Movement	$10,000	1	$10,000
Signage	$2,500	1	$2,500
Deed Restriction (including survey)	$10,000	1	$10,000

Total Corrective Action Cost: $1,914,750

Ongoing Monitoring Costs (per year)

Cost Element	Unit Cost	Total Units	Total Cost
Groundwater and Soil Pore Liquid Sampling	$8,000	1	$8,000
Soil Cap and Berm Inspections (monthly)	$200	12	$2,400
Reporting	$2,500	1	$2,500

Total Annual Monitoring Cost: $12,900

APPENDIX A

Soil Data Report

SWMU 55 SOIL INVESTIGATION DATA REPORT
SHELL OIL PRODUCTS U.S.
PUGET SOUND REFINERY
ANACORTES, WASHINGTON 98221

prepared for:

Shell Oil Products U.S. – Puget Sound Refinery
8505 South Texas Road
Anacortes, Washington 98221

January 26, 2018

whatcom ENVIRONMENTAL

soil | water | air
compliance consulting

228 East Champion Street, Suite 101, Bellingham, WA 98225
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SWMU 55 SOIL INVESTIGATION DATA REPORT
SHELL OIL PRODUCTS U.S. PUGET SOUND REFINERY
ANACORTES, WASHINGTON 98221

Prepared for:

Shell Oil Products U.S. – Puget Sound Refinery
8505 South Texas Road
Anacortes, Washington 98221

Prepared by:

Whatcom Environmental Services
228 East Champion Street #101
Bellingham, Washington 98225

January 26, 2018

Eric Libolt
Project Manager

Harold Cashman
QA/QC Reviewer

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ACRONYMS AND ABBREVIATIONS

APH	-	Air-Phase Petroleum Hydrocarbons
bgs	-	below ground surface
BTEX	-	Benzene, Toluene, Ethylbenzene, and Xylenes
COC	-	Contaminant/Chemical of Concern
cPAH	-	Carcinogenic Polycyclic Aromatic Hydrocarbons
CSID	-	Cleanup Site Identification Number
CSM	-	Conceptual Site Model
CUL	-	Clean-up levels
Ecology	-	Washington State Department of Ecology
EDB	-	1,2-Dibromoethane
EDC	-	1,2-Dichloroethane
EPA	-	Environmental Protection Agency
EPH	-	Extractable Petroleum Hydrocarbons
FSID	-	Facility Site Identification Number
LUST	-	Leaking Underground Storage Tank
MTCA	-	Model Toxics Control Act
NELAP	-	National Environmental Laboratory Accreditation Program
NFA	-	No Further Action
PCS	-	Petroleum Contaminated Soil
PID	-	Photoionization Detector
ppm	-	Parts Per Million
ppb	-	Parts Per Billion
QA/QC	-	Quality Assurance/Quality Control
RCW	-	Revised Code of Washington
SAP	-	Sampling and Analysis Plan
TEE	-	Terrestrial Ecological Evaluation
TPH	-	Total Petroleum Hydrocarbons
USDA	-	United States Department of Agriculture
UST	-	Underground Storage Tank
VCP	-	Voluntary Cleanup Program
VOC	-	Volatile Organic Compounds
VPH	-	Volatile Petroleum Hydrocarbons
WAC	-	Washington State Administrative Code
WSNDR	-	Washington State Department of Natural Resources

EXECUTIVE SUMMARY

A soil investigation was conducted at Solid Waste Management Unit 55 (SWMU 55) at the Shell Oil Product U.S. Puget Sound Refinery (PSR) located at 8505 South Texas Road, Anacortes, Washington. The site location is shown on Figure 1.

SWMU-55 has been used to treat non-hazardous waste generated at PSR since at least 1985. PSR is exploring the possibility of constructing above-ground storage tanks on SMWU 55.

Test pits were excavated at SWMU-55 to characterize the thickness and chemical constituents present in the treated waste residual at the site. SWMU-55 is monitored per Part V.B of the PSR Permit for Land Treatment of Dangerous Waste (Permit) (Ecology, 2000).

Laboratory analytical data from samples collected from test pits excavated at SWMU-55 indicate that the waste residual (WR) soil at the site is contaminated with petroleum compounds and metals. Toxicity Characteristic Leaching Procedure (TCLP) and bioassay samples collected at the site did not contain any hazardous or dangerous waste. The waste residual soil is considered petroleum contaminated soil and is regulated by the Model Toxics Control Act (WAC 173-340) (Ecology, 2013) and the Solid Waste Handling Standards (WAC 173-350).

Confirmation soil samples (CS) were collected at the bottom of the test pits in material that is presumed to be native soil. Only minor concentrations of petroleum compounds were detected in several CS samples indicating that waste residual constituents are not significantly migrating to native soil beneath SWMU-55.

1.0 SITE INFORMATION

1.1 GENERAL SITE INFORMATION

The Shell Oil Products U.S. Puget Sound Refinery is located at 8505 South Texas Road in Anacortes, Washington (parcel P32990). The refinery is in Section 28 in township 35 North, Range 2 East. The refinery is situated on March's Point, between Fidalgo Bay and Padilla Bay, approximately 0.4 miles north of Highway 20, and approximately 10 miles west of I-5. The refinery has a median elevation of approximately 100 feet above mean sea level and the site topography generally slopes from the northwest to the southeast.

The Shell Oil Products U.S. Puget Sound Refinery has been assigned the Facility Site ID# 7, and Cleanup Site ID# 2865. Contact information for the Ecology site manager, project consultant and property owner/facility operator is included below.

- Ecology Site Manager: Mark Dirkx
  - Address: 300 Desmond Drive SE, Lacey, WA 98503
  - Phone: (360) 407-6931
  - Email: mdir461@ecy.wa.gov
- Project Consultant: Whatcom Environmental Services, Inc.
  - Address: 228 E Champion St #101, Bellingham, WA 98225
  - Contact: Eric Libolt
  - Phone: (360) 752-9571
  - Email: elibolt@whatcomenvironmental.com
- Property Owner/Facility Operator: Shell Oil Products U.S.
  - Address: 8505 South Texas Road, Anacortes, WA, 98221
  - Contact: Gary Barklind
  - Phone: (360) 293-0868
  - Email: Gary.Barklind@shell.com

1.2 SITE GEOLOGY AND HYDROGEOLOGY

The Shell Puget Sound Refinery is industrial land that has been disturbed numerous times in the past during construction of tanks, piping infrastructure, and roadways. The refinery is underlain by glacial till of the Vashon Stade. The till consists of dense, unsorted diamicton which includes clast sizes ranging from boulders to clay. The unit contains localized areas of laminated silt and fine sand. Smaller clasts are generally sub angular to rounded while boulders tend to be polished, faceted and striated. The unit ranges in color from gray and olive-gray to brown and yellowish-brown, depending on lithologic content and oxidation state. The thickness of the unit is from less than 1 meter to a maximum of approximately 25 meters.

The glacial till located beneath the waste residual soil at SWMU-55 consists of a brown to brownish gray, stiff to hard, silty clay with a trace of gravel and occasional pockets of sand. It is between 5 and 12 feet thick. The glacial till reduces the vertical migration of waste constituents at the site.

The upper water bearing zone at SWMU-55 is located approximately 18 to 35 feet below ground surface in a sand layer beneath the glacial till (Landau, 1988).

2.0 INVESTIGATION METHODS

The investigation methods used to collect the soil data from SWMU 55 are described below.

2.1 SOIL SAMPLE COLLECTION AND ANALYSIS

Soil samples were collected from test pits as both composite and discrete grab samples via EPA Method 5035A in sample containers provided by the lab. The soil samples were collected using stainless steel sampling equipment. Equipment was washed in accordance with good industry practices using Alconox detergent and distilled water prior to sample collection. Soil sample descriptions were logged in the field and generally followed ASTM D2487 'Unified Soil Classification System' procedures for description and identification of soils.

Soil samples were evaluated in the field for organic vapors using a photoionization detector (PID) and for petroleum products using sheen tests. Immediately after the soil samples were described, a portion of each sample was placed in a labeled re-sealable bag. The PID was inserted into the re-sealable bag in order to evaluate the presence of organic vapors, and a headspace organic vapor detection in parts per million (ppm) was recorded in the field notebook. The organic vapor headspace analyses were conducted using a PID equipped with a 10.6 eV lamp. A portion of each soil sample was also sheen tested and the sheen test results were recorded as: NS – no sheen, VSS – very slight sheen, SS – slight sheen, MS – moderate sheen, and HS – heavy sheen.

Soil samples were stored on ice in a cooler immediately after collection. Standard industry protocols regarding sample collection, preservation, chain-of-custody, and shipping were followed.

All soil samples were analyzed at ALS Laboratory Group in Everett, Washington and Pace Analytical in Minneapolis, Minnesota. ALS and Pace are accredited by the Washington State Department of Ecology. Strict chain-of-custody and QA/QC protocols were followed for each sample.

2.2 TEST PITS

In order to characterize the waste residual soil and native soil underlying the waste residual soil, test pits were excavated to a depth of 6 feet to 15 feet at SWMU-55. A Whatcom Environmental Services field technician documented the excavation of the test pits, logged the soil in one-foot increments according to ASTM standards, and collected soil samples. Test pit logs are presented in Appendix A.

Test pit total depth varied with the depth to native soil which ranged from 6 ft. to 15 ft. below ground surface. The test pits were terminated when field screening indicated no presence of hydrocarbon contaminants. Test pits were backfilled with the excavated spoils before proceeding to the next location. Test pit photographs are included in the Photographic Log.

2.2.1 June 2017 Test Pits

Fifteen test pits were excavated in June 2017. The June test pit locations are shown on Figure 2. Two samples were collected from each test pit. One composite sample was collected from the waste residual (WR samples) from the most contaminated waste strata. One discrete sample was collected below the waste residual in presumed native soil (CS samples). One additional discrete sample was collected from a unique homogenous soil layer observed in Plot 15 Test Pit #2 (see Photograph 2).

Waste residual samples were collected as composite samples from the intervals of the test pits that showed the most evidence of contamination (based on field screening observations). Waste residual soil type varied across plots, and within test pits. The soil types encountered and depths of sub-samples collected are shown on the Test Pit Logs included in Appendix A.

Samples were analyzed for volatile range, diesel range, and oil range total petroleum hydrocarbons, BTEX constituents (Benzene, Toluene, Ethylbenzene, and Xylenes), soil pH, priority pollutant metals, Toxicity Characteristic Leaching Procedure (TCLP) Resource Conservation and Recovery Act (RCRA) 8 metals, and Volatile Organic Compounds (VOCs). Four samples were selected for additional testing of Polychlorinated Biphenyls (PCBs,) dioxins, hexavalent chromium, TCLP VOCs, TCLP SVOCs, and a dangerous waste bioassay.

2.2.2 November 2017 Test Pits

Two additional test pits were excavated in November 2017 at the location of the proposed Tank 503 as shown on Figure 2. The two additional test pits were excavated to provide more data on the concentration of petroleum compounds in each discrete two-foot soil layer to a depth of 10 feet.

A discrete grab sample was collected from the 2 foot, 4 foot, 6 foot, 8 foot, and the 10 foot layer from each test pit. The samples were analyzed for volatile petroleum hydrocarbons (VPH), extractable petroleum hydrocarbons (EPH), and targeted analytes (BTEX, hexane, MTBE, and select SVOCs).

3.0 ANALYTICAL RESULTS

Soil sample results are presented in Appendix B, and summarized in Tables 1-4.

3.1 JUNE 2017 WASTE RESIDUAL SAMPLE RESULTS

The laboratory analytical data results for the composite samples collected from the waste residual soil during the June 2017 sampling event are provided in Table 1. The laboratory analytical data for the four samples which had the extended analyte list are provided in Table 2. The results include the following:

- Volatile range, diesel range, and oil range total petroleum hydrocarbons (TPH) were detected in all samples.
- BTEX constituents were detected in samples from Plots 13, 14, and 15.
- Priority pollutant metals (except Beryllium, Silver, and Thallium) were detected in all samples. Cadmium was detected in one sample (Plot 13 TP 1 WR).
- Acetone was detected in most samples, although this is likely an artifact of the laboratory preparation/extraction process.
- 1- and 2-Methylnaphthalene and Acenaphthene were detected in most samples.
- cPAHs were detected in most samples. The toxic equivalency factor was calculated for the cPAHs and all samples exceeded the MTCA Method A Cleanup level of 0.1 mg/kg.
- When run using the TCLP method, Barium was detected in every sample, Arsenic was detected in most samples, and Selenium was detected in three samples. All TCLP Metals were below the dangerous waste thresholds provided in WAC 173-303-090.

- Volatile and Semi-Volatile Organic Compounds (VOCs and SVOCs) were also evaluated using the TCLP method. TCLP 1- and 2-Methylnaphthalene and TCLP Phenanthrene were detected in Plot 17 TP 1 WR, and TCLP Bis (2-Ethylhexyl) Phthalate was detected in Plot 17 TP 2 WR. None of the other TCLP VOCs or SVOCs were detected. All detections of TCLP VOCs and SVOCs were below the dangerous waste thresholds provided in WAC 173-303-090.
- Soil pH was within a range of 6.29 to 10.5 standard pH units which is within the non-dangerous waste range for corrosivity.
- An extended list was analyzed for four samples. No PCBs were detected in any of the four extended-list samples.
- Dioxins were detected in each of the four extended list samples, though none over cleanup levels.
- Hexavalent chromium was not detected in any of the extended list samples.
- The extended list samples were also analyzed using the standard fish toxicity test bioassay (Department of Ecology Method 80-12). The results were that all samples were considered Not Dangerous.

In general, the waste residual soil contains petroleum compounds and metals. Contaminants of concerns include TPH (volatile, diesel, and oil range), BTEX, naphthalenes (including naphthalene as well as 1- and 2-methylnapthalene), mercury, and cPAHs. All other detections were below MTCA Method A cleanup levels for unrestricted land use.

Waste residual soil does not contain dangerous or hazardous waste based on the TCLP and bioassay results.

3.2 JUNE 2017 CONFIRMATION SAMPLE RESULTS

Confirmation samples (from the bottom of the test pits) were submitted for laboratory analysis for volatile range, diesel range, and oil range petroleum hydrocarbons, as well as BTEX constituents. Confirmation samples indicated the presence of diesel range and oil range petroleum hydrocarbons in most samples and volatile range hydrocarbons in four samples. The sample results are provided in Table 3. In order to determine the severity of the detections, the sample results were compared to the most stringent cleanup levels which are the MTCA Method A cleanup levels for unrestricted land use (future cleanup at the site would likely utilize the MTCA Method C cleanup level for industrial sites but the MTCA Method C cleanup levels are not readily available in a lookup table).

All detections in the confirmation samples were below state cleanup levels for unrestricted land use (MTCA Method A), with a few exceptions. Sample Plot 17 TP 2 CS 11 ft, had a concentration of oil-range hydrocarbons of 2,700 mg/kg which is above the MTCA Method A cleanup level for unrestricted land use of 2,000 mg/kg and sample Plot 13 TP 2 CS 7 ft, had a concentration of benzene of 0.052 mg/kg which is above the MTCA Method A cleanup level for unrestricted land use of 0.03 mg/kg. Confirmation samples were collected in presumed native soil, which varied from clean coarse sand to sandy clay with gravels.

3.3 NOVEMBER 2017 SAMPLE RESULTS

The samples collected from the test pits in November 2017 contained concentrations of petroleum compounds which decreased over the depth of the test pit as shown in Table 4. The samples collected from the 2 foot and 4 foot depth had significant detections of petroleum constituents, the samples collected from the 6 foot depth and 8 foot depth had minor detections of petroleum constituents, and the samples collected from the 10 foot depth did not have detectable concentrations of petroleum constituents.

The VPH and EPH results indicate that the petroleum fractions which exist in the waste residual soil tend to be higher carbon number and less volatile. There were no detections of C5-C6 aliphatics and C10-12 aromatics. The highest concentrations of petroleum constituents were found in the C21-C34 aliphatic and C21-C34 aromatic ranges. The measured concentrations of carcinogenic polycyclic aromatic hydrocarbons were significant with Plot 14 TP5 4 ft. having a detection of benzo(a)pyrene of 15 mg/kg.

4.0 FINDINGS

Cross sections were created for each of the SWMU 55 plots in order to map the interface between clean, presumed native soil, and the waste residual overburden. The transect lines and cross sections are presented in Appendix C. Sample collection depths and locations are also shown on the cross sections.

Laboratory analytical data from samples collected from the test pits indicated that the waste residual soil is contaminated with petroleum compounds and metals. Toxicity Characteristic Leaching Procedure (TCLP) and bioassay samples did not contain any hazardous or dangerous waste. Waste residual soil is considered petroleum contaminated soil and is regulated by the Model Toxics Control Act (WAC 173-340) and the Solid Waste Handling Standards (WAC 173-350).

Contaminants of concerns include TPH (volatile, diesel, and oil range), BTEX, naphthalenes (including naphthalene as well as 1- and 2-methylnapthalene), mercury, and cPAHs. All other detections were below MTCA Method A cleanup levels for unrestricted land use.

The confirmation samples indicate that the petroleum compounds did not significantly migrate into the native soil beneath the waste residual.

As the site is currently industrial and will likely remain industrial into the future, it is possible to conduct any future soil assessment and cleanup at the site using the MTCA Method C cleanup levels. These cleanup levels will need to account for exposure to the waste residual through direct contact and ingestion as well as the potential threat to groundwater.

5.0 REFERENCES

Landau Associates, Inc. 1988. Hydrogeologic Investigation Texaco Puget Sound Plant. June 17, 1988.

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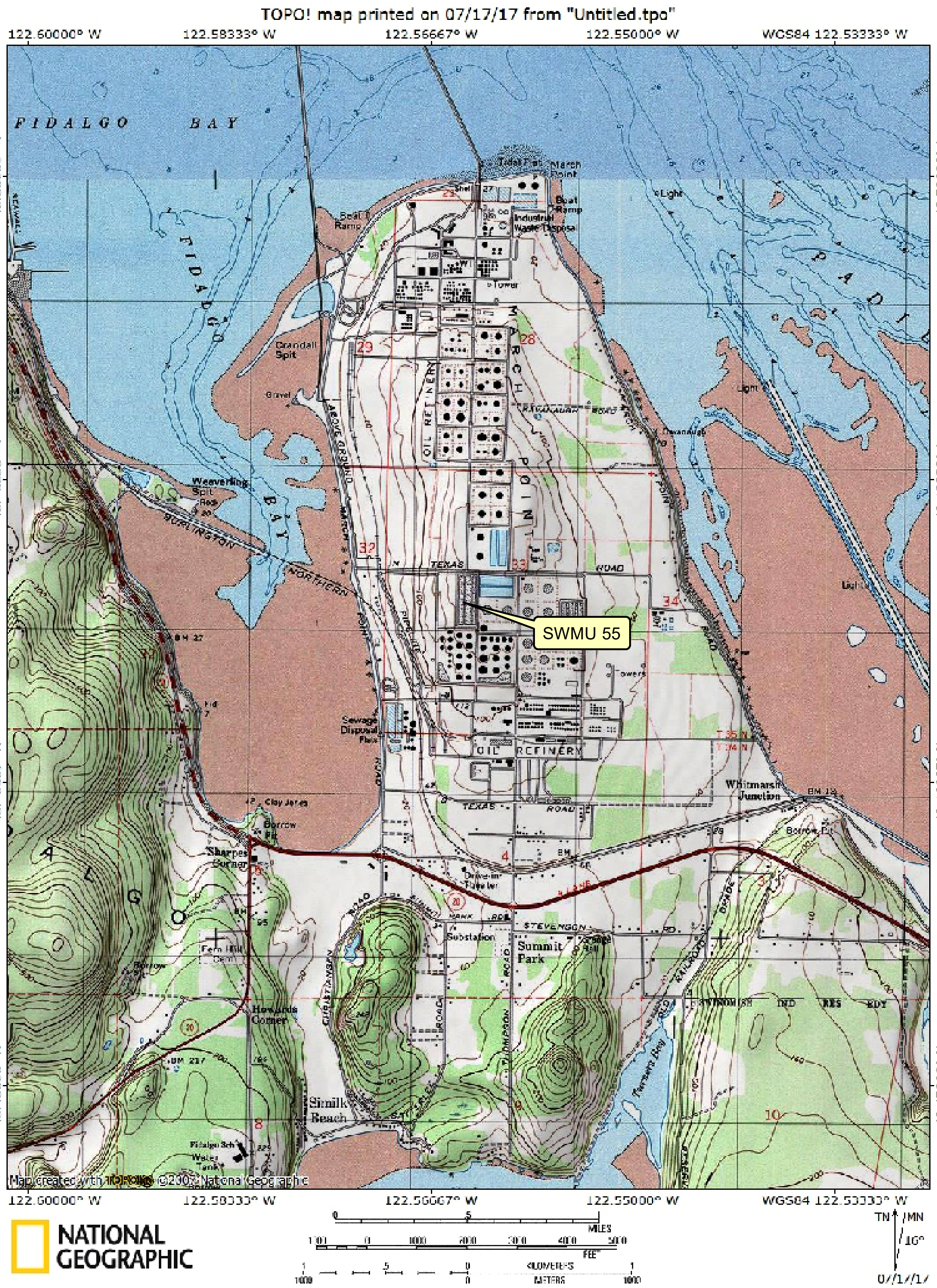
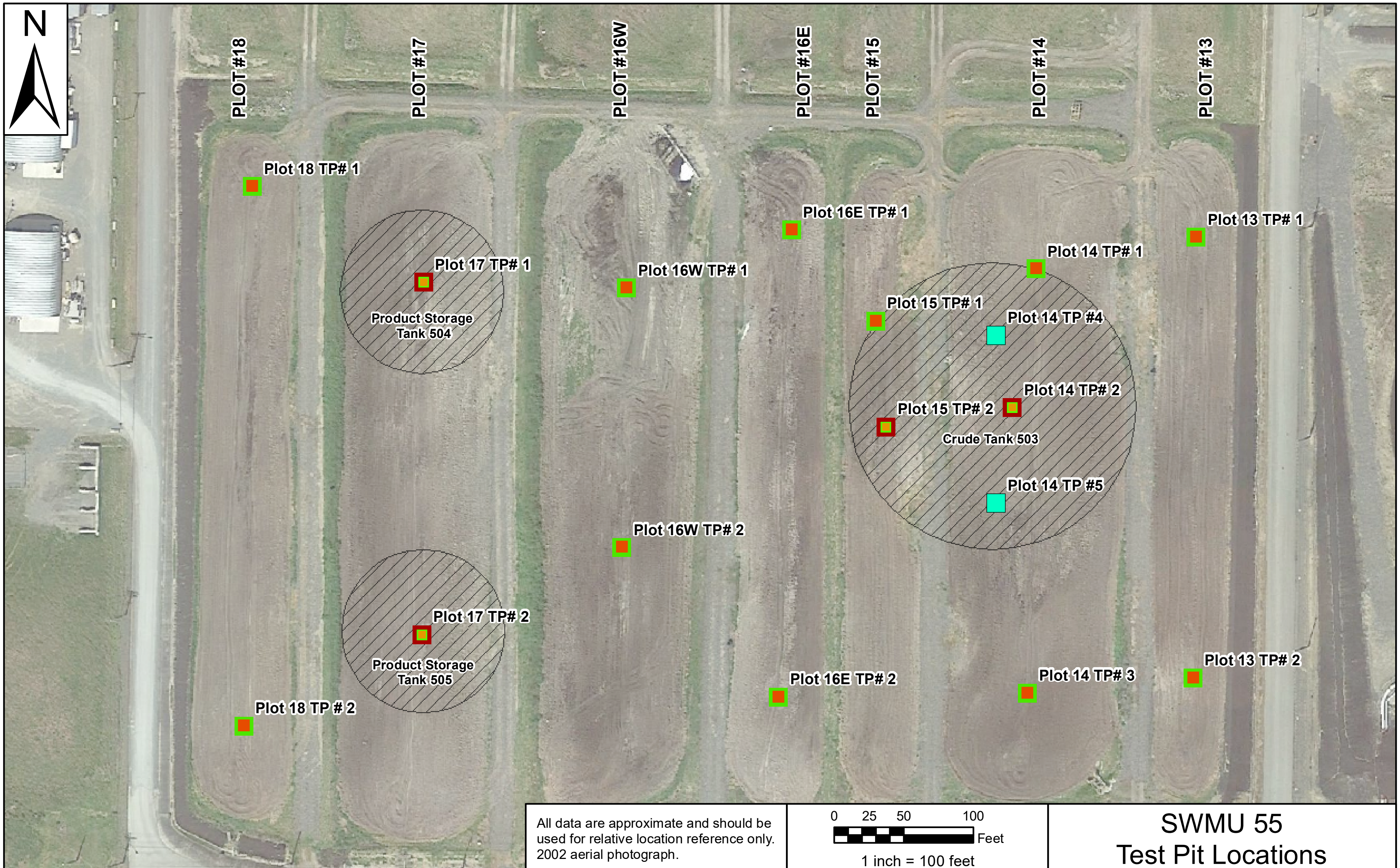
Washington State Department of Ecology (Ecology). 2013. Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC. Publication No. 94-06.

Washington State Department of Natural Resources (WSDNR). 2000. Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington. Open File Report 2000-5.



Prepared for: Shell PSR	Prepared by: whatcom ENVIRONMENTAL	Site Location Map	
		SWMU 55	Figure 1
		01/26/18	



All data are approximate and should be used for relative location reference only. 2002 aerial photograph.

0 25 50 100 Feet

1 inch = 100 feet

SWMU 55
Test Pit Locations

Soil Sample Analysis

- Waste Residual Sample and Confirmation Sample
- Waste Residual Sample with extended list and Confirmation Sample
- EPH/VPH +Targeted Analytes
- Proposed Tanks

Prepared for:

Shell PSR

Prepared by:

whatcom ENVIRONMENTAL

Shell Puget Sound Refinery
Anacortes, WA 98221

SWMU 55

01/26/18

Figure 2

Table 1. WR Soil Sample Analytical Results - SWMU-55

Sample ID		Dangerous Waste Toxicity Characteristic:	MTCA Method A Cleanup Level:	Plot 13 TP 1 WR	Plot 13 TP 2 WR	Plot 14 TP 1 WR	Plot 14 TP 2 WR	Plot 14 TP 3 WR	Plot 15 TP 1 WR	Plot 15 TP 1 2 ft	Plot 15 TP 2 WR	Plot 16E TP 1 WR	Plot 16E TP 2 WR	Plot 16W TP 1 WR	Plot 16W TP 2 WR	Plot 17 TP 1 WR	Plot 17 TP 2 WR	Plot 18 TP 1 WR	Plot 18 TP 2 WR	WES-DUP-2 (Dup of Plot 16E TP 2 WR)	WES-DUP-4 (Dup of Plot 18 TP 2 WR)
Date				6/8/2017	6/8/2017	6/8/2017	6/8/2017	6/8/2017	6/8/2017	6/8/2017	6/8/2017	6/12/2017	6/12/2017	6/12/2017	6/12/2017	6/12/2017	6/12/2017	6/12/2017	6/12/2017	6/12/2017	6/12/2017
TPH																					
NWTPH-Gx Volatile Range	mg/kg	-	100/30[a]	21	26	26	**51**	15	**270**	81	31	53	38	**130**	9.6	6.7	7.4	5.8	39	56	56
NWTPH-Dx Diesel Range	mg/kg	-	2,000	**5,000**	**4,500**	**3,400**	**8,000**	**6,200**	**7,700**	760	**4,700**	1,300	**2,500**	**5,100**	840	1,500	**11,000**	96	**9,000**	**2,700**	**4,800**
NWTPH-Dx Oil-Range	mg/kg	-	2,000	**8,900**	**5,000**	**4,500**	**11,000**	**9,200**	**5,500**	340	**4,700**	1,300	**3,000**	**5,500**	1,400	**3,100**	**4,500**	93	**11,000**	**2,300**	**6,100**
EPA-8021 Benzene	mg/kg	-	0.03	**6.7**	**6.1**	ND(<0.005)	**9.5**	**0.077**	**1.4**	ND(<0.005)	ND(<0.005)	ND(<0.050)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)
EPA-8021 Toluene	mg/kg	-	7	ND(<0.01)	ND(<0.01)	ND(<0.01)	**11**	0.011	0.037	ND(<0.01)	ND(<0.01)	0.14	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
EPA-8021 Ethylbenzene	mg/kg	-	6	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	2.3	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
EPA-8021 Xylenes	mg/kg	-	9	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)	**10.4**	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)	ND(<0.03)
Soil pH	-	-	-	6.84	7.34	7.33	7.79	7.63	7.26	10.5	7.67	8.76	7.57	7.44	7.43	6.89	7.5	6.29	7.5	7.39	7.42
Metals: Priority Pollutants																					
Antimony	mg/kg	-	32 [b]	22	7.2	7.9	19	22	10	3.7	7.6	0.68	0.69	6.6	3.6	9.2	0.63	6.2	16	0.88	9
Arsenic	mg/kg	-	20.0	20	7.2	4.7	11	8.8	14	11	8.9	3.7	6.2	7.9	5	7	4.6	9.5	11	5.4	9.4
Barium	mg/kg	-	16000 [b]	110	150	76	140	120	100	11	110	100	130	140	120	93	67	90	100	130	110
Beryllium	mg/kg	-	160 [b]	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)
Cadmium	mg/kg	-	2.0	0.73	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	0.58	ND(<0.50)	ND(<0.50)
Chromium	mg/kg	-	19/2000 [c]	580 [a]	270 [a]	200 [a]	330 [a]	390 [a]	360 [a]	8.1	260 [a]	150 [a]	73 [a]	180 [a]	150 [a]	170 [a]	120 [a]	110 [a]	190 [a]	71 d	160 [a]
Copper	mg/kg	-	3200 [b]	250 [a]	71	48	87	85	77	6.4	56	49	44	120 [d]	37	54	34	96	150 [a]	40	92
Lead	mg/kg	-	250.0	100	33	23	35	52	48	23	31	62	14	35	14	27	9.6	28	71	19	58
Mercury	mg/kg	-	2.0	**2.4**	0.75	1.1	**2.1**	0.48	1.5	0.065	0.95	0.18	0.095	0.47	0.43	0.88	0.13	1.2	1.1	0.095	1.1
Nickel	mg/kg	-	880 [b]	160 [a]	50	71	87	120 [a]	130 [a]	4.4	96	110 [a]	52	67	40	52	34	47	94	46	73
Selenium	mg/kg	-	400 [b]	10 [a]	ND(<5.0)	5.3 [a]	34 [a]	7.7 [a]	6.5 d	ND(<5.0)	8.6 [a]	ND(<5.0)	ND(<5.0)	7.1 [a]	5.4 [a]	13 [a]	ND(<5.0)	9.3 [a]	9.5 [a]	ND(<5.0)	6 [a]
Silver	mg/kg	-	400 [b]	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)	ND(<0.50)
Thallium	mg/kg	-	0.00001	*ND(<5.6)*	*ND(<5.6)*	*ND(<5.2)*	*ND(<5.5)*	*ND(<5.4)*	*ND(<5.6)*	*ND(<5.4)*	*ND(<5.4)*	*ND(<4.9)*	*ND(<5.2)*	*ND(<5.5)*	*ND(<5.3)*	*ND(<5.3)*	*ND(<4.8)*	*ND(<5.6)*	*ND(<5.5)*	*ND(<5.4)*	*ND(<5.4)*
Zinc	mg/kg	-	24000 [b]	320 [a]	170	140	310 [a]	240	220	38	180	78	80	160	140	190	76	200	220	79	180
Metals: TCLP RCRA 8																					
Arsenic	mg/L	5.0	-	ND(<0.025)	ND(<0.025)	ND(<0.025)	0.045	0.032	0.028	0.06	0.025	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	0.044	0.027	0.049	0.044	ND(<0.025)	0.05
Barium	mg/L	100.0	-	0.092	0.14	0.088	0.051	0.067	0.073	0.04	0.069	0.27	0.42	0.14	0.2	0.05	0.26	0.041	0.064	0.26	0.058
Cadmium	mg/L	1.0	-	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)
Chromium	mg/L	5.0	-	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)
Lead	mg/L	5.0	-	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)
Mercury	mg/L	0.2	-	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)	ND(<0.0002)
Selenium	mg/L	1.0	-	ND(<0.025)	ND(<0.025)	ND(<0.025)	0.026	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	0.029	ND(<0.025)	0.026	ND(<0.025)	ND(<0.025)	ND(<0.025)
Silver	mg/L	5.0	-	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)	ND(<0.025)
Volatile Organic Compounds (VOCs)																					
Dicholordifluoromethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Chloromethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Vinyl Chloride	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Bromomethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Chloroethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Carbon Tetrachloride	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Trichlorofluoromethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Carbon Disulfide	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Acetone	mg/kg	-	-	0.26	0.2	0.16	0.54	0.24	0.28	0.53	0.11	0.57	0.15	ND(<0.11)	ND(<0.11)	0.13	ND(<0.088)	0.15	ND(<0.12)	0.12	0.3
1,1-Dichloroethene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Methylene Chloride	mg/kg	-	-	ND(<0.05)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)
Acrylonitrile	mg/kg	-	-	ND(<0.02)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)
Methyl T-Buyl Ether	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)

Table 1. WR Soil Sample Analytical Results - SWMU-55

Sample ID		Dangerous Waste Toxicity Characteristic:	MTCA Method A Cleanup Level:	Plot 13 TP 1 WR	Plot 13 TP 2 WR	Plot 14 TP 1 WR	Plot 14 TP 2 WR	Plot 14 TP 3 WR	Plot 15 TP 1 WR	Plot 15 TP 1 2 ft	Plot 15 TP 2 WR	Plot 16E TP 1 WR	Plot 16E TP 2 WR	Plot 16W TP 1 WR	Plot 16W TP 2 WR	Plot 17 TP 1 WR	Plot 17 TP 2 WR	Plot 18 TP 1 WR	Plot 18 TP 2 WR	WES-DUP-2 (Dup of Plot 16E TP 2 WR)	WES-DUP-4 (Dup of Plot 18 TP 2 WR)
Trans-1,2-Dichloroethene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,1-Dichloroethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
2-Butanone	mg/kg	-	-	ND(<0.05)	ND(<0.05)	ND(<0.05)	0.14	ND(<0.05)	0.14	0.14	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)
Cis-1,2-Dichloroethene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
2,2-Dichloropropane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Bromochloromethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Chloroform	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,1,1-Trichloroethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,1-Dichloropropene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,2-Dichloroethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Trichloroethene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,2-Dichloropropane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Dibromomethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Bromodichloromethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Trans-1,3-Dichloropropene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
4-Methyl-2-Pentanone	mg/kg	-	-	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.01)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)
Cis-1,3-Dichloropropene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,1,2-Trichloroethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
2-Hexanone	mg/kg	-	-	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)
1,3-Dichloropropane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Tetrachloroethylene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Dibromochloromethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,2-Dibromoethane	mg/kg	-	-	ND(<0.005)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)	ND(<0.005)
Chlorobenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,1,1,2-Tetrachloroethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Styrene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Bromoform	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Isopropylbenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.02	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,1,2,2-Tetrachloroethane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,2,3-Trichloropropane	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Bromobenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
N-Propyl Benzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.044	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
2-Chlorotoluene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,3,5-Trimethylbenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	1.6	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
4-Chlorotoluene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
T-Buyl Benzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,2,4-Trimethylbenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	4.1	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.011	0.011	0.011	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
S-Butyl benzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
P-Isopropyltoluene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.012	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,3-Dichlorobenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,4-Dichlorobenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
N- Butylbenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.016	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,2-Dichlorobenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,2-Dicholorbenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,2-Dibromo 3-Chloropropane	mg/kg	-	-	ND(<0.05)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)
1,2,4-Trichlorobenzene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Hexochlorobutadiene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
Naphthalene	mg/kg	-	-	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.016	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.019	0.019	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
1,2,3-Trichlorobenzene	mg/kg	-	-	ND(<0.5)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)

Semi-Volatile Organic Compounds (SVOCs)

Table 1. WR Soil Sample Analytical Results - SWMU-55

Sample ID		Dangerous Waste Toxicity Characteristic:	MTCA Method A Cleanup Level:	Plot 13 TP 1 WR	Plot 13 TP 2 WR	Plot 14 TP 1 WR	Plot 14 TP 2 WR	Plot 14 TP 3 WR	Plot 15 TP 1 WR	Plot 15 TP 1 2 ft	Plot 15 TP 2 WR	Plot 16E TP 1 WR	Plot 16E TP 2 WR	Plot 16W TP 1 WR	Plot 16W TP 2 WR	Plot 17 TP 1 WR	Plot 17 TP 2 WR	Plot 18 TP 1 WR	Plot 18 TP 2 WR	WES-DUP-2 (Dup of Plot 16E TP 2 WR)	WES-DUP-4 (Dup of Plot 18 TP 2 WR)
Pyridine	mg/kg	-	-	ND(<1.0)	ND(<0.01)	ND(<0.01)	ND(<1.4)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<1.0)	ND(<0.2)	ND(<0.2)	ND(<0.2)	ND(<0.2)	ND(<1.0)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)
N-Nitrosodimethylamine	mg/kg	-	-	ND(<0.5)	ND(<0.01)	ND(<0.01)	ND(<0.87)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<1.0)
Phenol	mg/kg	-	-	ND(<0.5)	ND(<0.01)	ND(<0.01)	ND(<1.3)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.64)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)
Aniline	mg/kg	-	-	ND(<0.5)	ND(<0.01)	ND(<0.01)	ND(<1.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.74)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)
Bis(2-Choloroethyl) Ether	mg/kg	-	-	ND(<1.2)	ND(<0.01)	ND(<0.01)	ND(<3.1)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.5)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)
2-Chlorophenol	mg/kg	-	-	ND(<1.2)	ND(<0.01)	ND(<0.01)	ND(<3.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.6)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)
1,3-Dichlorobenzene	mg/kg	-	-	ND(<1.2)	ND(<0.01)	ND(<0.01)	ND(<0.85)	ND(<1.2)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)
1,4-Dichlorobenzene	mg/kg	-	-	ND(<1.2)	ND(<0.01)	ND(<0.01)	ND(<0.77)	ND(<1.2)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)
Benzyl alcohol	mg/kg	-	-	ND(<1.2)	ND(<0.01)	ND(<0.01)	ND(<1.7)	ND(<1.2)	ND(<0.5)	ND(<0.5)	ND(<0.82)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)
1,2-Dichlorobenzene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.76)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
2-Methylphenol	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.54)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Bis(2-Chloroisopropyl)Ether	mg/kg	-	-	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<4.1)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<2.0)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<0.25)	ND(<1.2)
3&4-Methylphenol	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.4)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.68)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
N-Nitroso-Di-N-Propylamine	mg/kg	-	-	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<3.0)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.5)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<0.25)	ND(<1.2)
Hexacholorethane	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.66)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Nitrobenzene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.63)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Isophorone	mg/kg	-	-	ND(<0.61)	ND(<0.61)	ND(<0.61)	ND(<2.3)	ND(<0.55)	ND(<0.61)	ND(<0.58)	ND(<1.1)	ND(<0.11)	ND(<0.11)	ND(<0.11)	ND(<0.12)	ND(<0.59)	ND(<0.52)	ND(<0.6)	ND(<0.6)	ND(<0.12)	ND(<0.57)
2-Nitrophenol	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.0)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
2-4-Dimethylphenol	mg/kg	-	-	ND(<0.56)	ND(<0.56)	ND(<0.56)	ND(<2.1)	ND(<0.51)	ND(<0.56)	ND(<0.53)	ND(<1.0)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.11)	ND(<0.54)	ND(<0.5)	ND(<0.55)	ND(<0.55)	ND(<0.11)	ND(<0.52)
Benzoic Acid	mg/kg	-	-	ND(<6.2)	ND(<6.2)	ND(<6.2)	ND(<23)	ND(<5.6)	ND(<6.2)	ND(<5.9)	ND(<11)	ND(<1.1)	ND(<1.1)	ND(<1.1)	ND(<1.2)	ND(<6.0)	ND(<5.3)	ND(<6.1)	ND(<6.1)	ND(<1.2)	ND(<5.8)
Bis(2-Chloroethoxy)Methane	mg/kg	-	-	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<3.9)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.9)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<0.25)	ND(<1.2)
2,4-Dichlorophenol	mg/kg	-	-	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<8.0)	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<3.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<0.5)	ND(<2.5)
1,2,4-Trichlorobenzene	mg/kg	-	-	ND(<0.61)	ND(<0.61)	ND(<0.61)	ND(<2.3)	ND(<0.56)	ND(<0.61)	ND(<0.58)	ND(<1.1)	ND(<1.1)	ND(<1.1)	ND(<1.1)	ND(<0.12)	ND(<0.59)	ND(<0.53)	ND(<0.60)	ND(<0.60)	ND(<0.12)	ND(<0.57)
Naphthalene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.87)	ND(<0.5)	2.5	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	0.17	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
4-Chlororaniline	mg/kg	-	-	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<18)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<9.1)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<1.0)	ND(<5.0)
2,6-Dichlorophenol	mg/kg	-	-	ND(<1.6)	ND(<1.6)	ND(<1.6)	ND(<5.9)	ND(<1.4)	ND(<1.6)	ND(<1.5)	ND(<2.9)	ND(<0.29)	ND(<0.29)	ND(<0.31)	ND(<0.3)	ND(<1.5)	ND(<1.4)	ND(<1.6)	ND(<1.6)	ND(<0.31)	ND(<1.5)
Hexachlorobutadiene	mg/kg	-	-	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<4.2)	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<0.5)	ND(<2.5)
4-Chloro-3-Methylphenol	mg/kg	-	-	ND(<2.8)	ND(<2.8)	ND(<2.8)	ND(<10)	ND(<2.5)	ND(<2.8)	ND(<2.7)	ND(<5.2)	ND(<0.5)	ND(<0.51)	ND(<0.55)	ND(<0.53)	ND(<2.7)	ND(<2.5)	ND(<2.8)	ND(<2.8)	ND(<0.55)	ND(<0.26)
2-Methylnaphthalene	mg/kg	-	-	ND(<1.3)	2.0	1.8	ND(<4.9)	ND(<1.2)	12	ND(<1.3)	ND(<2.5)	ND(<2.5)	2.2	1.5	ND(<2.5)	ND(<1.3)	6.8	ND(<1.3)	ND(<1.3)	2.6	ND(<1.2)
1-Methylnaphthalene	mg/kg	-	-	ND(<1.5)	2.7	3.1	ND(<5.7)	ND(<1.4)	15	ND(<1.5)	ND(<2.8)	0.42	4.5	1.9	ND(<2.9)	ND(<1.5)	8.3	ND(<1.5)	1.6	4.9	1.8
Hexochlorocyclopentadiene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.80)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
2,4,6-Trichlorophenol	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.3)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.64)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
2,4,5-Trichlorophenol	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.3)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.63)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
2-Chloronaphthalene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.0)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.51)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
2-Nitroaniline	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.61)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Acenaphthylene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.83)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Dimethylphthalate	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.4)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.68)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
2,6-Dinitrotoluene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.2)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.6)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Acenaphthene	mg/kg	-	-	ND(<0.5)	0.82	0.59	ND(<0.83)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	0.19	0.71	0.49	ND(<0.1)	ND(<0.5)	2.6	ND(<0.5)	ND(<0.5)	0.78	0.54
3-Nitroaniline	mg/kg	-	-	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<19)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<9.3)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<1.0)	ND(<5.0)
2,4-Dinitrophenol	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.7)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.85)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
4-Nitrophenol	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.8)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.87)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Dibenzofuran	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.0)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.52)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
2,4-Dinitrotoluene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.70)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
2,3,4,6-Tetrachlorophenol	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.6)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.8)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Diethylphthalate	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.4)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.67)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Fluorene	mg/kg	-	-	ND(<0.5)	1.1	ND(<0.5)	ND(<1.1)	ND(<0.5)	2.9	ND(<0.5)	ND(<0.56)	ND(<0.1)	1	0.6	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	1.2	ND(<0.5)
4-Chlorophenyl-Phenylether	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.3)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.66)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
4-Nitroaniline	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<4.1)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<2.0)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<0.25)	ND(<1.2)
4,6-Dinitro-2-Methylphenol	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.92)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
N-Nitrosodiphenylamine	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.55)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)

Table 1. WR Soil Sample Analytical Results - SWMU-55

Sample ID		Dangerous Waste Toxicity Characteristic:	MTCA Method A Cleanup Level:	Plot 13 TP 1 WR	Plot 13 TP 2 WR	Plot 14 TP 1 WR	Plot 14 TP 2 WR	Plot 14 TP 3 WR	Plot 15 TP 1 WR	Plot 15 TP 1 2 ft	Plot 15 TP 2 WR	Plot 16E TP 1 WR	Plot 16E TP 2 WR	Plot 16W TP 1 WR	Plot 16W TP 2 WR	Plot 17 TP 1 WR	Plot 17 TP 2 WR	Plot 18 TP 1 WR	Plot 18 TP 2 WR	WES-DUP-2 (Dup of Plot 16E TP 2 WR)	WES-DUP-4 (Dup of Plot 18 TP 2 WR)
Azobenzene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.4)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.71)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
4-Bromophenyl-Phenylether	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.2)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.58)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Hexachlorobenzene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.2)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.58)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Pentachlorophenol	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<4.7)	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<2.5)	1.1	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<2.5)	ND(<0.5)	ND(<2.5)
Phenanthrene	mg/kg	-	-	0.83	5.8	2.4	3.2	2	9.3	ND(<0.5)	0.93	ND(<0.1)	3.1	2.1	0.11	ND(<0.5)	8.5	ND(<0.5)	2.3	3.4	2.9
Anthrancene	mg/kg	-	-	ND(<0.5)	1.9	1.7	1.5	1.4	ND(<0.5)	ND(<0.5)	0.75	ND(<0.25)	1.1	ND(<0.1)	ND(<0.1)	ND(<0.5)	2.3	ND(<0.5)	1	1.2	ND(<0.5)
Carbazole	mg/kg	-	-	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<3.5)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.7)	ND(<0.1)	ND(<0.25)	ND(<0.25)	ND(<0.25)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<1.2)	ND(<0.25)	ND(<1.2)
Di-N-Butylphthalate	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<1.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.54)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Fluoranthene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	1.4	1.5	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	0.73	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Pyrene	mg/kg	-	-	2.5	8.1	5.8	19	12	6.4	ND(<0.5)	1.7	1.8	4.2	3.4	ND(<0.1)	ND(<0.5)	4.3	0.54	6.9	4.5	8.7
Butylbenzylphthalate	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.73)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.50)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
3,3-Dichlorobenzidine	mg/kg	-	-	ND(<1.5)	ND(<1.5)	ND(<1.5)	ND(<5.5)	ND(<1.3)	ND(<1.5)	ND(<1.4)	ND(<2.7)	ND(<2.7)	ND(<2.7)	ND(<0.29)	ND(<0.28)	ND(<1.4)	ND(<1.3)	ND(<1.5)	ND(<1.5)	ND(<0.29)	ND(<1.4)
Benzo[A]Anthracene	mg/kg	-	-	1.2	3.5	4.5	7.2	4.2	2.3	ND(<0.5)	ND(<0.5)	0.67	2	ND(<0.1)	ND(<0.1)	ND(<0.5)	1.9	ND(<0.5)	ND(<0.5)	2.3	ND(<0.5)
Chrysene	mg/kg	-	-	5.3	10	10	25	17	9.1	ND(<0.5)	3.6	3	6.1	5	0.26	ND(<0.5)	4.9	2	7.9	7	10
Bis(2-ethylhexyl)phthalate	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.71)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Di-N-Octylphthalate	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.70)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Benzo[B]Fluoranthene	mg/kg	-	-	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.71)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Benzo[K]Fluoranthene	mg/kg	-	-	2	1.8	2.5	5.7	6.8	1.7	ND(<0.5)	0.8	0.49	0.77	0.97	ND(<0.1)	ND(<0.5)	0.85	0.51	2.3	0.73	2.9
Benzo[A]Pyrene	mg/kg	-	-	3.6	4.3	5.5	11	16	3	ND(<0.5)	1.8	1.8	1.6	1.3	0.34	0.51	2.4	1.4	3.1	1.8	3.8
Indeno[1,2,3-Cd]Pyrene	mg/kg	-	-	0.83	0.82	1.2	1.7	1.4	ND(<0.5)	ND(<0.5)	ND(<0.5)	0.12	ND(<0.1)	0.17	0.12	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.1)	ND(<0.5)
Dibenz[A,H]Anthracene	mg/kg	-	-	1.1	1.2	1.8	2.7	2.5	0.78	ND(<0.5)	0.54	0.23	3.1	0.29	ND(<0.10)	ND(<0.5)	ND(<0.5)	ND(<0.5)	0.66	ND(<0.1)	0.8
Benzo[G,H,I]perylene	mg/kg	-	-	2.9	2.7	4.4	4.5	4.6	1.4	ND(<0.5)	0.9	0.29	2.6	0.47	0.38	0.78	ND(<0.5)	0.71	0.87	0.21	3.8
Total cPAH Equivalent (TEq)	mg/kg	-	0.1	**4.191**	**5.157**	**6.625**	**13.005**	**17.685**	**3.619**	**0.3775**	**2.045**	**2.006**	**2.298**	**1.543**	**0.4546**	**0.6375**	**2.799**	**1.571**	**3.55**	**2.248**	**4.345**

[a] - Cleanup level dependent on BTEX concentrations

[b] - indicates MTCA Method B Cleanup level when Method A is unavailable.

[c] - indicates cleanup level is dependant on Chromium(VI) concentrations.

ND - indicates analyte was not detected at level above reporting limit (shown in parentheses)

BOLD - indicates that the concentration in the sample exceeds the MTCA Method A target cleanup levels

italics - indicated that the laboratory reporting limit was raised above the MTCA Method A target cleanup level due to dilution of the sample

All samples collected using EPA Method 5035A

Table 2. WR Extended List Soil Sample Analytical Results - SWMU-55

Sample ID		Dangerous Waste Toxicity Characteristic:	MTCA Method A Cleanup Level:	Plot 14 TP 2 WR	Plot 15 TP 2 WR	Plot 17 TP 1 WR	Plot 17 TP 2 WR
Date				6/8/2017	6/8/2017	6/12/2017	6/12/2017
EPA-8082 PCBs[a]	mg/kg	-	1.0	ND(<0.8)	ND(<0.8)	ND(<0.8)	ND(<0.8)
Standard Fish Toxicity Test	-	-	-	Not Dangerous	Not Dangerous	Not Dangerous	Not Dangerous
EPA-1613 Dioxin Teq	ng/kg	-	12.8/1,680[b]	14	5.7	8.34	1
Chromium (VI)	mg/kg	-	19.0	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)
TCLP VOCs							
Pyridine	ug/L	5000	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
N-Nitrosodimethylamine	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Phenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Aniline	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Bis(2-Chloroethyl)Ether	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2-Chlorophenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
1,3-Dichlorobenzene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
1,4-Dichlorobenzene	ug/L	7500	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Benzyl Alcohol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
1,2-Dichlorobenzene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2-Methylphenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Bis(2-Chloroisopropyl)Ether	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
3&4-Methylphenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
N-Nitroso-Di-N-Propylamine	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Hexachloroethane	ug/L	3000	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Nitrobenzene	ug/L	2000	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Isophorone	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2-Nitrophenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2,4-Dimethylphenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Benzoic Acid	ug/L	-	-	ND(<10)	ND(<10)	ND(<10)	ND(<10)
Bis(2-Chloroethoxy)Methane	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2,4-Dichlorophenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
1,2,4-Trichlorobenzene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Naphthalene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
4-Chloroaniline	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2,6-Dichlorophenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Hexachlorobutadiene	ug/L	500	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
4-Chloro-3-Methylphenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2-Methylnaphthalene	ug/L	-	-	ND(<2.0)	ND(<2.0)	9.8	ND(<2.0)
1-Methylnaphthalene	ug/L	-	-	ND(<2.0)	ND(<2.0)	13	ND(<2.0)
Hexachlorocyclopentadiene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2,4,6-Trichlorophenol	ug/L	2000	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2,4,5-Trichlorophenol	ug/L	400000	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2-Chloronaphthalene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2-Nitroaniline	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Acenaphthylene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Dimethylphthalate	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2,6-Dinitrotoluene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Acenaphthene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
3-Nitroaniline	ug/L	-	-	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)
2,4-Dinitrophenol	ug/L	-	-	ND(<10)	ND(<10)	ND(<10)	ND(<10)
4-Nitrophenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Dibenzofuran	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2,4-Dinitrotoluene	ug/L	130	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
2,3,4,6-Tetrachlorophenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Diethylphthalate	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Fluorene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
4-Chlorophenyl-Phenylether	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)

Table 2. WR Extended List Soil Sample Analytical Results - SWMU-55

Sample ID		Dangerous Waste Toxicity Characteristic:	MTCA Method A Cleanup Level:	Plot 14 TP 2 WR	Plot 15 TP 2 WR	Plot 17 TP 1 WR	Plot 17 TP 2 WR
4-Nitroaniline	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
4,6-Dinitro-2-Methylphenol	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
N-Nitrosodiphenylamine	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Azobenzene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
4-Bromophenyl-Phenylether	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Hexachlorobenzene	ug/L	130	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Pentachlorophenol	ug/L	100000	-	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)
Phenanthrene	ug/L	-	-	ND(<2.0)	ND(<2.0)	2.8	ND(<2.0)
Anthracene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Carbazole	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Di-N-Butylphthalate	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Fluoranthene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Pyrene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Butylbenzylphthalate	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Benzo[A]Anthrancene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Chrysene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Bis(2-Ethylhexyl)Phthalate	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	20
Di-N-Octylphthalate	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Benzo[B]Fluoranthene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Benzo[K]Fluoranthene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Benzo[A]Pyrene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Indeno[1,2,3-Cd]Pyrene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Dibenz[A,H]Anthrancene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
Benzo[G,H,I]Perylene	ug/L	-	-	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2.0)
TCLP SVOCs							
Vinyl Chloride (ZHE)	mg/L	0.2	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)
Carbon Tetrachloride (ZHE)	mg/L	0.5	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)
1,1-Dichloroethene (ZHE)	mg/L	-	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)
2-Butanone (ZHE)	mg/L	-	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)
Chloroform (ZHE)	mg/L	6	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)
1,2-Dichloroethane (ZHE)	mg/L	0.5	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)
Benzene (ZHE)	mg/L	0.5	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)
Trichloroethene (ZHE)	mg/L	-	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)
Tetrachloroethylene (ZHE)	mg/L	0.7	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)
Chlorobenzene (ZHE)	mg/L	100	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)
1,4-Dichlorobenzne (ZHE)	mg/L	7.5	-	ND-H (<0.0050)	ND-H (<0.0050)	ND (<0.0050)	ND (<0.0050)

[a] - Polychlorinated biphenyls (PCB) constituents added and reported as a total.

[b] - Method B/Method C clean up level from Ecology CLARC database

ND-H (<0.0050)- indicates analyte was not detected at level above reporting limit (shown in parentheses), and was analyzed out of hold time by one day.

ND - indicates analyte was not detected at level above reporting limit (shown in parentheses)

All samples collected using EPA Method 5035A

Table 3. CS Soil Sample Analytical Results - SWMU-55

Sample ID	Date	NWTPH-Gx Volatile Range mg/kg	NWTPH-Dx Diesel Range mg/kg	NWTPH-Dx Oil Range mg/kg	EPA-8021 Benzene mg/kg	EPA-8021 Toluene mg/kg	EPA-8021 Ethylbenzene mg/kg	EPA-8021 Xylenes mg/kg	Soil pH
	MTCA Method A Cleanup Level:	100/30[a]	2,000	2,000	0.03	7	6	9	
Plot 13 TP 1 CS 7 ft	6/8/2017	20	230	340	ND(<0.03)	ND(<0.050)	0.056	ND(<0.02)	NA
Plot 13 TP 2 CS 9.5 ft	6/8/2017	ND(<3.0)	ND(<25)	ND(<50)	**0.052**	0.056	0.054	ND(<0.02)	NA
Plot 14 TP 1 CS 9.5 ft	6/8/2017	ND(<3.0)	36	56	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 14 TP 2 CS 6 ft	6/8/2017	ND(<3.0)	ND(<25)	ND(<50)	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 14 TP 3 CS 9 ft	6/8/2017	ND(<3.0)	55	160	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 15 TP 1 CS 9 ft	6/8/2017	15	120	100	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 15 TP 2 CS 8 ft	6/8/2017	7.6	300	320	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 16E TP 1 CS 9 ft	6/12/2017	4.3	330	400	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 16E TP 2 CS 15 ft	6/12/2017	ND(<3.0)	60	33	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 16W TP 1 CS 14 ft	6/12/2017	ND(<3.0)	100	120	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 16W TP 2 CS 10 ft	6/12/2017	ND(<3.0)	58	110	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 17 TP 1 CS 8 ft	6/12/2017	ND(<3.0)	ND(<25)	62	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 17 TP 2 CS 11 ft	6/12/2017	ND(<3.0)	1,800	**2,700**	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 18 TP 1 CS 8 ft	6/12/2017	ND(<3.0)	ND(<25)	ND(<50)	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
Plot 18 TP 2 CS 8 ft	6/12/2017	ND(<3.0)	45	79	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
WES-DUP-1 (Dup of Plot 16E TP 2 CS 15 ft)	6/12/2017	ND(<3.0)	61	110	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA
WES-DUP-3 (Dup of Plot 18 TP 2 CS 8 ft)	6/12/2017	ND(<3.0)	52	87	ND(<0.03)	ND(<0.050)	ND(<0.050)	ND(<0.02)	NA

[a] - Cleanup level dependent on BTEX concentrations

ND - indicates analyte was not detected at level above reporting limit (shown in parentheses)

BOLD - indicates that the concentration in the sample exceeds the MTCA Method A target cleanup levels

All samples collected using EPA Method 5035A

Table 4. VPH/EPH Soil Sample Analytical Results - SWMU-55

Sample ID	Units	Method	MTCA Method A Cleanup Level:	Plot 14 TP 4 2ft	Plot 14 TP 4 4ft	Plot 14 TP 6 ft	Plot 14 TP 4 8 ft	Plot 14 TP 4 10 ft	Plot 14 TP 5 2 ft	Plot 14 TP 5 4 ft	Plot 14 TP 5 6 ft	Plot 14 TP 5 8 ft	Plot 14 TP 10 ft
				11/15/2017	11/15/2017	11/15/2017	11/15/2017	11/15/2017	11/15/2017	11/15/2017	11/15/2017	11/15/2017	11/15/2017
Benzene	mg/kg	EPA 8021	0.03	**0.075**	**0.077**	ND(<0.03)	ND(<0.03)	ND(<0.03)	**0.099**	**0.47**	ND(<0.03)	ND(<0.03)	ND(<0.03)
Toluene	mg/kg	EPA 8021	7	0.24	ND(<0.03)	ND(<0.05)	ND(<0.05)	ND(<0.05)	0.069	1.4	ND(<0.03)	ND(<0.03)	ND(<0.03)
Ethylbenzene	mg/kg	EPA 8021	6	0.19	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	0.67	ND(<0.05)	ND(<0.05)	ND(<0.05)
Xylenes	mg/kg	EPA 8021	9	0.91	0.25	ND(<0.20)	ND(<0.20)	ND(<0.20)	0.26	2.7	ND(<0.20)	ND(<0.20)	ND(<0.20)
Methyl T-Butyl Ether	mg/kg	EPA 8021	0.1	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)
Hexane	mg/kg	NWVPH	-	ND(<0.20)	ND(<0.20)	ND(<0.20)	ND(<0.20)	ND(<0.20)	ND(<0.20)	ND(<0.20)	ND(<0.20)	ND(<0.20)	ND(<0.20)
C5-C6 Aliphatics	mg/kg	NWVPH	-	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)
>C6-C8 Aliphatics	mg/kg	NWVPH	-	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	8.7	ND(<5.0)	ND(<5.0)	ND(<5.0)
>C8-C10 Aliphatics	mg/kg	NWVPH	-	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	24	ND(<5.0)	ND(<5.0)	ND(<5.0)
>C8-C10 Aromatics	mg/kg	NWVPH	-	5.3	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	25	ND(<5.0)	ND(<5.0)	ND(<5.0)
>C10-C12 Aliphatics	mg/kg	NWEPH	-	ND(<5.0)	ND(<10.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<10.0)	470	ND(<5.0)	ND(<5.0)	ND(<5.0)
>C12-C16 Aliphatics	mg/kg	NWEPH	-	470	970	ND(<5.0)	26	ND(<5.0)	720	2700	53	12	ND(<5.0)
>C16-C21 Aliphatics	mg/kg	NWEPH	-	2000	3100	14	52	ND(<5.0)	2800	5000	97	27	ND(<5.0)
>C21-C34 Aliphatics	mg/kg	NWEPH	-	5800	7700	48	120	ND(<5.0)	7700	12000	210	71	ND(<5.0)
>C10-C12 Aromatics	mg/kg	NWEPH	-	ND(<25.0)	ND(<25.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<25.0)	ND(<25.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)
>C12-C16 Aromatics	mg/kg	NWEPH	-	ND(<25.0)	ND(<25.0)	ND(<5.0)	ND(<5.0)	ND(<5.0)	ND(<25.0)	550	13	ND(<5.0)	ND(<5.0)
>C16-C21 Aromatics	mg/kg	NWEPH	-	1400	2100	11	30	ND(<5.0)	2000	4700	98	25	ND(<5.0)
>C21-C34 Aromatics	mg/kg	NWEPH	-	6000	9700	53	88	ND(<5.0)	8900	14000	260	93	ND(<5.0)
Naphthalene	mg/kg	EPA 8270 SIM	5	0.14	0.26	ND(<0.02)	ND(<0.02)	ND(<0.02)	0.11	2.2	0.033	ND(<0.02)	ND(<0.02)
2-Methylnapthalene	mg/kg	EPA 8270 SIM	5	0.29	0.92	ND(<0.02)	ND(<0.02)	ND(<0.02)	0.31	**7.8**	0.15	ND(<0.02)	ND(<0.02)
1-Methylnaphthalene	mg/kg	EPA 8270 SIM	5	0.28	0.57	ND(<0.02)	ND(<0.02)	ND(<0.02)	0.19	**7.5**	0.17	ND(<0.02)	ND(<0.02)
Acenaphthylene	mg/kg	EPA 8270 SIM		ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)
Acenaphthene	mg/kg	EPA 8270 SIM		0.12	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	2.1	0.087	ND(<0.02)	ND(<0.02)
Fluorene	mg/kg	EPA 8270 SIM		ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)
Phenanthrene	mg/kg	EPA 8270 SIM		ND(<0.02)	1.2	0.07	0.025	ND(<0.02)	0.39	12	0.55	0.055	ND(<0.02)
Anthracene	mg/kg	EPA 8270 SIM		ND(<0.02)	0.35	ND(<0.02)	ND(<0.02)	ND(<0.02)	0.34	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)
Fluoranthene	mg/kg	EPA 8270 SIM		ND(<0.02)	ND(<0.02)	0.031	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	0.24	ND(<0.02)	ND(<0.02)
Pyrene	mg/kg	EPA 8270 SIM		1.9	2.6	0.23	0.083	ND(<0.02)	1.1	28	1.5	0.15	ND(<0.02)
Benzo[A]Anthracene	mg/kg	EPA 8270 SIM		ND(<0.02)	1.9	0.16	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	0.87	ND(<0.02)	ND(<0.02)
Chrysene	mg/kg	EPA 8270 SIM		8.4	2.9	ND(<0.02)	ND(<0.02)	ND(<0.02)	4.7	43	ND(<0.02)	ND(<0.02)	ND(<0.02)
Benzo[B]Fluoranthene	mg/kg	EPA 8270 SIM		ND(<0.02)	ND(<0.02)	0.13	ND(<0.02)	ND(<0.02)	ND(<0.02)	10	0.71	0.088	ND(<0.02)
Benzo[K]Fluoranthene	mg/kg	EPA 8270 SIM		ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)
Benzo[A]Pyrene	mg/kg	EPA 8270 SIM		4.1	3.1	0.21	0.08	ND(<0.02)	2.8	15	0.89	0.13	ND(<0.02)
Indeno[1,2,3-Cd]Pyrene	mg/kg	EPA 8270 SIM		ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	0.15	ND(<0.02)	ND(<0.02)
Dibenz[A,H]Anthrancene	mg/kg	EPA 8270 SIM		ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)
Benzo[G,H,I]Perylene	mg/kg	EPA 8270 SIM		2.4	1.9	0.17	0.059	ND(<0.02)	2.3	16	0.58	0.074	ND(<0.02)
Total cPAH Equivalent (TEq)	mg/kg	-	0.1	**4.189**	**3.323**	**0.2421**	**0.0851**	0.0151	**2.852**	**16.434**	**1.0651**	**0.1429**	0.0151

BOLD - indicates that the concentration in the sample exceeds the MTCA Method A target cleanup levels

ND - indicates analyte was not detected at level above reporting limit (shown in parentheses)

All samples collected using EPA Method 5035A

Photo 1. A view of Plot 13 Test Pit 2.

Photo 2. A view of Plot 15 Test Pit 2. Note the salt-and-pepper strata at 2 ft (arrow).

Photo 3. A view of Plot 16W Test Pit 1.

Photo 4. A view of Plot 18 Test Pit 2.

Prepared for: Shell PSR	Prepared by: whatcom ENVIRONMENTAL	SWMU-55 Test Pits	07/17/2017	**Photograph Log**

APPENDIX A

Test Pit Logs

Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 1
Location: Plot 13
Date Completed: 6/8/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 7.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Silty sand with coarse to fine gravel and organics, dark brown, loose, moist.	0	0.0	SS	
1 ft	Silty sand with coarse to fine gravel and organics, dark brown, loose, moist.	1	0.0	SS	
2 ft	Silty sand with coarse to fine gravel and organics, dark brown, loose, moist.	2	4.5	SS	
3 ft	Silty sand with coarse to fine gravel and organics, dark brown, loose, moist.	3	8.6	SS	
4 ft	Silty fine to medium sand with coarse to fine gravel, dark brown, loose, moist.	4	9.7	MS	
5 ft	Silty fine to medium sand with coarse to fine gravel, dark brown, loose, moist.	5	9.2	MS	
6 ft	Silty fine to medium sand with clay and fine gravel, gray to brown, loose, moist	6	179.3	MS	
7 ft	Clayey silty sand, light brown, elastic, moist	7	52.1	SS	7 ft

Composite Sample Collection Depths
Discrete Soil Sample Collection Depth

WHATCOM ENVIRONMENTAL SERVICES INC.

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NS = No Sheen; VSS = Very Slight Sheen; SS = Slight Sheen; MS = Moderate Sheen; HS = Heavy Sheen

Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 2
Location: Plot 13
Date Completed: 6/8/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 9.5 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft to 1 ft	Silty sand with organics, dark brown, loose, moist.	1	5.0	NS	
1 ft to 2.5 ft	Silty sand with organics and fine gravel, dark brown, loose, moist.	2.5	11.6	SS	
3 ft	Silty sand with organics and fine gravel, dark brown, loose, moist.	3	7.4	SS	
4 ft	Clayey fine to medium sand with fine gravel, dark brown, loose, moist.	4	17.7	SS	
4 ft to 6 ft	Clayey fine to medium sand with fine gravel and organics, dark brown, loose, moist.	6	23.0	MS	
7 ft	Silty fine sand with fine gravel, dark brown, loose, moist.	7	29.0	SS	
8 ft	Silty fine sand with fine gravel, dark brown, loose, moist.	8	17.0	SS	
9 ft	Silty sand with fine gravel and organics, dark brown, loose, moist.	9	32.3	SS	
9.5 ft	Clayey fine to medium sand with fine gravel, gray to brown, elastic, moist.	9.5	1.6	NS	9.5 ft

Composite Sample Collection Depths
Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 1
Location: Plot 14
Date Completed: 6/8/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 9.5 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Medium to coarse sand with silt, fine gravel, and organics, dark brown, loose, moist.	0	0.0	SS	
1 ft	Medium to coarse sand with silt, fine gravel, and organics, dark brown, loose, moist.	1	0.0	SS	
2 ft	Medium to coarse sand with silt, fine gravel, and organics, dark brown, loose, moist.	2	0.3	SS	
3 ft	Medium to coarse sand with silt, fine gravel, and organics, dark brown, loose, moist.	3	0.6	SS	
4 ft	Silty medium to coarse sand with fine gravel and concrete fragments, dark brown to black, loose, moist.	4	3.5	SS	
5 ft	Silty medium to coarse sand with fine gravel and concrete fragments, dark brown to black, loose, moist.	5	38.1	SS	
6 ft	Clean coarse sand, gray to brown, loose, moist.	6	2.2	SS	
7 ft	Clean coarse sand, gray to brown, loose, moist.	7	1.5	SS	
9.5 ft	Clean coarse sand, gray to brown, loose, moist.	9.5	0.8	NS	9.5 ft

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Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 2
Location: Plot 14
Date Completed: 6/8/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 6.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Well-graded sand with fine gravel, and organics, brown, loose, moist.	0	0.8	SS	
1 ft	Well-graded sand with fine gravel, and organics, brown, loose, moist.	1	1.7	SS	
2 ft	Well-graded sand with fine gravel, and organics, brown to black, loose, moist, petroleum odor.	2	4.5	SS	
3 ft	Well-graded sand with fine gravel and organics, dark brown, loose, moist.	3	3.0	SS	
4 ft	Well-graded sand with fine gravel and organics, dark brown, loose, moist.	4	2.9	SS	
5 ft	Well-graded sand with fine gravels and organics, brown to black, loose, moist, petroleum odor.	5	11.0	SS	
6 ft	Silty sand with fine gravel, gray to brown, loose, moist.	6	0.0	SS	6.0 ft

Composite Sample Collection Depths
Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 3
Location: Plot 14
Date Completed: 6/8/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 9.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Well-graded sand with fine gravel and organics, dark brown, loose, moist.	0	0.8	SS	
1 ft	Well-graded sand with fine gravel and organics, dark brown, loose, moist.	1	2.1	NS	
2 ft	Well-graded sand with fine gravel and organics, dark brown, loose, moist.	2	6.2	SS	
3.5 ft	Well-graded sand with fine gravel and organics, dark brown to black, loose, moist, petroleum odor.	3.5	4.1	SS	
4.5 ft	Well-graded sand with fine gravel and organics, dark brown to black, loose, moist, petroleum odor.	4.5	4.8	SS	
5 ft	Clayey medium to coarse sand with fine gravel, gray to brown, loose, moist, petroleum odor.	5	5.8	SS	
6 ft	Clayey medium to coarse sand with fine gravel, gray to brown, loose, moist, petroleum odor.	6	3.0	SS	
6.5 ft	Silty sand with fine gravel and organics, dark brown, loose, moist.	6.5	8.4	SS	
7 ft	Clayey medium to coarse sand with fine gravel, gray to brown, loose, moist, petroleum odor.	7	4.3	SS	
7.5 ft	Silty sand with fine gravel, dark brown, loose, moist, petroleum odor.	7.5	4.3	SS	
8.5 ft	Clayey sand with fine gravel and organics, brown to gray, loose, moist	8.5	2.2	NS	
9 ft	Clayey sand with fine gravel, gray to brown, elastic, moist.	9	0.5	NS	9.0 ft
	Composite Sample Collection Depths				
	Discrete Soil Sample Collection Depth				

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 4
Location: Plot 14
Date Completed: 11/15/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 10.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
Surface to 6 in.	Grass and organics				
6 in to 2 ft	Medium sand with fine gravel, dark brown, loose, moist.	2	4.6	SS	2.0 ft
2 ft to 4 ft	Coarse to medium sand with gravel, dark brown, loose, moist.	4	7.7	SS	4.0 ft
4 ft to 6 ft	Clayey course to medium sand with gravel, gray to brown, firm, moist.	6	5.3	SS	6.0 ft
6 ft to 8 ft	Clayey medium sand with gravel, light brown, firm, dry.	8	3.9	NS	8.0 ft
8 ft to 10 ft	Coarse sand with gravel, brown, loose, dry.	10	0.1	NS	10.0 ft

Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 5
Location: Plot 14
Date Completed: 11/15/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 10.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
Surface to 6 in.	Grass and organics				
6 in to 2 ft	Coarse to medium sand with gravel, dark brown, loose, moist.	2	2.3	SS	2.0 ft
2 ft to 4 ft	Coarse to medium sand with gravel, dark brown, loose, moist. Clay tile pipe fragments noted at 3.5 ft.	4	95.9	SS	4.0 ft
4 ft to 6 ft	Clayey course to medium sand with gravel, light brown, loose, dry.	6	10.4	SS	6.0 ft
6 ft to 8 ft	Clayey course to medium sand with gravel, light brown, loose, dry.	8	2.4	SS	8.0 ft
8 ft to 10 ft	Coarse to medium sand, light brown, loose, dry.	10	0.1	NS	10.0 ft

Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 1
Location: Plot 15
Date Completed: 6/8/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 9.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Medium sand with silt, fine gravel, and organics, dark brown, loose, moist.	0	1.2	NS	
1 ft	Medium sand with silt, fine gravel, and organics, dark brown, loose, moist.	1	45.0	SS	
2 ft to 2.5 ft	Solid strata with comingling of soils above, salt and pepper, very firm, moist.	2	14.7	MS	2.0 ft.
3 ft	Silty sand with comingling of strata above, fine gravel, and organics, dark brown to black, loose, moist.	3	13.4	SS	
4 ft	Silty sand with comingling of 2 ft strata, fine gravel, and organics, with trace catayst beads, and barrel-shaped 1" pellets, dark brown to black, loose, moist.	4	14.1	SS	
5 ft	Silty fine sand with clay, fine gravel, and organics, dark brown to black, loose, moist.	5	220.5	SS	
6 ft	Silty fine sand with clay, fine gravels, and organics, dark brown to black, loose, moist.	6	319.3	SS	
7 ft	Clayey sand with fine gravel, gray to brown, elastic, moist.	7	132.4	HS	
8 ft	Clayey sand with fine gravel, gray to brown, elastic, moist.	8	80.2	HS	
9 ft	Clayey sand with fine gravel, gray to brown, elastic, moist.	9	22.7	SS	9.0 ft

Composite Sample Collection Depths
Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 2
Location: Plot 15
Date Completed: 6/8/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 8.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft to 1 ft	Well-graded sand with fine gravel and organics, light brown, loose, moist.	1	2.8	SS	
2 ft	Well-graded sand with fine gravel and organics, light brown, loose, moist.	2	3.4	SS	
3 ft	Well-graded sand with fine gravel and organics, dark brown to black, loose, moist.	3	3.8	SS	
4 ft	Clayey fine to medium sand with fine gravel, dark brown to black, loose, moist.	4	12.7	SS	
5 ft	Clayey fine to medium sand with fine gravel, dark brown, loose, moist.	5	15.1	MS	
6 ft	Clayey fine to medium sand with fine gravel, dark brown, loose, moist.	6	12.2	SS	
7 ft	Clayey fine to medium sand with fine gravel, dark brown, loose, moist.	7	12.4	SS	
8 ft	Clayey fine sand with fine gravel, gray to brown, elastic, moist.	8	10.6	SS	8.0 ft

Composite Sample Collection Depths
Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 1
Location: Plot 16E
Date Completed: 6/12/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 9.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Silty sand with fine gravel and organics, with trace catalyst beads, dark brown, loose, moist.	0	1.3	NS	
1 ft	Silty sand with fine gravel and organics, with trace catalyst beads, dark brown, loose, moist.	1	3.5	NS	
2 ft	Silty sand with fine gravel and organics, with trace catalyst beads, dark brown, loose, moist.	2	9.2	NS	
3 ft	Silty sand with fine gravel and organics, with trace catalyst beads, dark brown, loose, moist.	3	6.0	NS	
4 ft	Silty sand with fine gravel and organics, with trace catalyst beads, dark brown, loose, moist.	4	9.0	SS	
5 ft	Silty sand with fine gravel, dark brown to gray, loose, moist, petroleum odor.	5	32.9	HS	
6 ft	Silty sand with fine gravel, dark brown to gray, loose, moist, petroleum odor.	6	23.2	SS	
7 ft	Clayey sand with fine gravel, gray to brown, loose to firm, moist, petroleum odor.	7	12.4	MS	
8 ft	Clayey sand with fine gravel, gray to brown, loose to firm, moist, petroleum odor.	8	16.8	HS	
9 ft	Clayey medium to coarse sand with fine gravel, gray to brown, loose, moist.	9	3.2	SS	9.0 ft

Composite Sample Collection Depths
Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 2
Location: Plot 16E
Date Completed: 6/12/17

Sheet: 1 of 2
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 15.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Silty sand with fine gravel, organics, and occasional catalyst beads, dark brown, loose, moist.	0	0.1	SS	
1 ft	Silty sand with fine gravel, organics, and occasional catalyst beads, dark brown, loose, moist.	1	0.1	VSS	
2 ft	Silty sand with fine gravel, organics, and occasional catalyst beads, dark brown, loose, moist.	2	3.0	VSS	
3 ft	Silty sand with fine gravel, dark brown, loose, moist.	3	4.1	SS	
4 ft	Silty sand with fine gravel, dark brown to gray, loose, moist.	4	10.6	MS	
5 ft	Silty sand with fine gravel, dark brown to gray, loose, moist.	5	19.3	MS	
6 ft	Silty sand with fine gravel, dark brown to gray, loose, moist.	6	35.6	MS	Composite
7 ft	Silty sand with fine gravel, dark brown to gray, loose, moist.	7	28.6	MS	
8 ft	Clayey sand with coarse gravel to cobbles, dark brown to gray, loose to firm, moist.	8	22.5	MS	Composite
9 ft	Clayey sand with coarse gravel to cobbles, dark brown to gray, loose to firm, moist.	9	21.7	MS	
10 ft	Clayey sand with coarse gravel to cobbles, dark brown to gray, loose to firm, moist.	10	25.6	MS	Composite
11 ft	Clayey sand with coarse gravel to cobbles, dark brown to gray, loose to firm, moist.	11	22.1	MS	
12 ft	Clayey sand with coarse gravel to cobbles, dark brown to gray, loose to firm, moist.	12	17.9	MS	

(grey)	Composite Sample Collection Depths
(black)	Discrete Soil Sample Collection Depth

WHATCOM ENVIRONMENTAL SERVICES INC.

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NS = No Sheen; VSS = Very Slight Sheen; SS = Slight Sheen; MS = Moderate Sheen; HS = Heavy Sheen

Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 2
Location: Plot 16E
Date Completed: 6/12/17

Sheet: 2 of 2
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 15.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
13 ft	Silty sand with fine gravel, light brown to gray, loose, moist.	13	6.7	MS	
14 ft	Silty sand with fine gravel, light brown to gray, loose, moist.	14	12.9	MS	
15 ft	Silty sand with fine gravel, light brown to gray, loose, moist.	15	2.7	SS	15.0 ft

	Composite Sample Collection Depths
	Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 1
Location: Plot 16W
Date Completed: 6/12/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 14.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Silty sand with fine gravel, light brown, loose, moist.	0	0.7	SS	
1 ft	Silty sand with fine gravel, light brown, loose, moist.	1	1.5	SS	
2 ft	Silty sand with fine gravel, dark brown to black, loose, moist.	2	10.1	NS	
3 ft	Silty sand with fine gravel, dark brown to black, loose, moist.	3	4.2	VSS	
4 ft	Silty fine sand with light gray silt interspersed, with gravel, dark gray, loose, moist.	4	6.9	NS	
5 ft	Silty fine sand with light gray silt interspersed, with gravel, dark gray, loose, moist.	5	45.6	MS	
6 ft	Silty fine sand with light gray silt interspersed, with gravel, dark gray, loose, moist.	6	42.5	MS	
7 ft	Clayey fine sand, light gray to light brown, elastic, moist.	7	28.5	HS	
8 ft	Clayey fine sand, light gray to light brown, elastic, moist.	8	26.9	HS	
9 ft	Clayey fine sand with fine gravel, blue-gray, elastic, moist.	9	43.7	HS	
10 ft	Clayey fine sand with fine gravel, blue-gray, elastic, moist.	10	29.7	HS	
11 ft	Clean coarse sand, olive green to gray, loose, moist.	11	9.8	MS	
12 ft	Clean coarse sand, olive green to gray, loose, moist.	12	8.1	HS	
13 ft	Medium to coarse sand with fine gravel, olive green to gray, loose, moist	13	3.4	SS	
14 ft	Medium to coarse sand with fine gravel, olive green to gray, loose, moist	14	1.8	SS	14.0 ft
	Composite Sample Collection Depths				
	Discrete Soil Sample Collection Depth				

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 2
Location: Plot 16W
Date Completed: 6/12/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 10.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Silty fine sand with fine gravel and organics, dark brown, loose, moist.	0	1.2	NS	
1 ft	Silty fine sand with fine gravel and organics, dark brown, loose, moist.	1	3.1	VSS	
2 ft	Silty fine sand with fine gravel and organics, dark brown, loose, moist.	2	4.1	VSS	
3.5 ft	Silty fine sand with fine gravel, dark brown, loose, moist.	3.5	1.7	SS	
4 ft	Silty fine sand with coarse gravel to cobbles, dark brown to gray, loose, moist.	4	0.9	SS	
5 ft	Clayey fine sand, light brown to gray, loose to firm, moist.	5	0.7	SS	
6 ft	Clayey fine sand, light brown to gray, loose to firm, moist.	6	0.8	SS	
7 ft	Clayey fine sand, light brown to gray, loose to firm, moist.	7	0.8	SS	
8 ft	Clayey fine sand, light brown to gray, loose to firm, moist.	8	0.9	SS	
9 ft	Clayey fine sand, light brown to gray, loose to firm, moist.	9	0.8	VSS	
10 ft	Clayey fine sand, light brown to gray, loose to firm, moist.	10	0.7	NS	10.0 ft

Composite Sample Collection Depths
Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 1
Location: Plot 17
Date Completed: 6/12/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 8.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Silty fine sand with gravel and catalyst beads, dark brown, loose, moist.	0	0.5	VSS	
1 ft	Silty fine sand with gravel and catalyst beads, dark brown, loose, moist.	1	1.7	VSS	
2 ft	Silty fine sand with gravel and catalyst beads, dark brown, loose, moist.	2	2.0	VSS	
3 ft	Silty fine sand with gravel and catalyst beads, dark brown, loose, moist.	3	2.1	VSS	
4 ft	Silty fine sand with gravel and catalyst beads, dark brown, loose, moist.	4	2.1	VSS	
5 ft	Silty fine sand with gravel and catalyst beads, dark brown, loose, moist.	5	1.7	VSS	
6 ft	Silty fine sand with fine gravel, light brown, loose, moist.	6	0.7	NS	
7 ft	Silty fine sand with fine gravel, light brown, loose, moist.	7	0.7	NS	
8 ft	Silty fine to medium sand with fine gravel, light brown, loose, moist.	8	0.5	NS	8.0 ft

Composite Sample Collection Depths
Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 2
Location: Plot 17
Date Completed: 6/12/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 11.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Silty fine sand with fine gravel and catalyst beads, dark brown, loose, moist.	0	0.0	NS	
1 ft	Silty fine sand with fine gravel and catalyst beads, dark brown, loose, moist.	1	1.7	VSS	
2 ft	Silty fine sand with fine gravel and catalyst beads, dark brown, loose, moist.	2	2.0	VSS	
3 ft	Silty fine sand with fine gravel and catalyst beads, dark brown, loose, moist.	3	3.3	VSS	
4 ft	Silty fine sand with fine gravel, blue-gray to dark brown, loose, moist.	4	32.2	MS	
5 ft	Silty fine sand with gravel, gray to light brown, loose, moist.	5	38.1	HS	
6 ft	Clayey fine sand with fine gravel, gray to light brown, loose, moist.	6	25.6	MS	
7 ft	Clayey fine sand with fine gravel, gray to light brown, loose, moist.	7	24.9	HS	
8 ft	Clayey fine sand with fine gravel, gray to light brown, loose, moist.	8	14.6	MS	
9 ft	Clayey fine sand with fine gravel, gray to light brown, loose, moist.	9	12.4	SS	
10 ft	Clayey fine sand with fine gravel, gray to light brown, loose, moist.	10	9.1	SS	
11 ft	Clayey fine sand with fine gravel, light brown, loose to firm, moist.	11	6.2	SS	11.0 ft
	Composite Sample Collection Depths				
	Discrete Soil Sample Collection Depth				

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 1
Location: Plot 18
Date Completed: 6/12/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 8.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Silty fine sand with fine gravel, dark brown, loose, moist.	0	1.9	SS	
1 ft	Silty fine sand with fine gravel, dark brown, loose, moist.	1	3.8	SS	
2.5 ft	Silty fine sand with fine gravel, dark brown, loose, moist.	2.5	4.3	SS	
3 ft	Silty fine sand with fine gravel, dark brown, loose, moist.	3	2.9	VSS	
4 ft	Silty fine sand with fine gravel, dark brown, loose, moist.	4	5.2	SS	
5 ft	Fine to medium sand with coarse gravel to cobbles, olive gray, loose, moist.	5	4.0	SS	
6 ft	Clayey fine sand with fine gravel, light gray to light brown, loose, moist.	6	1.9	VSS	
7 ft	Sandy clay with fine gravel, light gray to light brown mottled, plastic, moist.	7	1.6	NS	
8 ft	Sandy clay with fine gravel, light gray to light brown mottled, plastic, moist.	8	1.6	NS	8.0 ft

Composite Sample Collection Depths
Discrete Soil Sample Collection Depth

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Test Pit Log

Project: SWMU 55 Test Pits
Client: Shell PSR
Test Pit Number: 2
Location: Plot 18
Date Completed: 6/12/17

Sheet: 1 of 1
Excavated by: WRS
Logged by: Britta Nelson
First Encountered Water: N/A
Total Depth: 8.0 ft

Depth	Description	Screening Depth	PID (ppm)	Sheen	Sample
0 ft	Silty fine sand with fine gravel and organics, light brown, loose, moist.	0	1.0	VSS	
1 ft	Silty fine sand with fine gravel and organics, light brown, loose, moist.	1	7.7	VSS	
2 ft	Silty fine sand with fine gravel and organics, light brown, loose, moist.	2	4.6	VSS	
3 ft	Silty fine sand with gravel, dark brown, loose to firm, moist.	3	8.8	SS	
4 ft	Silty fine sand with gravel, dark brown, loose to firm, moist.	4	9.1	SS	
5 ft	Silty fine sand with gravel, dark brown, loose to firm, moist.	5	23.3	MS	
6 ft	Silty fine sand, light gray to light brown, loose to firm, moist.	6	5.8	SS	
7 ft	Silty fine sand, light gray to light brown, loose to firm, moist.	7	8.0	SS	
8 ft	Silty fine sand, light gray to light brown, loose to firm, moist.	8	1.9	NS	8.0 ft

Composite Sample Collection Depths
Discrete Soil Sample Collection Depth

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APPENDIX B

Laboratory Analytical Data Reports

June 28, 2017

Mr. Harold Cashman
Whatcom Environmental Svcs., Inc.
228 E. Champion St., Suite 101
Bellingham, WA 98225

Dear Mr. Cashman,

On June 14th, 35 samples were received by our laboratory and assigned our laboratory project number EV17060086. The project was identified as your Shell PSR SWMU-55. The sample identification and requested analyses are outlined on the attached chain of custody record.

TCLP Volatiles on ALS samples 7 and 14 were performed one day beyond the recomended 14 day holding time. No other abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan
Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-01
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 8:20:00 AM
CLIENT SAMPLE ID	Plot 13 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**21**	3.0	1	MG/KG	06/19/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**5000**	250	10	MG/KG	06/22/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**8900**	500	10	MG/KG	06/22/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Acetone	EPA-8260	**260**	130	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/21/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/21/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/21/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Benzene	EPA-8260	**6.7**	5.0	1	UG/KG	06/21/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/21/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/21/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-01
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 8:20:00 AM
CLIENT SAMPLE ID	Plot 13 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/21/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/21/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/21/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/21/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-01
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 8:20:00 AM
CLIENT SAMPLE ID	Plot 13 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	610	5	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	560	5	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	6200	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	610	5	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1600	5	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2800	5	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	U	1300	5	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	U	1500	5	UG/KG	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-01
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 8:20:00 AM
CLIENT SAMPLE ID	Plot 13 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	**830**	500	5	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	**2500**	500	5	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1500	5	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	**1200**	500	5	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	**5300**	500	5	UG/KG	06/23/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**2000**	500	5	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	**3600**	500	5	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	**830**	500	5	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**1100**	500	5	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**2900**	500	5	UG/KG	06/23/2017	PAB
pH	EPA-9045	**6.84**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**2.4**	0.40	20	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**22**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**20**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**110**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	**0.73**	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**580**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**250**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**100**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**160**	0.57	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**10**	5.0	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-01
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 8:20:00 AM
CLIENT SAMPLE ID	Plot 13 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Thallium	EPA-6020	U	5.6	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**320**	3.3	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.092**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**116**	06/19/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**103**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**117**	06/21/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**96.6**	06/22/2017	DLC
Toluene-d8	EPA-8260	**95.9**	06/21/2017	DLC
Toluene-d8	EPA-8260	**94.4**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**112**	06/21/2017	DLC
4-Bromofluorobenzene	EPA-8260	**97.9**	06/22/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**60.7**	06/23/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**58.3**	06/23/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**55.6**	06/23/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**67.1**	06/23/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**84.1**	06/23/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**70.9**	06/23/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-02
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 8:30:00 AM
CLIENT SAMPLE ID	Plot 13 TP1 CS 7ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**20**	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	**0.056**	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**230**	25	1	MG/KG	06/19/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**340**	50	1	MG/KG	06/19/2017	DLC

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**93.8**	06/17/2017	SNC
TFT	EPA-8021	**87.1**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**99.2**	06/19/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-03
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 9:20:00 AM
CLIENT SAMPLE ID	Plot 13 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**26**	3.0	1	MG/KG	06/19/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**4500**	250	10	MG/KG	06/19/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**5000**	500	10	MG/KG	06/19/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**200**	120	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	**6.1**	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-03
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 9:20:00 AM
CLIENT SAMPLE ID	Plot 13 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	**11**	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-03
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 9:20:00 AM
CLIENT SAMPLE ID	Plot 13 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	610	5	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	560	5	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	6200	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	610	5	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1600	5	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2800	5	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	**2000**	1300	5	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	**2700**	1500	5	UG/KG	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	**820**	500	5	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	**1100**	500	5	UG/KG	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-03
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 9:20:00 AM
CLIENT SAMPLE ID	Plot 13 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	**5800**	500	5	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	**1900**	500	5	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	**8100**	500	5	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1500	5	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	**3500**	500	5	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	**10000**	500	5	UG/KG	06/23/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**1800**	500	5	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	**4300**	500	5	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	**820**	500	5	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**1200**	500	5	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**2700**	500	5	UG/KG	06/23/2017	PAB
pH	EPA-9045	**7.34**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.75**	0.10	5	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**7.2**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**7.2**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**150**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**270**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**71**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**33**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**50**	0.57	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	U	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-03
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 9:20:00 AM
CLIENT SAMPLE ID	Plot 13 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.6	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**170**	3.2	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.14**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**109**	06/19/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**116**	06/19/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**96.6**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**96.8**	06/22/2017	DLC
Toluene-d8	EPA-8260	**94.6**	06/22/2017	DLC
Toluene-d8	EPA-8260	**95.2**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**98.9**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**108**	06/22/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**73.7**	06/23/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**73.1**	06/23/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**62.4**	06/23/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**74.7**	06/23/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**93.4**	06/23/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**72.5**	06/23/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-04
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 9:30:00 AM
CLIENT SAMPLE ID	Plot 13 TP2 CS 9.5ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	**0.052**	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	**0.056**	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	**0.054**	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	U	25	1	MG/KG	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	U	50	1	MG/KG	06/15/2017	DLC

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**94.3**	06/17/2017	SNC
TFT	EPA-8021	**88.0**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**83.0**	06/15/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-05
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:45:00 AM
CLIENT SAMPLE ID	Plot 14 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**26**	3.0	1	MG/KG	06/19/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**3400**	250	10	MG/KG	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**4500**	500	10	MG/KG	06/15/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**160**	110	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-05
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:45:00 AM
CLIENT SAMPLE ID	Plot 14 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

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ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-05
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:45:00 AM
CLIENT SAMPLE ID	Plot 14 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	540	5	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	5500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	540	5	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1400	5	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	**1800**	1200	5	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	**3100**	1400	5	UG/KG	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	**590**	500	5	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-05
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:45:00 AM
CLIENT SAMPLE ID	Plot 14 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	**2400**	500	5	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	**1700**	500	5	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	**1400**	500	5	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	**5800**	500	5	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1300	5	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	**4500**	500	5	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	**10000**	500	5	UG/KG	06/23/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**2500**	500	5	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	**5500**	500	5	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	**1200**	500	5	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**1800**	500	5	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**4400**	500	5	UG/KG	06/23/2017	PAB
pH	EPA-9045	**7.33**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**1.1**	0.20	10	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**7.9**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**4.7**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**76**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**200**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**48**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**23**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**71**	0.53	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**5.3**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-05
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:45:00 AM
CLIENT SAMPLE ID	Plot 14 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.2	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**140**	3.0	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.088**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**125**	06/19/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**110**	06/15/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**101**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**98.0**	06/23/2017	DLC
Toluene-d8	EPA-8260	**101**	06/22/2017	DLC
Toluene-d8	EPA-8260	**98.6**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**113**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**98.2**	06/23/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**93.0**	06/23/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**92.6**	06/23/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**83.5**	06/23/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**99.6**	06/23/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**120**	06/23/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**102**	06/23/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

Chromatogram indicates that it is likely that sample contains highly weathered gasoline, an unidentified diesel range product and lube oil.

Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-06
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:40:00 AM
CLIENT SAMPLE ID	Plot 14 TP1 CS 9.5ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**36**	25	1	MG/KG	06/15/2017	DLC
TPH-Diesel Range	NWTPH-DX	U	25	1	MG/KG	06/16/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**56**	50	1	MG/KG	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX	U	50	1	MG/KG	06/16/2017	DLC

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**103**	06/17/2017	SNC
TFT	EPA-8021	**94.2**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**93.6**	06/15/2017	DLC
C25	NWTPH-DX	**99.6**	06/16/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains an unidentified diesel range product and lube oil.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-07
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:10:00 AM
CLIENT SAMPLE ID	Plot 14 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**51**	3.0	1	MG/KG	06/19/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**8000**	500	20	MG/KG	06/19/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**11000**	1000	20	MG/KG	06/19/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**540**	130	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	**140**	98	1	UG/KG	06/23/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	**9.5**	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	**11**	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-07
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:10:00 AM
CLIENT SAMPLE ID	Plot 14 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Carbon Tetrachloride (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
1,1-Dichloroethene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
2-Butanone (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Chloroform (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
1,2-Dichloroethane (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Benzene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Trichloroethene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Tetrachloroethylene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-07
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:10:00 AM
CLIENT SAMPLE ID	Plot 14 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Chlorobenzene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
1,4-Dichlorobenzene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Pyridine	EPA-8270	U	1400	5	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	870	5	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	1300	5	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	1500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	3100	5	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	3200	5	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	850	5	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	770	5	UG/KG	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	1700	5	UG/KG	06/23/2017	PAB
1,2-Dichlorobenzene	EPA-8270	U	760	5	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	1100	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	4100	5	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	1400	5	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	3000	5	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	660	5	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	630	5	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	2300	5	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	2100	5	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	23000	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	3900	5	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	8000	5	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	2300	5	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	U	870	5	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	18000	5	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	5900	5	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	4200	5	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	10000	5	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	U	4900	5	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	U	5700	5	UG/KG	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	800	5	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	1300	5	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	1300	5	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	610	5	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	830	5	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	1400	5	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-07
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:10:00 AM
CLIENT SAMPLE ID	Plot 14 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
2,6-Dinitrotoluene	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	U	920	5	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	19000	5	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	1700	5	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	1800	5	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	700	5	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	1600	5	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	1400	5	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	U	1100	5	UG/KG	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	1300	5	UG/KG	06/23/2017	PAB
4-Nitroaniline	EPA-8270	U	4100	5	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	920	5	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	1100	5	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	1400	5	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	4700	5	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	**3200**	840	5	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	**1500**	750	5	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	3500	5	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	1100	5	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	**1500**	960	5	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	**19000**	960	5	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	730	5	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	5500	5	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	**7200**	830	5	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	**25000**	1000	5	UG/KG	06/23/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	710	5	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	700	5	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	710	5	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**5700**	1300	5	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	**11000**	620	5	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	**1700**	780	5	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**2700**	710	5	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**4500**	1100	5	UG/KG	06/23/2017	PAB
Pyridine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitrosodimethylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Phenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-07
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:10:00 AM
CLIENT SAMPLE ID	Plot 14 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Aniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Chloroethyl)Ether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Chlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,3-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,4-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzyl Alcohol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,2-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Chloroisopropyl)Ether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
3&4-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitroso-Di-N-Propylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachloroethane (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Nitrobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Isophorone (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Nitrophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dimethylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzoic Acid (TCLP)	EPA-8270/1311	U	10	1	UG/L	06/27/2017	PAB
Bis(2-Chloroethoxy)Methane (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,2,4-Trichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Naphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chloroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,6-Dichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorobutadiene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chloro-3-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Methylnaphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1-Methylnaphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorocyclopentadiene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4,6-Trichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4,5-Trichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Chloronaphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Nitroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Acenaphthylene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Dimethylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,6-Dinitrotoluene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Acenaphthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
3-Nitroaniline (TCLP)	EPA-8270/1311	U	5.0	1	UG/L	06/27/2017	PAB
2,4-Dinitrophenol (TCLP)	EPA-8270/1311	U	10	1	UG/L	06/27/2017	PAB
4-Nitrophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-07
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:10:00 AM
CLIENT SAMPLE ID	Plot 14 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibenzofuran (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dinitrotoluene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,3,4,6-Tetrachlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Diethylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Fluorene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chlorophenyl-Phenylether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Nitroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4,6-Dinitro-2-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitrosodiphenylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Azobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Bromophenyl-Phenylether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Pentachlorophenol (TCLP)	EPA-8270/1311	U	5.0	1	UG/L	06/27/2017	PAB
Phenanthrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Carbazole (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Di-N-Butylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Butylbenzylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[A]Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Chrysene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Ethylhexyl)Phthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Di-N-Octylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[B]Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[K]Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[A]Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Indeno[1,2,3-Cd]Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Dibenz[A,H]Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[G,H,I]Perylene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
PCB-1016	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1221	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1232	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1242	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1248	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1254	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1260	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1268	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
Chromium (VI)	EPA-7196	U	5.0	1	MG/KG	06/26/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-07
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:10:00 AM
CLIENT SAMPLE ID	Plot 14 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
pH	EPA-9045	**7.79**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**2.1**	0.40	20	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**19**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**11**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**140**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**330**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**87**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**35**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**87**	0.56	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**34**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Thallium	EPA-6020	U	5.5	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**310**	3.2	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	**0.045**	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.051**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	**0.026**	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**105**	06/19/2017	SNC
C25 20X Dilution	NWTPH-DX w/ SGA	**103**	06/19/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**114**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**100**	06/23/2017	DLC
Toluene-d8	EPA-8260	**106**	06/22/2017	DLC
Toluene-d8	EPA-8260	**97.2**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**127 GS1**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**103**	06/23/2017	DLC
1,2-Dichloroethane-d4	EPA-8260/1311	**108**	06/27/2017	DLC
Toluene-d8	EPA-8260/1311	**98.0**	06/27/2017	DLC
4-Bromofluorobenzene	EPA-8260/1311	**103**	06/27/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**48.7**	06/23/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**45.4**	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-07
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:10:00 AM
CLIENT SAMPLE ID	Plot 14 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
Nitrobenzene-d5 5X Dilution	EPA-8270	**47.9**	06/23/2017	PAB
2-Fluorobiphenyl 5X Dilution 2,4,6-	EPA-8270	**53.2**	06/23/2017	PAB
Tribromophenol 5X Dilution Terphenyl-	EPA-8270	**57.5**	06/23/2017	PAB
d14 5X Dilution	EPA-8270	**63.0**	06/23/2017	PAB
2-Fluorophenol (TCLP)	EPA-8270/1311	**67.4**	06/27/2017	PAB
Phenol-d5 (TCLP)	EPA-8270/1311	**57.9**	06/27/2017	PAB
Nitrobenzene-d5 (TCLP)	EPA-8270/1311	**65.8**	06/27/2017	PAB
2-Fluorobiphenyl (TCLP)	EPA-8270/1311	**42.8**	06/27/2017	PAB
2,4,6-Tribromophenol (TCLP)	EPA-8270/1311	**75.9**	06/27/2017	PAB
Terphenyl-d14 (TCLP)	EPA-8270/1311	**81.7**	06/27/2017	PAB
TCMX	EPA-8082	**46.5**	06/24/2017	PAB
DCB	EPA-8082	**40.7**	06/24/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
GS1 - Surrogate outside of control limits due to matrix effect.
H - Sample analyzed outside of hold time.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-08
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 11:00:00 AM
CLIENT SAMPLE ID	Plot 14 TP2 CS 6ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	U	25	1	MG/KG	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	U	50	1	MG/KG	06/15/2017	DLC

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**111**	06/17/2017	SNC
TFT	EPA-8021	**99.4**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**94.3**	06/15/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-09
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 10:30:00 AM
CLIENT SAMPLE ID	Plot 14 TP3 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**15**	3.0	1	MG/KG	06/19/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**6200**	500	20	MG/KG	06/19/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**9200**	1000	20	MG/KG	06/19/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**240**	130	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	**7.7**	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	**11**	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-09
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 10:30:00 AM
CLIENT SAMPLE ID	Plot 14 TP3 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-09
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 10:30:00 AM
CLIENT SAMPLE ID	Plot 14 TP3 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	550	5	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	510	5	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	5600	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	560	5	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1400	5	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	U	1400	5	UG/KG	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-09
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 10:30:00 AM
CLIENT SAMPLE ID	Plot 14 TP3 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	**2000**	500	5	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	**1400**	500	5	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	**12000**	500	5	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1300	5	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	**4200**	500	5	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	**17000**	500	5	UG/KG	06/23/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**6800**	500	5	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	**16000**	500	5	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	**1400**	500	5	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**2500**	500	5	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**4600**	500	5	UG/KG	06/23/2017	PAB
pH	EPA-9045	**7.63**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.48**	0.020	1	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**22**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**8.8**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**120**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**390**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**85**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**52**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**120**	0.55	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**7.7**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-09
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 10:30:00 AM
CLIENT SAMPLE ID	Plot 14 TP3 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.4	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**240**	3.2	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	**0.032**	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.067**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**112**	06/19/2017	SNC
C25 20X Dilution	NWTPH-DX w/ SGA	**100**	06/19/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**111**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**102**	06/23/2017	DLC
Toluene-d8	EPA-8260	**105**	06/22/2017	DLC
Toluene-d8	EPA-8260	**99.0**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**116**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**100**	06/23/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**67.6**	06/23/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**66.8**	06/23/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**60.4**	06/23/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**70.8**	06/23/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**87.0**	06/23/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**71.7**	06/23/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-10
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 10:35:00 AM
CLIENT SAMPLE ID	Plot 14 TP3 CS 9ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**55**	25	1	MG/KG	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**160**	50	1	MG/KG	06/15/2017	DLC

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**109**	06/17/2017	SNC
TFT	EPA-8021	**99.5**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**100**	06/15/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-11
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:05:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**270**	15	5	MG/KG	06/20/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**7700**	250	10	MG/KG	06/19/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**5500**	500	10	MG/KG	06/19/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**280**	130	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	**140**	95	1	UG/KG	06/23/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	**1400**	5.0	1	UG/KG	06/23/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	**37**	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-11
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:05:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	**2300**	70	1	UG/KG	06/23/2017	DLC
m,p-Xylene	EPA-8260	**7000**	130	1	UG/KG	06/23/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	**3400**	60	1	UG/KG	06/23/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	**20**	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	**44**	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	**1600**	54	1	UG/KG	06/23/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	**4100**	580	10	UG/KG	06/23/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	**12**	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	**16**	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	**1600**	74	1	UG/KG	06/23/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

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CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:05:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	610	5	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	560	5	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	6200	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	610	5	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	**2500**	500	5	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1600	5	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2800	5	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	**12000**	1300	5	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	**15000**	1500	5	UG/KG	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	**2900**	500	5	UG/KG	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-11
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:05:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	**9300**	500	5	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	**6400**	500	5	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1500	5	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	**2300**	500	5	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	**9100**	500	5	UG/KG	06/23/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**1700**	500	5	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	**3000**	500	5	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**780**	500	5	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**1400**	500	5	UG/KG	06/23/2017	PAB
pH	EPA-9045	**7.26**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**1.5**	0.20	10	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**10**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**14**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**100**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**360**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**77**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**48**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**130**	0.57	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**6.5**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-11
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:05:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.6	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**220**	3.3	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	**0.028**	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.073**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT 5X Dilution	NWTPH-GX	**92.7**	06/20/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**121**	06/19/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**119**	06/22/2017	DLC
1,2-Dichloroethane-d4 10X Dilution	EPA-8260	**98.1**	06/23/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**93.8**	06/23/2017	DLC
Toluene-d8	EPA-8260	**94.0**	06/22/2017	DLC
Toluene-d8 10X Dilution	EPA-8260	**107**	06/23/2017	DLC
Toluene-d8	EPA-8260	**84.4**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**117**	06/22/2017	DLC
4-Bromofluorobenzene 10X Dilution	EPA-8260	**100**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**102**	06/23/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**70.7**	06/23/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**73.0**	06/23/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**64.1**	06/23/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**84.8**	06/23/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**105**	06/23/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**64.8**	06/23/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains weathered gasoline, highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-12
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:10:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 2ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**81**	3.0	1	MG/KG	06/20/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**760**	25	1	MG/KG	06/19/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**340**	50	1	MG/KG	06/19/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**530**	130	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	**140**	96	1	UG/KG	06/23/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-12
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:10:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 2ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-12
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:10:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 2ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	580	5	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	530	5	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	5900	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	580	5	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1500	5	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2700	5	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	U	1300	5	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	U	1500	5	UG/KG	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-12
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:10:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 2ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1400	5	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
pH	EPA-9045	**10.5**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.065**	0.020	1	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**3.7**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**11**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**11**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**8.1**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**6.4**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**23**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**4.4**	0.54	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	U	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-12
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:10:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 2ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.4	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**38**	3.1	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	**0.060**	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.040**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**116**	06/20/2017	SNC
C25	NWTPH-DX w/ SGA	**78.5**	06/19/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**109**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**99.3**	06/23/2017	DLC
Toluene-d8	EPA-8260	**103**	06/22/2017	DLC
Toluene-d8	EPA-8260	**95.7**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**123 GS1**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**107**	06/23/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**67.1**	06/23/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**69.4**	06/23/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**77.3**	06/23/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**73.5**	06/23/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**50.2**	06/23/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**79.1**	06/23/2017	PAB

GS1 - Surrogate outside of control limits due to matrix effect.
U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, an unidentified diesel range product and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-13
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:00:00 PM
CLIENT SAMPLE ID	Plot 15 TP1 CS 9ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**15**	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**120**	25	1	MG/KG	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**100**	50	1	MG/KG	06/15/2017	DLC

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**112**	06/17/2017	SNC
TFT	EPA-8021	**108**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**89.7**	06/15/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-14
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 15 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**31**	3.0	1	MG/KG	06/20/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**4700**	250	10	MG/KG	06/16/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**4700**	500	10	MG/KG	06/16/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**110**	87	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

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CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 15 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Carbon Tetrachloride (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
1,1-Dichloroethene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
2-Butanone (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Chloroform (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
1,2-Dichloroethane (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Benzene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Trichloroethene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Tetrachloroethylene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC

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CERTIFICATE OF ANALYSIS

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CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 15 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Chlorobenzene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
1,4-Dichlorobenzene (ZHE)	EPA-8260/1311	ND- H	0.0050	1	MG/L	06/27/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	640	5	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	740	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1500	5	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	1600	5	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	820	5	UG/KG	06/23/2017	PAB
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	540	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	2000	5	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	680	5	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1500	5	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	1100	5	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	1000	5	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	11000	5	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1900	5	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	3900	5	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	1100	5	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	9100	5	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	2900	5	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	5200	5	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	U	2800	5	UG/KG	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	640	5	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	630	5	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	510	5	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	680	5	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

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CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 15 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
2,6-Dinitrotoluene	EPA-8270	U	600	5	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	9300	5	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	850	5	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	870	5	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	520	5	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	800	5	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	670	5	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	U	560	5	UG/KG	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	660	5	UG/KG	06/23/2017	PAB
4-Nitroaniline	EPA-8270	U	2000	5	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	550	5	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	710	5	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	580	5	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	580	5	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	**930**	500	5	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	**750**	500	5	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	1700	5	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	540	5	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	**1700**	500	5	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	2700	5	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	**3600**	500	5	UG/KG	06/23/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**800**	670	5	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	**1800**	500	5	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	500	5	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**540**	500	5	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**900**	550	5	UG/KG	06/23/2017	PAB
Pyridine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitrosodimethylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Phenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB

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CERTIFICATE OF ANALYSIS

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CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 15 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Aniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Chloroethyl)Ether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Chlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,3-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,4-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzyl Alcohol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,2-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Chloroisopropyl)Ether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
3&4-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitroso-Di-N-Propylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachloroethane (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Nitrobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Isophorone (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Nitrophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dimethylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzoic Acid (TCLP)	EPA-8270/1311	U	10	1	UG/L	06/27/2017	PAB
Bis(2-Chloroethoxy)Methane (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,2,4-Trichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Naphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chloroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,6-Dichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorobutadiene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chloro-3-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Methylnaphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1-Methylnaphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorocyclopentadiene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4,6-Trichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4,5-Trichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Chloronaphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Nitroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Acenaphthylene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Dimethylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,6-Dinitrotoluene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Acenaphthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
3-Nitroaniline (TCLP)	EPA-8270/1311	U	5.0	1	UG/L	06/27/2017	PAB
2,4-Dinitrophenol (TCLP)	EPA-8270/1311	U	10	1	UG/L	06/27/2017	PAB
4-Nitrophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB

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ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-14
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 15 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibenzofuran (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dinitrotoluene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,3,4,6-Tetrachlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Diethylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Fluorene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chlorophenyl-Phenylether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Nitroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4,6-Dinitro-2-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitrosodiphenylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Azobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Bromophenyl-Phenylether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Pentachlorophenol (TCLP)	EPA-8270/1311	U	5.0	1	UG/L	06/27/2017	PAB
Phenanthrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Carbazole (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Di-N-Butylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Butylbenzylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[A]Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Chrysene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Ethylhexyl)Phthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Di-N-Octylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[B]Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[K]Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[A]Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Indeno[1,2,3-Cd]Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Dibenz[A,H]Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[G,H,I]Perylene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
PCB-1016	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1221	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1232	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1242	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1248	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1254	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1260	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
PCB-1268	EPA-8082	U	0.10	1	MG/KG	06/24/2017	PAB
Chromium (VI)	EPA-7196	U	5.0	1	MG/KG	06/26/2017	RAL

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CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 15 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
pH	EPA-9045	**7.67**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.95**	0.20	10	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**7.6**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**8.9**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**110**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**260**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**56**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**31**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**96**	0.55	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**8.6**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Thallium	EPA-6020	U	5.4	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**180**	3.1	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	**0.025**	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.069**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**111**	06/20/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**80.3**	06/16/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**108**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**99.7**	06/23/2017	DLC
Toluene-d8	EPA-8260	**96.1**	06/22/2017	DLC
Toluene-d8	EPA-8260	**88.1**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**105**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**97.9**	06/23/2017	DLC
1,2-Dichloroethane-d4	EPA-8260/1311	**107**	06/27/2017	DLC
Toluene-d8	EPA-8260/1311	**99.0**	06/27/2017	DLC
4-Bromofluorobenzene	EPA-8260/1311	**100**	06/27/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**45.1**	06/23/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**47.0**	06/23/2017	PAB

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CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-14
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 15 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
Nitrobenzene-d5 5X Dilution	EPA-8270	**50.5**	06/23/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**60.1**	06/23/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**69.6**	06/23/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**66.2**	06/23/2017	PAB
2-Fluorophenol (TCLP)	EPA-8270/1311	**64.1**	06/27/2017	PAB
Phenol-d5 (TCLP)	EPA-8270/1311	**56.4**	06/27/2017	PAB
Nitrobenzene-d5 (TCLP)	EPA-8270/1311	**64.8**	06/27/2017	PAB
2-Fluorobiphenyl (TCLP)	EPA-8270/1311	**45.3**	06/27/2017	PAB
2,4,6-Tribromophenol (TCLP)	EPA-8270/1311	**75.1**	06/27/2017	PAB
Terphenyl-d14 (TCLP)	EPA-8270/1311	**78.4**	06/27/2017	PAB
TCMX	EPA-8082	**46.4**	06/24/2017	PAB
DCB	EPA-8082	**39.0**	06/24/2017	PAB

H - Sample analyzed outside of hold time.
U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-15
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/8/2017 2:45:00 PM
CLIENT SAMPLE ID	Plot 15 TP2 CS 8ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**7.6**	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**300**	25	1	MG/KG	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**320**	50	1	MG/KG	06/15/2017	DLC

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**106**	06/17/2017	SNC
TFT	EPA-8021	**102**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**97.2**	06/15/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-16
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:45:00 AM
CLIENT SAMPLE ID	Plot 16E TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**53**	3.0	1	MG/KG	06/20/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**1300**	120	5	MG/KG	06/16/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**1300**	250	5	MG/KG	06/16/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**57 E**	50	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	**14**	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-16
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:45:00 AM
CLIENT SAMPLE ID	Plot 16E TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	200	1	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-16
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:45:00 AM
CLIENT SAMPLE ID	Plot 16E TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	110	1	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	1100	1	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	500	1	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	110	1	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	1000	1	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	290	1	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	500	1	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	500	1	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	**420**	280	1	UG/KG	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	**190**	100	1	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	1000	1	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-16
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:45:00 AM
CLIENT SAMPLE ID	Plot 16E TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	500	1	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	**1100**	100	1	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	**1800**	100	1	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	270	1	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	**670**	100	1	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	**3000**	100	1	UG/KG	06/23/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**490**	100	1	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	**1800**	100	1	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	**120**	100	1	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**230**	100	1	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**290**	100	1	UG/KG	06/23/2017	PAB
pH	EPA-9045	**8.76**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.18**	0.020	1	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**0.68**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**3.7**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**100**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**150**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**49**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**62**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**110**	0.50	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	U	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-16
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:45:00 AM
CLIENT SAMPLE ID	Plot 16E TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	4.9	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**78**	2.9	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.27**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**120**	06/20/2017	SNC
C25 5X Dilution	NWTPH-DX w/ SGA	**123**	06/16/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**101**	06/22/2017	DLC
Toluene-d8	EPA-8260	**85.2**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**108**	06/22/2017	DLC
2-Fluorophenol	EPA-8270	**77.7**	06/23/2017	PAB
Phenol-d5	EPA-8270	**77.8**	06/23/2017	PAB
Nitrobenzene-d5	EPA-8270	**67.6**	06/23/2017	PAB
2-Fluorobiphenyl	EPA-8270	**80.9**	06/23/2017	PAB
2,4,6-Tribromophenol	EPA-8270	**94.7**	06/23/2017	PAB
Terphenyl-d14	EPA-8270	**70.5**	06/23/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
E - Reported result is an estimate because it exceeds the calibration range.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-17
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:40:00 AM
CLIENT SAMPLE ID	Plot 16E TP1 CS 9ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**4.3**	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**330**	25	1	MG/KG	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**400**	50	1	MG/KG	06/15/2017	DLC

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**109**	06/17/2017	SNC
TFT	EPA-8021	**98.4**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**87.9**	06/15/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-18
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 9:45:00 AM
CLIENT SAMPLE ID	Plot 16E TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**38**	3.0	1	MG/KG	06/20/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**2500**	250	10	MG/KG	06/19/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**3000**	500	10	MG/KG	06/19/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**150 E**	50	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-18
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 9:45:00 AM
CLIENT SAMPLE ID	Plot 16E TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	200	1	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-18
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 9:45:00 AM
CLIENT SAMPLE ID	Plot 16E TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	110	1	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	1100	1	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	500	1	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	110	1	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	1000	1	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	290	1	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	500	1	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	510	1	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	**2200**	250	1	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	**4500**	1400	5	UG/KG	06/27/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	**710**	100	1	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	1000	1	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	**1000**	100	1	UG/KG	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-18
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 9:45:00 AM
CLIENT SAMPLE ID	Plot 16E TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	500	1	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	**3100**	100	1	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	**1100**	100	1	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	**4200**	100	1	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	270	1	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	**2000**	100	1	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	**6100**	500	5	UG/KG	06/27/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**770**	100	1	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	**1600**	100	1	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**310**	100	1	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**260**	100	1	UG/KG	06/23/2017	PAB
pH	EPA-9045	**7.57**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.095**	0.020	1	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**0.69**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**6.2**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**130**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**73**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**44**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**14**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**52**	0.53	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	U	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-18
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 9:45:00 AM
CLIENT SAMPLE ID	Plot 16E TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.2	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**80**	3.0	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.42**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**119**	06/20/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**115**	06/19/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**104**	06/22/2017	DLC
Toluene-d8	EPA-8260	**92.8**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**118**	06/22/2017	DLC
2-Fluorophenol	EPA-8270	**51.6**	06/23/2017	PAB
2-Fluorophenol 5X Dilution	EPA-8270	**51.8**	06/27/2017	PAB
Phenol-d5	EPA-8270	**51.0**	06/23/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**45.7**	06/27/2017	PAB
Nitrobenzene-d5	EPA-8270	**43.2**	06/23/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**44.4**	06/27/2017	PAB
2-Fluorobiphenyl	EPA-8270	**53.5**	06/23/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**53.1**	06/27/2017	PAB
2,4,6-Tribromophenol	EPA-8270	**62.0**	06/23/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**52.3**	06/27/2017	PAB
Terphenyl-d14	EPA-8270	**50.8**	06/23/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**55.8**	06/27/2017	PAB

E - Reported result is an estimate because it exceeds the calibration range.
U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, an unidentified diesel range product and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-19
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 9:40:00 AM
CLIENT SAMPLE ID	Plot 16E TP2 CS 15ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**60**	25	1	MG/KG	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**83**	50	1	MG/KG	06/15/2017	DLC

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**93.5**	06/17/2017	SNC
TFT	EPA-8021	**92.0**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**89.7**	06/15/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-20
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 11:35:00 AM
CLIENT SAMPLE ID	Plot 16W TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**130**	6.0	2	MG/KG	06/20/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**5100**	120	5	MG/KG	06/19/2017	DLC
TPH-Oil Range	NWTPH-DX w/ SGA	**5500**	250	5	MG/KG	06/19/2017	DLC
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	U	110	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-20
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 11:35:00 AM
CLIENT SAMPLE ID	Plot 16W TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	**11**	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	**19**	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	200	1	UG/KG	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Phenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Aniline	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-20
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 11:35:00 AM
CLIENT SAMPLE ID	Plot 16W TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Isophorone	EPA-8270	U	120	1	UG/KG	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	110	1	UG/KG	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	1200	1	UG/KG	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	500	1	UG/KG	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	120	1	UG/KG	06/23/2017	PAB
Naphthalene	EPA-8270	**170**	100	1	UG/KG	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	1000	1	UG/KG	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	310	1	UG/KG	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	500	1	UG/KG	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	550	1	UG/KG	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	**1500**	260	1	UG/KG	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	**1900**	300	1	UG/KG	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Acenaphthene	EPA-8270	**490**	100	1	UG/KG	06/23/2017	PAB
3-Nitroaniline	EPA-8270	U	1000	1	UG/KG	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Fluorene	EPA-8270	**600**	100	1	UG/KG	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-20
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 11:35:00 AM
CLIENT SAMPLE ID	Plot 16W TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Azobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	500	1	UG/KG	06/23/2017	PAB
Phenanthrene	EPA-8270	**2100**	100	1	UG/KG	06/23/2017	PAB
Anthracene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Carbazole	EPA-8270	U	250	1	UG/KG	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Fluoranthene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Pyrene	EPA-8270	**3400**	100	1	UG/KG	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	290	1	UG/KG	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Chrysene	EPA-8270	**5000**	500	5	UG/KG	06/27/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	100	1	UG/KG	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**970**	100	1	UG/KG	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	**1300**	100	1	UG/KG	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	**170**	100	1	UG/KG	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**290**	100	1	UG/KG	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**470**	100	1	UG/KG	06/23/2017	PAB
pH	EPA-9045	**7.44**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.47**	0.020	1	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**6.6**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**7.9**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**140**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**180**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**120**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**35**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**67**	0.56	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**7.1**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-20
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 11:35:00 AM
CLIENT SAMPLE ID	Plot 16W TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.5	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**160**	3.2	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.14**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT 2X Dilution	NWTPH-GX	**79.5**	06/20/2017	SNC
C25 5X Dilution	NWTPH-DX w/ SGA	**131**	06/19/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**107**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**104**	06/23/2017	DLC
Toluene-d8	EPA-8260	**90.6**	06/22/2017	DLC
Toluene-d8	EPA-8260	**88.2**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**118**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**95.9**	06/23/2017	DLC
2-Fluorophenol	EPA-8270	**70.5**	06/23/2017	PAB
2-Fluorophenol 5X Dilution	EPA-8270	**75.1**	06/27/2017	PAB
Phenol-d5	EPA-8270	**71.2**	06/23/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**68.0**	06/27/2017	PAB
Nitrobenzene-d5	EPA-8270	**60.9**	06/23/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**64.8**	06/27/2017	PAB
2-Fluorobiphenyl	EPA-8270	**77.3**	06/23/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**75.9**	06/27/2017	PAB
2,4,6-Tribromophenol	EPA-8270	**94.1**	06/23/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**75.3**	06/27/2017	PAB
Terphenyl-d14	EPA-8270	**73.5**	06/23/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**77.3**	06/27/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline, highly weathered diesel and lube oil.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-21
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 11:30:00 AM
CLIENT SAMPLE ID	Plot 16W TP1 CS 14ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**100**	25	1	MG/KG	06/15/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**120**	50	1	MG/KG	06/15/2017	EBS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**106**	06/17/2017	SNC
TFT	EPA-8021	**101**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**86.6**	06/15/2017	EBS

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains weathered diesel.
Diesel range product results biased high due to oil range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-22
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 10:25:00 AM
CLIENT SAMPLE ID	Plot 16W TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**9.6**	3.0	1	MG/KG	06/20/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**840**	50	2	MG/KG	06/16/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**1400**	100	2	MG/KG	06/16/2017	EBS
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	U	110	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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ALS Group USA, Corp dba ALS Environmental

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-22
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 10:25:00 AM
CLIENT SAMPLE ID	Plot 16W TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	200	1	UG/KG	06/24/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Phenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Aniline	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
2-Chlorophenol	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Benzyl Alcohol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-22
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 10:25:00 AM
CLIENT SAMPLE ID	Plot 16W TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2-Methylphenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
3&4-Methylphenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
Hexachloroethane	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Nitrobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Isophorone	EPA-8270	U	120	1	UG/KG	06/24/2017	PAB
2-Nitrophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	110	1	UG/KG	06/24/2017	PAB
Benzoic Acid	EPA-8270	U	1200	1	UG/KG	06/24/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	500	1	UG/KG	06/24/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	120	1	UG/KG	06/24/2017	PAB
Naphthalene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
4-Chloroaniline	EPA-8270	U	1000	1	UG/KG	06/24/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	300	1	UG/KG	06/24/2017	PAB
Hexachlorobutadiene	EPA-8270	U	500	1	UG/KG	06/24/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	530	1	UG/KG	06/24/2017	PAB
2-Methylnaphthalene	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
1-Methylnaphthalene	EPA-8270	U	290	1	UG/KG	06/24/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2-Chloronaphthalene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2-Nitroaniline	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Acenaphthylene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Dimethylphthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Acenaphthene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
3-Nitroaniline	EPA-8270	U	1000	1	UG/KG	06/24/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
4-Nitrophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Dibenzofuran	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Diethylphthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Fluorene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-22
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 10:25:00 AM
CLIENT SAMPLE ID	Plot 16W TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Azobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Hexachlorobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Pentachlorophenol	EPA-8270	U	500	1	UG/KG	06/24/2017	PAB
Phenanthrene	EPA-8270	**110**	100	1	UG/KG	06/24/2017	PAB
Anthracene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Carbazole	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Fluoranthene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Pyrene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Butylbenzylphthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	280	1	UG/KG	06/24/2017	PAB
Benzo[A]Anthracene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Chrysene	EPA-8270	**260**	100	1	UG/KG	06/24/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Benzo[A]Pyrene	EPA-8270	**340**	100	1	UG/KG	06/24/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	**120**	100	1	UG/KG	06/24/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**380**	100	1	UG/KG	06/24/2017	PAB
pH	EPA-9045	**7.43**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.43**	0.020	1	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**3.6**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**5.0**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**120**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**150**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**37**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**14**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**40**	0.53	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**5.4**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-22
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 10:25:00 AM
CLIENT SAMPLE ID	Plot 16W TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.3	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**140**	3.0	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.20**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**109**	06/20/2017	SNC
C25 2X Dilution	NWTPH-DX w/ SGA	**74.8**	06/16/2017	EBS
1,2-Dichloroethane-d4	EPA-8260	**104**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**103**	06/23/2017	DLC
Toluene-d8	EPA-8260	**97.6**	06/22/2017	DLC
Toluene-d8	EPA-8260	**97.7**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**107**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**97.6**	06/23/2017	DLC
2-Fluorophenol	EPA-8270	**57.8**	06/24/2017	PAB
Phenol-d5	EPA-8270	**57.0**	06/24/2017	PAB
Nitrobenzene-d5	EPA-8270	**47.4**	06/24/2017	PAB
2-Fluorobiphenyl	EPA-8270	**63.7**	06/24/2017	PAB
2,4,6-Tribromophenol	EPA-8270	**81.6**	06/24/2017	PAB
Terphenyl-d14	EPA-8270	**61.7**	06/24/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline and highly weathered diesel.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-23
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 10:20:00 AM
CLIENT SAMPLE ID	Plot 16W TP2 CS 10ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**58**	25	1	MG/KG	06/15/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**110**	50	1	MG/KG	06/15/2017	EBS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**105**	06/17/2017	SNC
TFT	EPA-8021	**98.0**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**94.2**	06/15/2017	EBS

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains weathered diesel.
Diesel range product results biased high due to oil range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-24
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 1:45:00 PM
CLIENT SAMPLE ID	Plot 17 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**6.7**	3.0	1	MG/KG	06/19/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**1500**	250	10	MG/KG	06/15/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**3100**	500	10	MG/KG	06/15/2017	EBS
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**130**	110	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-24
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 1:45:00 PM
CLIENT SAMPLE ID	Plot 17 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Carbon Tetrachloride (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
1,1-Dichloroethene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
2-Butanone (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Chloroform (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
1,2-Dichloroethane (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Benzene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Trichloroethene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Tetrachloroethylene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-24
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 1:45:00 PM
CLIENT SAMPLE ID	Plot 17 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Chlorobenzene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
1,4-Dichlorobenzene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/24/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Isophorone	EPA-8270	U	590	5	UG/KG	06/24/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	540	5	UG/KG	06/24/2017	PAB
Benzoic Acid	EPA-8270	U	6000	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	590	5	UG/KG	06/24/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/24/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1500	5	UG/KG	06/24/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2700	5	UG/KG	06/24/2017	PAB
2-Methylnaphthalene	EPA-8270	U	1300	5	UG/KG	06/24/2017	PAB
1-Methylnaphthalene	EPA-8270	U	1500	5	UG/KG	06/24/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-24
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 1:45:00 PM
CLIENT SAMPLE ID	Plot 17 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Acenaphthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/24/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Fluorene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
Phenanthrene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Anthracene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Fluoranthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Pyrene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1400	5	UG/KG	06/24/2017	PAB
Benzo[A]Anthracene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Chrysene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[A]Pyrene	EPA-8270	**510**	500	5	UG/KG	06/24/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**780**	500	5	UG/KG	06/24/2017	PAB
Pyridine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitrosodimethylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Phenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-24
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 1:45:00 PM
CLIENT SAMPLE ID	Plot 17 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Aniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Chloroethyl)Ether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Chlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,3-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,4-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzyl Alcohol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,2-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Chloroisopropyl)Ether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
3&4-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitroso-Di-N-Propylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachloroethane (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Nitrobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Isophorone (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Nitrophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dimethylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzoic Acid (TCLP)	EPA-8270/1311	U	10	1	UG/L	06/27/2017	PAB
Bis(2-Chloroethoxy)Methane (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,2,4-Trichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Naphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chloroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,6-Dichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorobutadiene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chloro-3-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Methylnaphthalene (TCLP)	EPA-8270/1311	**9.8**	2.0	1	UG/L	06/27/2017	PAB
1-Methylnaphthalene (TCLP)	EPA-8270/1311	**13**	2.0	1	UG/L	06/27/2017	PAB
Hexachlorocyclopentadiene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4,6-Trichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4,5-Trichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Chloronaphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Nitroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Acenaphthylene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Dimethylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,6-Dinitrotoluene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Acenaphthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
3-Nitroaniline (TCLP)	EPA-8270/1311	U	5.0	1	UG/L	06/27/2017	PAB
2,4-Dinitrophenol (TCLP)	EPA-8270/1311	U	10	1	UG/L	06/27/2017	PAB
4-Nitrophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-24
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 1:45:00 PM
CLIENT SAMPLE ID	Plot 17 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibenzofuran (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dinitrotoluene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,3,4,6-Tetrachlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Diethylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Fluorene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chlorophenyl-Phenylether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Nitroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4,6-Dinitro-2-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitrosodiphenylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Azobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Bromophenyl-Phenylether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Pentachlorophenol (TCLP)	EPA-8270/1311	U	5.0	1	UG/L	06/27/2017	PAB
Phenanthrene (TCLP)	EPA-8270/1311	**2.8**	2.0	1	UG/L	06/27/2017	PAB
Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Carbazole (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Di-N-Butylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Butylbenzylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[A]Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Chrysene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Ethylhexyl)Phthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Di-N-Octylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[B]Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[K]Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[A]Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Indeno[1,2,3-Cd]Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Dibenz[A,H]Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[G,H,I]Perylene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
PCB-1016	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1221	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1232	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1242	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1248	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1254	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1260	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1268	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
Chromium (VI)	EPA-7196	U	5.0	1	MG/KG	06/26/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-24
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 1:45:00 PM
CLIENT SAMPLE ID	Plot 17 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
pH	EPA-9045	**6.89**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.88**	0.20	10	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**9.2**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**7.0**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**93**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**170**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**54**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**27**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**52**	0.54	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**13**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Thallium	EPA-6020	U	5.3	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**190**	3.1	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	**0.044**	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.050**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	**0.029**	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**100**	06/19/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**88.9**	06/15/2017	EBS
1,2-Dichloroethane-d4	EPA-8260	**108**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**99.0**	06/23/2017	DLC
Toluene-d8	EPA-8260	**97.6**	06/22/2017	DLC
Toluene-d8	EPA-8260	**93.0**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**114**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**97.4**	06/23/2017	DLC
1,2-Dichloroethane-d4	EPA-8260/1311	**107**	06/27/2017	DLC
Toluene-d8	EPA-8260/1311	**99.0**	06/27/2017	DLC
4-Bromofluorobenzene	EPA-8260/1311	**103**	06/27/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**76.7**	06/24/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**63.9**	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-24
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 1:45:00 PM
CLIENT SAMPLE ID	Plot 17 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
Nitrobenzene-d5 5X Dilution	EPA-8270	**69.6**	06/24/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**86.6**	06/24/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**107**	06/24/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**86.3**	06/24/2017	PAB
2-Fluorophenol (TCLP)	EPA-8270/1311	**71.4**	06/27/2017	PAB
Phenol-d5 (TCLP)	EPA-8270/1311	**61.7**	06/27/2017	PAB
Nitrobenzene-d5 (TCLP)	EPA-8270/1311	**69.2**	06/27/2017	PAB
2-Fluorobiphenyl (TCLP)	EPA-8270/1311	**47.7**	06/27/2017	PAB
2,4,6-Tribromophenol (TCLP)	EPA-8270/1311	**80.1**	06/27/2017	PAB
Terphenyl-d14 (TCLP)	EPA-8270/1311	**83.0**	06/27/2017	PAB
TCMX	EPA-8082	**61.1**	06/26/2017	PAB
DCB	EPA-8082	**63.6**	06/26/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains weathered gasoline and an unidentified diesel range product.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-25
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 1:40:00 PM
CLIENT SAMPLE ID	Plot 17 TP1 CS 8ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	U	25	1	MG/KG	06/16/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**62**	50	1	MG/KG	06/16/2017	EBS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**97.3**	06/17/2017	SNC
TFT	EPA-8021	**89.9**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**98.2**	06/16/2017	EBS

U - Analyte analyzed for but not detected at level above reporting limit.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-26
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 2:20:00 PM
CLIENT SAMPLE ID	Plot 17 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**7.4**	3.0	1	MG/KG	06/19/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**11000**	250	10	MG/KG	06/15/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**4500**	500	10	MG/KG	06/15/2017	EBS
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	U	88	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-26
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 2:20:00 PM
CLIENT SAMPLE ID	Plot 17 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Carbon Tetrachloride (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
1,1-Dichloroethene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
2-Butanone (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Chloroform (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
1,2-Dichloroethane (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Benzene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Trichloroethene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Tetrachloroethylene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC

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CERTIFICATE OF ANALYSIS

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CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 2:20:00 PM
CLIENT SAMPLE ID	Plot 17 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Chlorobenzene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
1,4-Dichlorobenzene (ZHE)	EPA-8260/1311	U	0.0050	1	MG/L	06/27/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/24/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Isophorone	EPA-8270	U	520	5	UG/KG	06/24/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzoic Acid	EPA-8270	U	5300	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	530	5	UG/KG	06/24/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/24/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1400	5	UG/KG	06/24/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
2-Methylnaphthalene	EPA-8270	**6800**	1200	5	UG/KG	06/24/2017	PAB
1-Methylnaphthalene	EPA-8270	**8300**	1300	5	UG/KG	06/24/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-26
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 2:20:00 PM
CLIENT SAMPLE ID	Plot 17 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Acenaphthene	EPA-8270	**2600**	500	5	UG/KG	06/24/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/24/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Fluorene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
Phenanthrene	EPA-8270	**8500**	500	5	UG/KG	06/24/2017	PAB
Anthracene	EPA-8270	**2300**	500	5	UG/KG	06/24/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Fluoranthene	EPA-8270	**730**	500	5	UG/KG	06/24/2017	PAB
Pyrene	EPA-8270	**4300**	500	5	UG/KG	06/24/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1300	5	UG/KG	06/24/2017	PAB
Benzo[A]Anthracene	EPA-8270	**1900**	500	5	UG/KG	06/24/2017	PAB
Chrysene	EPA-8270	**4900**	500	5	UG/KG	06/24/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**850**	500	5	UG/KG	06/24/2017	PAB
Benzo[A]Pyrene	EPA-8270	**2400**	500	5	UG/KG	06/24/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Pyridine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitrosodimethylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Phenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB

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CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 2:20:00 PM
CLIENT SAMPLE ID	Plot 17 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Aniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Chloroethyl)Ether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Chlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,3-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,4-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzyl Alcohol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,2-Dichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Chloroisopropyl)Ether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
3&4-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitroso-Di-N-Propylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachloroethane (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Nitrobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Isophorone (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Nitrophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dimethylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzoic Acid (TCLP)	EPA-8270/1311	U	10	1	UG/L	06/27/2017	PAB
Bis(2-Chloroethoxy)Methane (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1,2,4-Trichlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Naphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chloroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,6-Dichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorobutadiene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chloro-3-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Methylnaphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
1-Methylnaphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorocyclopentadiene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4,6-Trichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4,5-Trichlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Chloronaphthalene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2-Nitroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Acenaphthylene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Dimethylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,6-Dinitrotoluene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Acenaphthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
3-Nitroaniline (TCLP)	EPA-8270/1311	U	5.0	1	UG/L	06/27/2017	PAB
2,4-Dinitrophenol (TCLP)	EPA-8270/1311	U	10	1	UG/L	06/27/2017	PAB
4-Nitrophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB

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CLIENT SAMPLE ID	Plot 17 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibenzofuran (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,4-Dinitrotoluene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
2,3,4,6-Tetrachlorophenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Diethylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Fluorene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Chlorophenyl-Phenylether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Nitroaniline (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4,6-Dinitro-2-Methylphenol (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
N-Nitrosodiphenylamine (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Azobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
4-Bromophenyl-Phenylether (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Hexachlorobenzene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Pentachlorophenol (TCLP)	EPA-8270/1311	U	5.0	1	UG/L	06/27/2017	PAB
Phenanthrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Carbazole (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Di-N-Butylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Butylbenzylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[A]Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Chrysene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Bis(2-Ethylhexyl)Phthalate (TCLP)	EPA-8270/1311	**20**	2.0	1	UG/L	06/27/2017	PAB
Di-N-Octylphthalate (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[B]Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[K]Fluoranthene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[A]Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Indeno[1,2,3-Cd]Pyrene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Dibenz[A,H]Anthracene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
Benzo[G,H,I]Perylene (TCLP)	EPA-8270/1311	U	2.0	1	UG/L	06/27/2017	PAB
PCB-1016	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1221	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1232	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1242	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1248	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1254	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1260	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
PCB-1268	EPA-8082	U	0.10	1	MG/KG	06/26/2017	PAB
Chromium (VI)	EPA-7196	U	5.0	1	MG/KG	06/26/2017	RAL

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SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
pH	EPA-9045	**7.50**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.13**	0.020	1	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**0.63**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**4.6**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**67**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**120**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**34**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**9.6**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**34**	0.50	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	U	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Thallium	EPA-6020	U	4.8	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**76**	2.8	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	**0.027**	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.26**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**116**	06/19/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**183**	06/15/2017	EBS
1,2-Dichloroethane-d4	EPA-8260	**103**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**102**	06/23/2017	DLC
Toluene-d8	EPA-8260	**88.0**	06/22/2017	DLC
Toluene-d8	EPA-8260	**87.4**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**117**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**100**	06/23/2017	DLC
1,2-Dichloroethane-d4	EPA-8260/1311	**101**	06/27/2017	DLC
Toluene-d8	EPA-8260/1311	**101**	06/27/2017	DLC
4-Bromofluorobenzene	EPA-8260/1311	**102**	06/27/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**69.7**	06/24/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**67.6**	06/24/2017	PAB

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SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
Nitrobenzene-d5 5X Dilution	EPA-8270	**65.1**	06/24/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**97.7**	06/24/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**78.8**	06/24/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**78.8**	06/24/2017	PAB
2-Fluorophenol (TCLP)	EPA-8270/1311	**67.0**	06/27/2017	PAB
Phenol-d5 (TCLP)	EPA-8270/1311	**57.7**	06/27/2017	PAB
Nitrobenzene-d5 (TCLP)	EPA-8270/1311	**65.5**	06/27/2017	PAB
2-Fluorobiphenyl (TCLP)	EPA-8270/1311	**49.9**	06/27/2017	PAB
2,4,6-Tribromophenol (TCLP)	EPA-8270/1311	**74.4**	06/27/2017	PAB
Terphenyl-d14 (TCLP)	EPA-8270/1311	**80.6**	06/27/2017	PAB
TCMX	EPA-8082	**70.5**	06/26/2017	PAB
DCB	EPA-8082	**70.0**	06/26/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline and weathered diesel.
Gasoline range product results biased high due to semivolatile range product overlap.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-27
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 2:15:00 PM
CLIENT SAMPLE ID	Plot 17 TP2 CS 11ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**1800**	250	10	MG/KG	06/15/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**2700**	500	10	MG/KG	06/15/2017	EBS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**95.5**	06/17/2017	SNC
TFT	EPA-8021	**95.3**	06/17/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**82.1**	06/15/2017	EBS

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered diesel.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-28
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 18 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**5.8**	3.0	1	MG/KG	06/22/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**96**	25	1	MG/KG	06/15/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**93**	50	1	MG/KG	06/15/2017	EBS
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**150**	130	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-28
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 18 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/24/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-28
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 18 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Isophorone	EPA-8270	U	600	5	UG/KG	06/24/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	550	5	UG/KG	06/24/2017	PAB
Benzoic Acid	EPA-8270	U	6100	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	600	5	UG/KG	06/24/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/24/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1600	5	UG/KG	06/24/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2800	5	UG/KG	06/24/2017	PAB
2-Methylnaphthalene	EPA-8270	U	1300	5	UG/KG	06/24/2017	PAB
1-Methylnaphthalene	EPA-8270	U	1500	5	UG/KG	06/24/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Acenaphthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/24/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Fluorene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-28
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 18 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
Phenanthrene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Anthracene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Fluoranthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Pyrene	EPA-8270	**540**	500	5	UG/KG	06/24/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1500	5	UG/KG	06/24/2017	PAB
Benzo[A]Anthracene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Chrysene	EPA-8270	**2000**	500	5	UG/KG	06/24/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**510**	500	5	UG/KG	06/24/2017	PAB
Benzo[A]Pyrene	EPA-8270	**1400**	500	5	UG/KG	06/24/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**710**	500	5	UG/KG	06/24/2017	PAB
pH	EPA-9045	**6.29**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**1.2**	0.20	10	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**6.2**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**9.5**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**90**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**110**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**96**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**28**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**47**	0.56	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**9.3**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-28
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:00:00 PM
CLIENT SAMPLE ID	Plot 18 TP1 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.6	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**200**	3.2	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	**0.049**	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.041**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	**0.026**	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**51.2 GS1**	06/22/2017	SNC
C25	NWTPH-DX w/ SGA	**94.2**	06/15/2017	EBS
1,2-Dichloroethane-d4	EPA-8260	**106**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**98.0**	06/23/2017	DLC
Toluene-d8	EPA-8260	**96.5**	06/22/2017	DLC
Toluene-d8	EPA-8260	**96.6**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**109**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**95.8**	06/23/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**62.8**	06/24/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**56.6**	06/24/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**57.6**	06/24/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**78.4**	06/24/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**102**	06/24/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**82.7**	06/24/2017	PAB

GS1 - Surrogate outside of control limits due to matrix effect.
U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains weathered gasoline and highly weathered diesel.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-29
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 2:50:00 PM
CLIENT SAMPLE ID	Plot 18 TP1 CS 8ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	U	25	1	MG/KG	06/15/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	U	50	1	MG/KG	06/15/2017	EBS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**93.7**	06/17/2017	SNC
TFT	EPA-8021	**88.2**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**97.8**	06/15/2017	EBS

U - Analyte analyzed for but not detected at level above reporting limit.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	6/28/2017
		ALS JOB#:	EV17060086
		ALS SAMPLE#:	EV17060086-30
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:25:00 PM
CLIENT SAMPLE ID	Plot 18 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**39**	3.0	1	MG/KG	06/20/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**9000**	250	10	MG/KG	06/15/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**11000**	500	10	MG/KG	06/15/2017	EBS
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	U	120	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-30
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:25:00 PM
CLIENT SAMPLE ID	Plot 18 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/24/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-30
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:25:00 PM
CLIENT SAMPLE ID	Plot 18 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Isophorone	EPA-8270	U	600	5	UG/KG	06/24/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	550	5	UG/KG	06/24/2017	PAB
Benzoic Acid	EPA-8270	U	6100	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	600	5	UG/KG	06/24/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/24/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1600	5	UG/KG	06/24/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2800	5	UG/KG	06/24/2017	PAB
2-Methylnaphthalene	EPA-8270	U	1300	5	UG/KG	06/24/2017	PAB
1-Methylnaphthalene	EPA-8270	**1600**	1500	5	UG/KG	06/24/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Acenaphthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/24/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Fluorene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

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CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:25:00 PM
CLIENT SAMPLE ID	Plot 18 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
Phenanthrene	EPA-8270	**2300**	500	5	UG/KG	06/24/2017	PAB
Anthracene	EPA-8270	**1000**	500	5	UG/KG	06/24/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Fluoranthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Pyrene	EPA-8270	**6900**	500	5	UG/KG	06/24/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1500	5	UG/KG	06/24/2017	PAB
Benzo[A]Anthracene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Chrysene	EPA-8270	**7900**	500	5	UG/KG	06/24/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**2300**	500	5	UG/KG	06/24/2017	PAB
Benzo[A]Pyrene	EPA-8270	**3100**	500	5	UG/KG	06/24/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**660**	500	5	UG/KG	06/24/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**870**	500	5	UG/KG	06/24/2017	PAB
pH	EPA-9045	**7.50**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**1.1**	0.20	10	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**16**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**11**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**100**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	**0.58**	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**190**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**150**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**71**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**94**	0.55	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**9.5**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-30
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:25:00 PM
CLIENT SAMPLE ID	Plot 18 TP2 WR	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.5	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**220**	3.2	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	**0.044**	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.064**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**104**	06/20/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**305**	06/15/2017	EBS
1,2-Dichloroethane-d4	EPA-8260	**100**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**97.1**	06/23/2017	DLC
Toluene-d8	EPA-8260	**96.1**	06/22/2017	DLC
Toluene-d8	EPA-8260	**90.4**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**107**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**101**	06/23/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**72.5**	06/24/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**69.9**	06/24/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**59.8**	06/24/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**85.7**	06/24/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**108**	06/24/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**86.8**	06/24/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline and an unidentified diesel range product.
Gasoline range product results biased high due to semivolatile range product overlap.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-31
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 3:20:00 PM
CLIENT SAMPLE ID	Plot 18 TP2 CS 8ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**45**	25	1	MG/KG	06/15/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**79**	50	1	MG/KG	06/15/2017	EBS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**105**	06/17/2017	SNC
TFT	EPA-8021	**96.0**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**93.6**	06/15/2017	EBS

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains an unidentified diesel range product.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-32
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:00:00 AM
CLIENT SAMPLE ID	WES-DUP-1	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**61**	25	1	MG/KG	06/15/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**110**	50	1	MG/KG	06/15/2017	EBS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**92.7**	06/17/2017	SNC
TFT	EPA-8021	**89.7**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**103**	06/15/2017	EBS

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains an unidentified diesel range product.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-33
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:05:00 AM
CLIENT SAMPLE ID	WES-DUP-2	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**56**	3.0	1	MG/KG	06/20/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**2700**	120	5	MG/KG	06/16/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**2300**	250	5	MG/KG	06/16/2017	EBS
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**120 E**	50	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-33
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:05:00 AM
CLIENT SAMPLE ID	WES-DUP-2	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	200	1	UG/KG	06/24/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Phenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Aniline	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
2-Chlorophenol	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Benzyl Alcohol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-33
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:05:00 AM
CLIENT SAMPLE ID	WES-DUP-2	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2-Methylphenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
3&4-Methylphenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
Hexachloroethane	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Nitrobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Isophorone	EPA-8270	U	120	1	UG/KG	06/24/2017	PAB
2-Nitrophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	110	1	UG/KG	06/24/2017	PAB
Benzoic Acid	EPA-8270	U	1200	1	UG/KG	06/24/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	500	1	UG/KG	06/24/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	120	1	UG/KG	06/24/2017	PAB
Naphthalene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
4-Chloroaniline	EPA-8270	U	1000	1	UG/KG	06/24/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	310	1	UG/KG	06/24/2017	PAB
Hexachlorobutadiene	EPA-8270	U	500	1	UG/KG	06/24/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	550	1	UG/KG	06/24/2017	PAB
2-Methylnaphthalene	EPA-8270	**2600**	260	1	UG/KG	06/24/2017	PAB
1-Methylnaphthalene	EPA-8270	**4900**	1500	5	UG/KG	06/27/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2-Chloronaphthalene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2-Nitroaniline	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Acenaphthylene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Dimethylphthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Acenaphthene	EPA-8270	**780**	100	1	UG/KG	06/24/2017	PAB
3-Nitroaniline	EPA-8270	U	1000	1	UG/KG	06/24/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
4-Nitrophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Dibenzofuran	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Diethylphthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Fluorene	EPA-8270	**1200**	100	1	UG/KG	06/24/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-33
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:05:00 AM
CLIENT SAMPLE ID	WES-DUP-2	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Azobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Hexachlorobenzene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Pentachlorophenol	EPA-8270	U	500	1	UG/KG	06/24/2017	PAB
Phenanthrene	EPA-8270	**3400**	100	1	UG/KG	06/24/2017	PAB
Anthracene	EPA-8270	**1200**	100	1	UG/KG	06/24/2017	PAB
Carbazole	EPA-8270	U	250	1	UG/KG	06/24/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Fluoranthene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Pyrene	EPA-8270	**4500**	500	5	UG/KG	06/27/2017	PAB
Butylbenzylphthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	290	1	UG/KG	06/24/2017	PAB
Benzo[A]Anthracene	EPA-8270	**2300**	100	1	UG/KG	06/24/2017	PAB
Chrysene	EPA-8270	**7000**	500	5	UG/KG	06/27/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**730**	100	1	UG/KG	06/24/2017	PAB
Benzo[A]Pyrene	EPA-8270	**1800**	100	1	UG/KG	06/24/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	U	100	1	UG/KG	06/24/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**210**	100	1	UG/KG	06/24/2017	PAB
pH	EPA-9045	**7.39**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**0.095**	0.020	1	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**0.88**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**5.4**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**130**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**71**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**40**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**19**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**46**	0.55	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	U	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-33
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:05:00 AM
CLIENT SAMPLE ID	WES-DUP-2	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.4	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**79**	3.1	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.26**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**115**	06/20/2017	SNC
C25 5X Dilution	NWTPH-DX w/ SGA	**71.3**	06/16/2017	EBS
1,2-Dichloroethane-d4	EPA-8260	**105**	06/22/2017	DLC
Toluene-d8	EPA-8260	**92.3**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**109**	06/22/2017	DLC
2-Fluorophenol	EPA-8270	**49.4**	06/24/2017	PAB
2-Fluorophenol 5X Dilution	EPA-8270	**51.8**	06/27/2017	PAB
Phenol-d5	EPA-8270	**47.9**	06/24/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**46.8**	06/27/2017	PAB
Nitrobenzene-d5	EPA-8270	**40.0**	06/24/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**43.6**	06/27/2017	PAB
2-Fluorobiphenyl	EPA-8270	**55.7**	06/24/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**55.1**	06/27/2017	PAB
2,4,6-Tribromophenol	EPA-8270	**64.7**	06/24/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**53.3**	06/27/2017	PAB
Terphenyl-d14	EPA-8270	**57.2**	06/24/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**54.4**	06/27/2017	PAB

E - Reported result is an estimate because it exceeds the calibration range.
U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline and an unidentified diesel range product.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-34
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:10:00 AM
CLIENT SAMPLE ID	WES-DUP-3	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	3.0	1	MG/KG	06/17/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	06/17/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	06/17/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	06/17/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**52**	25	1	MG/KG	06/16/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**87**	50	1	MG/KG	06/16/2017	EBS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**105**	06/17/2017	SNC
TFT	EPA-8021	**99.0**	06/17/2017	SNC
C25	NWTPH-DX w/ SGA	**94.8**	06/16/2017	EBS

U - Analyte analyzed for but not detected at level above reporting limit.

Chromatogram indicates that it is likely that sample contains an unidentified diesel range product.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-35
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:15:00 AM
CLIENT SAMPLE ID	WES-DUP-4	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	**56**	3.0	1	MG/KG	06/20/2017	SNC
TPH-Diesel Range	NWTPH-DX w/ SGA	**4800**	250	10	MG/KG	06/16/2017	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	**6100**	500	10	MG/KG	06/16/2017	EBS
Dichlorodifluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Vinyl Chloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Tetrachloride	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trichlorofluoromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Carbon Disulfide	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Acetone	EPA-8260	**300**	150	1	UG/KG	06/23/2017	DLC
1,1-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Methylene Chloride	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Acrylonitrile	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Butanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Chloroform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Benzene	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Trichloroethene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Dibromomethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromodichloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
Toluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Hexanone	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,3-Dichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Tetrachloroethylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC

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CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:15:00 AM
CLIENT SAMPLE ID	WES-DUP-4	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Dibromochloromethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromoethane	EPA-8260	U	5.0	1	UG/KG	06/22/2017	DLC
Chlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Ethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
m,p-Xylene	EPA-8260	U	20	1	UG/KG	06/22/2017	DLC
Styrene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
o-Xylene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromoform	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Isopropylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Bromobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Propyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
2-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
4-Chlorotoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
T-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
S-Butyl Benzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
P-Isopropyltoluene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
N-Butylbenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	50	1	UG/KG	06/22/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Hexachlorobutadiene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Naphthalene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	10	1	UG/KG	06/22/2017	DLC
Pyridine	EPA-8270	U	1000	5	UG/KG	06/24/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Phenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Aniline	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
2-Chlorophenol	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzyl Alcohol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB

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CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:15:00 AM
CLIENT SAMPLE ID	WES-DUP-4	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
1,2-Dichlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
3&4-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
Hexachloroethane	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Nitrobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Isophorone	EPA-8270	U	570	5	UG/KG	06/24/2017	PAB
2-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	520	5	UG/KG	06/24/2017	PAB
Benzoic Acid	EPA-8270	U	5800	5	UG/KG	06/24/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	570	5	UG/KG	06/24/2017	PAB
Naphthalene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Chloroaniline	EPA-8270	U	5000	5	UG/KG	06/24/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	1500	5	UG/KG	06/24/2017	PAB
Hexachlorobutadiene	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	2600	5	UG/KG	06/24/2017	PAB
2-Methylnaphthalene	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
1-Methylnaphthalene	EPA-8270	**1800**	1400	5	UG/KG	06/24/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Chloronaphthalene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2-Nitroaniline	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Acenaphthylene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dimethylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Acenaphthene	EPA-8270	**540**	500	5	UG/KG	06/24/2017	PAB
3-Nitroaniline	EPA-8270	U	5000	5	UG/KG	06/24/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Nitrophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dibenzofuran	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Diethylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Fluorene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB

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CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:15:00 AM
CLIENT SAMPLE ID	WES-DUP-4	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
4-Nitroaniline	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Azobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Hexachlorobenzene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Pentachlorophenol	EPA-8270	U	2500	5	UG/KG	06/24/2017	PAB
Phenanthrene	EPA-8270	**2900**	500	5	UG/KG	06/24/2017	PAB
Anthracene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Carbazole	EPA-8270	U	1200	5	UG/KG	06/24/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Fluoranthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Pyrene	EPA-8270	**8700**	500	5	UG/KG	06/24/2017	PAB
Butylbenzylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	1400	5	UG/KG	06/24/2017	PAB
Benzo[A]Anthracene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Chrysene	EPA-8270	**10000**	500	5	UG/KG	06/24/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	**2900**	500	5	UG/KG	06/24/2017	PAB
Benzo[A]Pyrene	EPA-8270	**3800**	500	5	UG/KG	06/24/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	500	5	UG/KG	06/24/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	**800**	500	5	UG/KG	06/24/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	**1200**	500	5	UG/KG	06/24/2017	PAB
pH	EPA-9045	**7.42**	± 0.01	1	S.U.	06/15/2017	SMR
Mercury	EPA-7471	**1.1**	0.20	10	MG/KG	06/20/2017	RAL
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	06/22/2017	RAL
Antimony	EPA-6020	**9.0**	0.50	5	MG/KG	06/19/2017	RAL
Arsenic	EPA-6020	**9.4**	1.0	5	MG/KG	06/19/2017	RAL
Barium	EPA-6020	**110**	0.50	5	MG/KG	06/19/2017	RAL
Beryllium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Cadmium	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL
Chromium	EPA-6020	**160**	0.50	5	MG/KG	06/19/2017	RAL
Copper	EPA-6020	**92**	0.50	5	MG/KG	06/19/2017	RAL
Lead	EPA-6020	**58**	0.50	5	MG/KG	06/19/2017	RAL
Nickel	EPA-6020	**73**	0.55	5	MG/KG	06/19/2017	RAL
Selenium	EPA-6020	**6.0**	5.0	5	MG/KG	06/19/2017	RAL
Silver	EPA-6020	U	0.50	5	MG/KG	06/19/2017	RAL

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	6/28/2017 EV17060086 EV17060086-35
CLIENT CONTACT:	Harold Cashman	DATE RECEIVED:	06/14/2017
CLIENT PROJECT:	Shell PSR SWMU-55	COLLECTION DATE:	6/12/2017 8:15:00 AM
CLIENT SAMPLE ID	WES-DUP-4	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Thallium	EPA-6020	U	5.4	5	MG/KG	06/19/2017	RAL
Zinc	EPA-6020	**180**	3.2	5	MG/KG	06/19/2017	RAL
Arsenic (TCLP)	EPA-6020/1311	**0.050**	0.025	5	MG/L	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	**0.058**	0.025	5	MG/L	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	06/22/2017	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**108**	06/20/2017	SNC
C25 10X Dilution	NWTPH-DX w/ SGA	**240**	06/16/2017	EBS
1,2-Dichloroethane-d4	EPA-8260	**113**	06/22/2017	DLC
1,2-Dichloroethane-d4	EPA-8260	**103**	06/23/2017	DLC
Toluene-d8	EPA-8260	**98.5**	06/22/2017	DLC
Toluene-d8	EPA-8260	**98.0**	06/23/2017	DLC
4-Bromofluorobenzene	EPA-8260	**112**	06/22/2017	DLC
4-Bromofluorobenzene	EPA-8260	**97.2**	06/23/2017	DLC
2-Fluorophenol 5X Dilution	EPA-8270	**74.4**	06/24/2017	PAB
Phenol-d5 5X Dilution	EPA-8270	**71.3**	06/24/2017	PAB
Nitrobenzene-d5 5X Dilution	EPA-8270	**60.6**	06/24/2017	PAB
2-Fluorobiphenyl 5X Dilution	EPA-8270	**87.2**	06/24/2017	PAB
2,4,6-Tribromophenol 5X Dilution	EPA-8270	**115**	06/24/2017	PAB
Terphenyl-d14 5X Dilution	EPA-8270	**92.2**	06/24/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains highly weathered gasoline and an unidentified diesel range product.
Diesel range product results biased high due to oil range product overlap.
Gasoline range product results biased high due to semivolatile range product overlap.

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CLIENT CONTACT:	Harold Cashman		
CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY BLANK RESULTS

MBG-061617S - Batch 117278 - Soil by NWTPH-GX

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	MG/KG	3.0	06/19/2017	SNC

U - Analyte analyzed for but not detected at level above reporting limit.

MBG-061617S2 - Batch 117279 - Soil by NWTPH-GX

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	MG/KG	3.0	06/16/2017	SNC

U - Analyte analyzed for but not detected at level above reporting limit.

MB-061617S2 - Batch 117279 - Soil by EPA-8021

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Benzene	EPA-8021	U	MG/KG	0.030	06/16/2017	SNC
Toluene	EPA-8021	U	MG/KG	0.050	06/16/2017	SNC
Ethylbenzene	EPA-8021	U	MG/KG	0.050	06/16/2017	SNC
Xylenes	EPA-8021	U	MG/KG	0.20	06/16/2017	SNC

U - Analyte analyzed for but not detected at level above reporting limit.

MB-061517S - Batch 117352 - Soil by NWTPH-DX

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range	NWTPH-DX	U	MG/KG	25	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX	U	MG/KG	50	06/15/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.

MB2-061517S - Batch 117268 - Soil by NWTPH-DX

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range	NWTPH-DX	U	MG/KG	25	06/15/2017	DLC
TPH-Oil Range	NWTPH-DX	U	MG/KG	50	06/15/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.

MB-062117S - Batch 117471 - Soil by EPA-8260

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Dichlorodifluoromethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Chloromethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Vinyl Chloride	EPA-8260	U	UG/KG	10	06/21/2017	DLC

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CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	6/28/2017 EV17060086 C601
CLIENT CONTACT:	Harold Cashman		
CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY BLANK RESULTS

MB-062117S - Batch 117471 - Soil by EPA-8260

Bromomethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Chloroethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Carbon Tetrachloride	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Trichlorofluoromethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Carbon Disulfide	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Acetone	EPA-8260	U	UG/KG	50	06/21/2017	DLC
1,1-Dichloroethene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Methylene Chloride	EPA-8260	U	UG/KG	20	06/21/2017	DLC
Acrylonitrile	EPA-8260	U	UG/KG	50	06/21/2017	DLC
Methyl T-Butyl Ether	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Trans-1,2-Dichloroethene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,1-Dichloroethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
2-Butanone	EPA-8260	U	UG/KG	50	06/21/2017	DLC
Cis-1,2-Dichloroethene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
2,2-Dichloropropane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Bromochloromethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Chloroform	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,1,1-Trichloroethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,1-Dichloropropene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,2-Dichloroethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Benzene	EPA-8260	U	UG/KG	5.0	06/21/2017	DLC
Trichloroethene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,2-Dichloropropane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Dibromomethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Bromodichloromethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Trans-1,3-Dichloropropene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
4-Methyl-2-Pentanone	EPA-8260	U	UG/KG	50	06/21/2017	DLC
Toluene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Cis-1,3-Dichloropropene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,1,2-Trichloroethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
2-Hexanone	EPA-8260	U	UG/KG	50	06/21/2017	DLC
1,3-Dichloropropane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Tetrachloroethylene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Dibromochloromethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,2-Dibromoethane	EPA-8260	U	UG/KG	5.0	06/21/2017	DLC
Chlorobenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,1,1,2-Tetrachloroethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Ethylbenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
m,p-Xylene	EPA-8260	U	UG/KG	20	06/21/2017	DLC
Styrene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
o-Xylene	EPA-8260	U	UG/KG	10	06/21/2017	DLC

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		ALS SDG#:	EV17060086
		WDOE ACCREDITATION:	C601
CLIENT CONTACT:	Harold Cashman		
CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY BLANK RESULTS

MB-062117S - Batch 117471 - Soil by EPA-8260

Bromoform	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Isopropylbenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,1,2,2-Tetrachloroethane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,2,3-Trichloropropane	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Bromobenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
N-Propyl Benzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
2-Chlorotoluene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,3,5-Trimethylbenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
4-Chlorotoluene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
T-Butyl Benzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,2,4-Trimethylbenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
S-Butyl Benzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
P-Isopropyltoluene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,3-Dichlorobenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,4-Dichlorobenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
N-Butylbenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,2-Dichlorobenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,2-Dibromo 3-Chloropropane	EPA-8260	U	UG/KG	50	06/21/2017	DLC
1,2,4-Trichlorobenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Hexachlorobutadiene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
Naphthalene	EPA-8260	U	UG/KG	10	06/21/2017	DLC
1,2,3-Trichlorobenzene	EPA-8260	U	UG/KG	10	06/21/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-297260 - Batch R297260 - TCLP Extract by EPA-8260

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Vinyl Chloride (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC
Carbon Tetrachloride (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC
1,1-Dichloroethene (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC
2-Butanone (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC
Chloroform (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC
1,2-Dichloroethane (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC
Benzene (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC
Trichloroethene (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC
Tetrachloroethylene (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC
Chlorobenzene (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC
1,4-Dichlorobenzene (ZHE)	EPA-8260/1311	U	MG/L	0.0050	06/27/2017	DLC

U - Analyte analyzed for but not detected at level above reporting limit.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	6/28/2017 EV17060086 C601
CLIENT CONTACT:	Harold Cashman		
CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY BLANK RESULTS

MB-062217S - Batch 117553 - Soil by EPA-8270

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Pyridine	EPA-8270	U	UG/KG	200	06/23/2017	PAB
N-Nitrosodimethylamine	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Phenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Aniline	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Bis(2-Chloroethyl)Ether	EPA-8270	U	UG/KG	250	06/23/2017	PAB
2-Chlorophenol	EPA-8270	U	UG/KG	250	06/23/2017	PAB
1,3-Dichlorobenzene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
1,4-Dichlorobenzene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Benzyl Alcohol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
1,2-Dichlorobenzene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
2-Methylphenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Bis(2-Chloroisopropyl)Ether	EPA-8270	U	UG/KG	250	06/23/2017	PAB
3&4-Methylphenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine	EPA-8270	U	UG/KG	250	06/23/2017	PAB
Hexachloroethane	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Nitrobenzene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Isophorone	EPA-8270	U	UG/KG	100	06/23/2017	PAB
2-Nitrophenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
2,4-Dimethylphenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Benzoic Acid	EPA-8270	U	UG/KG	1000	06/23/2017	PAB
Bis(2-Chloroethoxy)Methane	EPA-8270	U	UG/KG	250	06/23/2017	PAB
2,4-Dichlorophenol	EPA-8270	U	UG/KG	500	06/23/2017	PAB
1,2,4-Trichlorobenzene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Naphthalene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
4-Chloroaniline	EPA-8270	U	UG/KG	1000	06/23/2017	PAB
2,6-Dichlorophenol	EPA-8270	U	UG/KG	250	06/23/2017	PAB
Hexachlorobutadiene	EPA-8270	U	UG/KG	500	06/23/2017	PAB
4-Chloro-3-Methylphenol	EPA-8270	U	UG/KG	500	06/23/2017	PAB
2-Methylnaphthalene	EPA-8270	U	UG/KG	250	06/23/2017	PAB
1-Methylnaphthalene	EPA-8270	U	UG/KG	250	06/23/2017	PAB
Hexachlorocyclopentadiene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
2,4,6-Trichlorophenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
2,4,5-Trichlorophenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
2-Chloronaphthalene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
2-Nitroaniline	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Acenaphthylene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Dimethylphthalate	EPA-8270	U	UG/KG	100	06/23/2017	PAB
2,6-Dinitrotoluene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Acenaphthene	EPA-8270	U	UG/KG	100	06/23/2017	PAB

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CLIENT CONTACT:	Harold Cashman		
CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY BLANK RESULTS

MB-062217S - Batch 117553 - Soil by EPA-8270

3-Nitroaniline	EPA-8270	U	UG/KG	1000	06/23/2017	PAB
2,4-Dinitrophenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
4-Nitrophenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Dibenzofuran	EPA-8270	U	UG/KG	100	06/23/2017	PAB
2,4-Dinitrotoluene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
2,3,4,6-Tetrachlorophenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Diethylphthalate	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Fluorene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
4-Chlorophenyl-Phenylether	EPA-8270	U	UG/KG	100	06/23/2017	PAB
4-Nitroaniline	EPA-8270	U	UG/KG	250	06/23/2017	PAB
4,6-Dinitro-2-Methylphenol	EPA-8270	U	UG/KG	100	06/23/2017	PAB
N-Nitrosodiphenylamine	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Azobenzene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
4-Bromophenyl-Phenylether	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Hexachlorobenzene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Pentachlorophenol	EPA-8270	U	UG/KG	500	06/23/2017	PAB
Phenanthrene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Anthracene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Carbazole	EPA-8270	U	UG/KG	250	06/23/2017	PAB
Di-N-Butylphthalate	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Fluoranthene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Pyrene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Butylbenzylphthalate	EPA-8270	U	UG/KG	100	06/23/2017	PAB
3,3-Dichlorobenzidine	EPA-8270	U	UG/KG	250	06/23/2017	PAB
Benzo[A]Anthracene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Chrysene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Bis(2-Ethylhexyl)Phthalate	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Di-N-Octylphthalate	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Benzo[B]Fluoranthene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Benzo[K]Fluoranthene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Benzo[A]Pyrene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270	U	UG/KG	100	06/23/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270	U	UG/KG	100	06/23/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-297264 - Batch R297264 - TCLP Extract by EPA-8270

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Pyridine (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
N-Nitrosodimethylamine (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB

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CLIENT CONTACT:	Harold Cashman		
CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY BLANK RESULTS

MBLK-297264 - Batch R297264 - TCLP Extract by EPA-8270

Phenol	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Aniline (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Bis(2-Chloroethyl)Ether (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2-Chlorophenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
1,3-Dichlorobenzene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
1,4-Dichlorobenzene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Benzyl Alcohol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
1,2-Dichlorobenzene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2-Methylphenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Bis(2-Chloroisopropyl)Ether (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
3&4-Methylphenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
N-Nitroso-Di-N-Propylamine (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Hexachloroethane (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Nitrobenzene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Isophorone (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2-Nitrophenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2,4-Dimethylphenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Benzoic Acid (TCLP)	EPA-8270/1311	U	UG/L	10	06/27/2017	PAB
Bis(2-Chloroethoxy)Methane (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2,4-Dichlorophenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
1,2,4-Trichlorobenzene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Naphthalene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
4-Chloroaniline (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2,6-Dichlorophenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Hexachlorobutadiene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
4-Chloro-3-Methylphenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2-Methylnaphthalene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
1-Methylnaphthalene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Hexachlorocyclopentadiene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2,4,6-Trichlorophenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2,4,5-Trichlorophenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2-Chloronaphthalene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2-Nitroaniline (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Acenaphthylene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Dimethylphthalate (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2,6-Dinitrotoluene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Acenaphthene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
3-Nitroaniline (TCLP)	EPA-8270/1311	U	UG/L	5.0	06/27/2017	PAB
2,4-Dinitrophenol (TCLP)	EPA-8270/1311	U	UG/L	10	06/27/2017	PAB
4-Nitrophenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Dibenzofuran (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB

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CLIENT CONTACT:	Harold Cashman		
CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY BLANK RESULTS

MBLK-297264 - Batch R297264 - TCLP Extract by EPA-8270

2,4-Dinitrotoluene	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
2,3,4,6-Tetrachlorophenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Diethylphthalate (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Fluorene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
4-Chlorophenyl-Phenylether (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
4-Nitroaniline (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
4,6-Dinitro-2-Methylphenol (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
N-Nitrosodiphenylamine (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Azobenzene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
4-Bromophenyl-Phenylether (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Hexachlorobenzene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Pentachlorophenol (TCLP)	EPA-8270/1311	U	UG/L	5.0	06/27/2017	PAB
Phenanthrene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Anthracene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Carbazole (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Di-N-Butylphthalate (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Fluoranthene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Pyrene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Butylbenzylphthalate (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Benzo[A]Anthracene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Chrysene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Bis(2-Ethylhexyl)Phthalate (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Di-N-Octylphthalate (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Benzo[B]Fluoranthene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Benzo[K]Fluoranthene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Benzo[A]Pyrene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Indeno[1,2,3-Cd]Pyrene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Dibenz[A,H]Anthracene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB
Benzo[G,H,I]Perylene (TCLP)	EPA-8270/1311	U	UG/L	2.0	06/27/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

MB-062117S - Batch 117496 - Soil by EPA-8082

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
PCB-1016	EPA-8082	U	MG/KG	0.10	06/23/2017	PAB
PCB-1221	EPA-8082	U	MG/KG	0.10	06/23/2017	PAB
PCB-1232	EPA-8082	U	MG/KG	0.10	06/23/2017	PAB
PCB-1242	EPA-8082	U	MG/KG	0.10	06/23/2017	PAB
PCB-1248	EPA-8082	U	MG/KG	0.10	06/23/2017	PAB
PCB-1254	EPA-8082	U	MG/KG	0.10	06/23/2017	PAB
PCB-1260	EPA-8082	U	MG/KG	0.10	06/23/2017	PAB

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CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY BLANK RESULTS

MB-062117S - Batch 117496 - Soil by EPA-8082

PCB-1268	EPA-8082	U	MG/KG	0.10	06/23/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-297118 - Batch R297118 - Soil by EPA-7196

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Chromium (VI)	EPA-7196	U	MG/KG	5.0	06/26/2017	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-297104 - Batch R297104 - Soil by EPA-7471

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Mercury	EPA-7471	U	MG/KG	0.020	06/20/2017	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-296996 - Batch R296996 - TCLP Extract by EPA-7470

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	MG/L	0.00020	06/22/2017	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

MB-061917S - Batch 117303 - Soil by EPA-6020

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Antimony	EPA-6020	U	MG/KG	0.10	06/19/2017	RAL
Arsenic	EPA-6020	U	MG/KG	0.20	06/19/2017	RAL
Barium	EPA-6020	U	MG/KG	0.10	06/19/2017	RAL
Beryllium	EPA-6020	U	MG/KG	0.10	06/19/2017	RAL
Cadmium	EPA-6020	U	MG/KG	0.10	06/19/2017	RAL
Chromium	EPA-6020	U	MG/KG	0.10	06/19/2017	RAL
Copper	EPA-6020	U	MG/KG	0.10	06/19/2017	RAL
Lead	EPA-6020	U	MG/KG	0.10	06/19/2017	RAL
Nickel	EPA-6020	U	MG/KG	0.10	06/19/2017	RAL
Selenium	EPA-6020	U	MG/KG	1.0	06/19/2017	RAL
Silver	EPA-6020	U	MG/KG	0.10	06/19/2017	RAL
Thallium	EPA-6020	U	MG/KG	0.87	06/19/2017	RAL
Zinc	EPA-6020	U	MG/KG	0.50	06/19/2017	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

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CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY BLANK RESULTS

MBLK-297106 - Batch R297106 - TCLP Extract by EPA-6020

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Arsenic (TCLP)	EPA-6020/1311	U	MG/L	0.0050	06/22/2017	RAL
Barium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	06/22/2017	RAL
Cadmium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	06/22/2017	RAL
Chromium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	06/22/2017	RAL
Lead (TCLP)	EPA-6020/1311	U	MG/L	0.0050	06/22/2017	RAL
Selenium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	06/22/2017	RAL
Silver (TCLP)	EPA-6020/1311	U	MG/L	0.0050	06/22/2017	RAL

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CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: 117278 - Soil by NWTPH-GX

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range - BS	NWTPH-GX	**90.6**			66.5	122.7	06/19/2017	SNC
TPH-Volatile Range - BSD	NWTPH-GX	**100**	**10**		66.5	122.7	06/19/2017	SNC

ALS Test Batch ID: 117279 - Soil by NWTPH-GX

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range - BS	NWTPH-GX	**101**			66.5	122.7	06/17/2017	SNC
TPH-Volatile Range - BSD	NWTPH-GX	**98.3**	**3**		66.5	122.7	06/17/2017	SNC

ALS Test Batch ID: 117279 - Soil by EPA-8021

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Benzene - BS	EPA-8021	**86.4**			67.7	124	06/17/2017	SNC
Benzene - BSD	EPA-8021	**87.1**	**1**		67.7	124	06/17/2017	SNC
Toluene - BS	EPA-8021	**83.7**			71	123	06/17/2017	SNC
Toluene - BSD	EPA-8021	**84.0**	**0**		71	123	06/17/2017	SNC
Ethylbenzene - BS	EPA-8021	**85.1**			69.8	117	06/17/2017	SNC
Ethylbenzene - BSD	EPA-8021	**87.0**	**2**		69.8	117	06/17/2017	SNC
Xylenes - BS	EPA-8021	**87.9**			70	119	06/17/2017	SNC
Xylenes - BSD	EPA-8021	**89.3**	**2**		70	119	06/17/2017	SNC

ALS Test Batch ID: 117268 - Soil by NWTPH-DX

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range - BS	NWTPH-DX	**114**			75.5	122.1	06/16/2017	DLC
TPH-Diesel Range - BSD	NWTPH-DX	**107**	**6**		75.5	122.1	06/16/2017	DLC

ALS Test Batch ID: 117352 - Soil by NWTPH-DX

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range - BS	NWTPH-DX	**120**			75.5	122.1	06/16/2017	DLC
TPH-Diesel Range - BSD	NWTPH-DX	**119**	**1**		75.5	122.1	06/16/2017	DLC

ALS Test Batch ID: 117471 - Soil by EPA-8260

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
1,1-Dichloroethene - BS	EPA-8260	**97.1**			73	138	06/21/2017	DLC
1,1-Dichloroethene - BSD	EPA-8260	**93.0**	**4**		73	138	06/21/2017	DLC
Benzene - BS	EPA-8260	**94.0**			75	138	06/21/2017	DLC

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CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY CONTROL SAMPLE RESULTS

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Benzene - BSD	EPA-8260	**90.9**	**3**		75	138	06/21/2017	DLC
Trichloroethene - BS	EPA-8260	**93.8**			75	136	06/21/2017	DLC
Trichloroethene - BSD	EPA-8260	**90.6**	**3**		75	136	06/21/2017	DLC
Toluene - BS	EPA-8260	**99.7**			76	134	06/21/2017	DLC
Toluene - BSD	EPA-8260	**96.6**	**3**		76	134	06/21/2017	DLC
Chlorobenzene - BS	EPA-8260	**104**			79	128	06/21/2017	DLC
Chlorobenzene - BSD	EPA-8260	**99.8**	**4**		79	128	06/21/2017	DLC

ALS Test Batch ID: R297260 - TCLP Extract by EPA-8260

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
1,1-Dichloroethene (ZHE) - BS	EPA-8260/1311	**118**			80.2	139	06/27/2017	DLC
1,1-Dichloroethene (ZHE) - BSD	EPA-8260/1311	**119**	**1**		80.2	139	06/27/2017	DLC
Benzene (ZHE) - BS	EPA-8260/1311	**111**			79.2	138	06/27/2017	DLC
Benzene (ZHE) - BSD	EPA-8260/1311	**111**	**0**		79.2	138	06/27/2017	DLC
Trichloroethene (ZHE) - BS	EPA-8260/1311	**111**			87.1	134	06/27/2017	DLC
Trichloroethene (ZHE) - BSD	EPA-8260/1311	**100**	**10**		87.1	134	06/27/2017	DLC
Chlorobenzene (ZHE) - BS	EPA-8260/1311	**115**			78	130	06/27/2017	DLC
Chlorobenzene (ZHE) - BSD	EPA-8260/1311	**114**	**1**		78	130	06/27/2017	DLC

ALS Test Batch ID: 117553 - Soil by EPA-8270

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Phenol - BS	EPA-8270	**56.3**			36.1	131	06/23/2017	PAB
Phenol - BSD	EPA-8270	**58.7**	**4**		36.1	131	06/23/2017	PAB
2-Chlorophenol - BS	EPA-8270	**56.4**			59.9	111	06/23/2017	PAB
2-Chlorophenol - BSD	EPA-8270	**59.7**	**6**		59.9	111	06/23/2017	PAB
1,4-Dichlorobenzene - BS	EPA-8270	**57.7**			44.3	122	06/23/2017	PAB
1,4-Dichlorobenzene - BSD	EPA-8270	**59.4**	**3**		44.3	122	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine - BS	EPA-8270	**51.4**			31.6	134	06/23/2017	PAB
N-Nitroso-Di-N-Propylamine - BSD	EPA-8270	**55.3**	**7**		31.6	134	06/23/2017	PAB
1,2,4-Trichlorobenzene - BS	EPA-8270	**61.1**			44.6	122	06/23/2017	PAB
1,2,4-Trichlorobenzene - BSD	EPA-8270	**63.0**	**3**		44.6	122	06/23/2017	PAB
4-Chloro-3-Methylphenol - BS	EPA-8270	**52.6**			49.2	135	06/23/2017	PAB
4-Chloro-3-Methylphenol - BSD	EPA-8270	**55.2**	**5**		49.2	135	06/23/2017	PAB
Acenaphthene - BS	EPA-8270	**61.6**			49.3	117	06/23/2017	PAB
Acenaphthene - BSD	EPA-8270	**62.9**	**2**		49.3	117	06/23/2017	PAB
4-Nitrophenol - BS	EPA-8270	**49.7**			29.8	137	06/23/2017	PAB
4-Nitrophenol - BSD	EPA-8270	**51.4**	**3**		29.8	137	06/23/2017	PAB
2,4-Dinitrotoluene - BS	EPA-8270	**58.4**			55.3	130	06/23/2017	PAB

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LABORATORY CONTROL SAMPLE RESULTS

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
2,4-Dinitrotoluene - BSD	EPA-8270	**59.9**	**3**		55.3	130	06/23/2017	PAB
Pentachlorophenol - BS	EPA-8270	**57.5**			41.3	113	06/23/2017	PAB
Pentachlorophenol - BSD	EPA-8270	**61.0**	**6**		41.3	113	06/23/2017	PAB
Pyrene - BS	EPA-8270	**57.3**			57.4	145	06/23/2017	PAB
Pyrene - BSD	EPA-8270	**60.6**	**6**		48.9	150	06/23/2017	PAB

ALS Test Batch ID: R297264 - TCLP Extract by EPA-8270

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Phenol - BS (TCLP)	EPA-8270/1311	**68.9**			5	84	06/27/2017	PAB
Phenol - BSD (TCLP)	EPA-8270/1311	**65.0**	**6**		5	84	06/27/2017	PAB
2-Chlorophenol - BS (TCLP)	EPA-8270/1311	**83.3**			60	67	06/27/2017	PAB
2-Chlorophenol - BSD (TCLP)	EPA-8270/1311	**78.4**	**6**		60	67	06/27/2017	PAB
1,4-Dichlorobenzene - BS (TCLP)	EPA-8270/1311	**67.3**			27	91	06/27/2017	PAB
1,4-Dichlorobenzene - BSD (TCLP)	EPA-8270/1311	**54.7**	**21**		27	91	06/27/2017	PAB
N-Nitroso-Di-N-Propylamine - BS (TCLP)	EPA-8270/1311	**80.8**			31	127	06/27/2017	PAB
N-Nitroso-Di-N-Propylamine - BSD (TCLP)	EPA-8270/1311	**77.4**	**4**		31	127	06/27/2017	PAB
1,2,4-Trichlorobenzene - BS (TCLP)	EPA-8270/1311	**70.3**			29	97	06/27/2017	PAB
1,2,4-Trichlorobenzene - BSD (TCLP)	EPA-8270/1311	**58.7**	**18**		29	97	06/27/2017	PAB
4-Chloro-3-Methylphenol - BS (TCLP)	EPA-8270/1311	**75.8**			59	107	06/27/2017	PAB
4-Chloro-3-Methylphenol - BSD (TCLP)	EPA-8270/1311	**68.5**	**10**		59	107	06/27/2017	PAB
Acenaphthene - BS (TCLP)	EPA-8270/1311	**93.9**			41	107	06/27/2017	PAB
Acenaphthene - BSD (TCLP)	EPA-8270/1311	**88.4**	**6**		41	107	06/27/2017	PAB
4-Nitrophenol - BS (TCLP)	EPA-8270/1311	**57.2**			5	63	06/27/2017	PAB
4-Nitrophenol - BSD (TCLP)	EPA-8270/1311	**48.4**	**17**		5	63	06/27/2017	PAB
2,4-Dinitrotoluene - BS (TCLP)	EPA-8270/1311	**86.5**			49	98	06/27/2017	PAB
2,4-Dinitrotoluene - BSD (TCLP)	EPA-8270/1311	**79.3**	**9**		49	98	06/27/2017	PAB
Pentachlorophenol - BS (TCLP)	EPA-8270/1311	**90.3**			33	124	06/27/2017	PAB
Pentachlorophenol - BSD (TCLP)	EPA-8270/1311	**85.3**	**6**		33	124	06/27/2017	PAB
Pyrene - BS (TCLP)	EPA-8270/1311	**102**			55	136	06/27/2017	PAB
Pyrene - BSD (TCLP)	EPA-8270/1311	**104**	**2**		55	136	06/27/2017	PAB

ALS Test Batch ID: 117496 - Soil by EPA-8082

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
PCB-1016 - BS	EPA-8082	**61.8**			50	150	06/23/2017	PAB
PCB-1016 - BSD	EPA-8082	**64.0**	**3**		50	150	06/23/2017	PAB
PCB-1260 - BS	EPA-8082	**75.7**			50	150	06/23/2017	PAB
PCB-1260 - BSD	EPA-8082	**75.1**	**1**		50	150	06/23/2017	PAB

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	6/28/2017 EV17060086 C601
CLIENT CONTACT:	Harold Cashman		
CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: R297118 - Soil by EPA-7196

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Chromium (VI) - BS	EPA-7196	**103**			91	114	06/26/2017	RAL
Chromium (VI) - BSD	EPA-7196	**100**	**3**		91	114	06/26/2017	RAL

ALS Test Batch ID: R297104 - Soil by EPA-7471

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Mercury - BS	EPA-7471	**111**			81.8	117	06/20/2017	RAL
Mercury - BSD	EPA-7471	**107**	**4**		81.8	117	06/20/2017	RAL

ALS Test Batch ID: R296996 - TCLP Extract by EPA-7470

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP) - BS	EPA-7470/1311	**100**			85	115	06/22/2017	RAL
Mercury (TCLP) - BSD	EPA-7470/1311	**102**	**2**		85	115	06/22/2017	RAL

ALS Test Batch ID: 117303 - Soil by EPA-6020

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Antimony - BS	EPA-6020	**102**			80	120	06/19/2017	RAL
Antimony - BSD	EPA-6020	**103**	**1**		80	120	06/19/2017	RAL
Arsenic - BS	EPA-6020	**99.6**			80	120	06/19/2017	RAL
Arsenic - BSD	EPA-6020	**100**	**1**		80	120	06/19/2017	RAL
Barium - BS	EPA-6020	**100**			80	120	06/19/2017	RAL
Barium - BSD	EPA-6020	**100**	**0**		80	120	06/19/2017	RAL
Beryllium - BS	EPA-6020	**92.2**			80	120	06/19/2017	RAL
Beryllium - BSD	EPA-6020	**93.3**	**1**		80	120	06/19/2017	RAL
Cadmium - BS	EPA-6020	**98.2**			80	120	06/19/2017	RAL
Cadmium - BSD	EPA-6020	**99.2**	**1**		80	120	06/19/2017	RAL
Chromium - BS	EPA-6020	**102**			80	120	06/19/2017	RAL
Chromium - BSD	EPA-6020	**102**	**0**		80	120	06/19/2017	RAL
Copper - BS	EPA-6020	**103**			80	120	06/19/2017	RAL
Copper - BSD	EPA-6020	**103**	**0**		80	120	06/19/2017	RAL
Lead - BS	EPA-6020	**98.0**			80	120	06/19/2017	RAL
Lead - BSD	EPA-6020	**99.0**	**1**		80	120	06/19/2017	RAL
Nickel - BS	EPA-6020	**101**			80	120	06/19/2017	RAL
Nickel - BSD	EPA-6020	**101**	**0**		80	120	06/19/2017	RAL
Selenium - BS	EPA-6020	**104**			80	120	06/19/2017	RAL
Selenium - BSD	EPA-6020	**104**	**0**		80	120	06/19/2017	RAL
Silver - BS	EPA-6020	**102**			80	120	06/19/2017	RAL

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	6/28/2017 EV17060086 C601
CLIENT CONTACT:	Harold Cashman		
CLIENT PROJECT:	Shell PSR SWMU-55		

LABORATORY CONTROL SAMPLE RESULTS

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Silver - BSD	EPA-6020	**102**	**1**		80	120	06/19/2017	RAL
Thallium - BS	EPA-6020	**97.7**			80	120	06/19/2017	RAL
Thallium - BSD	EPA-6020	**101**	**3**		80	120	06/19/2017	RAL
Zinc - BS	EPA-6020	**98.6**			80	119	06/19/2017	RAL
Zinc - BSD	EPA-6020	**98.2**	**0**		80	119	06/19/2017	RAL

ALS Test Batch ID: R297106 - TCLP Extract by EPA-6020

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Arsenic (TCLP) - BS	EPA-6020/1311	**93.2**			89.1	110	06/22/2017	RAL
Arsenic (TCLP) - BSD	EPA-6020/1311	**92.4**	**1**		89.1	110	06/22/2017	RAL
Barium (TCLP) - BS	EPA-6020/1311	**91.3**			88.5	108	06/22/2017	RAL
Barium (TCLP) - BSD	EPA-6020/1311	**92.9**	**2**		88.5	108	06/22/2017	RAL
Cadmium (TCLP) - BS	EPA-6020/1311	**93.5**			89.4	109	06/22/2017	RAL
Cadmium (TCLP) - BSD	EPA-6020/1311	**92.9**	**1**		89.4	109	06/22/2017	RAL
Chromium (TCLP) - BS	EPA-6020/1311	**93.2**			86.2	107	06/22/2017	RAL
Chromium (TCLP) - BSD	EPA-6020/1311	**92.0**	**1**		86.2	107	06/22/2017	RAL
Lead (TCLP) - BS	EPA-6020/1311	**91.6**			87.5	107	06/22/2017	RAL
Lead (TCLP) - BSD	EPA-6020/1311	**91.6**	**0**		87.5	107	06/22/2017	RAL
Selenium (TCLP) - BS	EPA-6020/1311	**94.8**			90.2	113	06/22/2017	RAL
Selenium (TCLP) - BSD	EPA-6020/1311	**92.0**	**3**		90.2	113	06/22/2017	RAL
Silver (TCLP) - BS	EPA-6020/1311	**93.3**			80	120	06/22/2017	RAL
Silver (TCLP) - BSD	EPA-6020/1311	**92.4**	**1**		80	120	06/22/2017	RAL

APPROVED BY

Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental
8620 Holly Drive, Suite 100
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http://www.alsglobal.com

Chain Of Custody/ Laboratory Analysis Request

ALS Job# (Laboratory Use Only): EV17060086

Date 6/13/17 Page 1 Of 4

PROJECT ID: Shell PSR SWMU-55
REPORT TO COMPANY: Whatcom Environmental SVCS
PROJECT MANAGER: Eric Libolt
ADDRESS: 228 E Champion St #101
Bellingham WA 98225
PHONE: 3607529571 FAX:
P.O. #: E-MAIL:
INVOICE TO COMPANY: Same
ATTENTION:
ADDRESS:

SAMPLE I.D.	DATE	TIME	TYPE	LAB#	NWTPH-HCID	NWTPH-DX (with silica gel)	NWTPH-GX	BTEX by EPA 8021 [X] BTEX by EPA 8260 ☐	MTBE by EPA 8021 ☐ MTBE by EPA 8260 ☐	Halogenated Volatiles by EPA 8260	Volatile Organic Compounds by EPA 8260	EDB / EDC by EPA 8260 SIM (water)	EDB / EDC by EPA 8260 (soil)	Semivolatile Organic Compounds by EPA 8270	Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM	PCB by EPA 8082 [X] Pesticides by EPA 8081 ☐	Metals-MTCA-5 ☐ RCRA-8 ☐ Pri Pol [X] TAL ☐	Metals Other (Specify) Barium	TCLP-Metals [X] RCRA-8 VOA ☐ Semi-Vol ☐ Pest ☐ Herbs ☐	Soil pH	TCLP VOCs (EPA 1311)	TCLP SVOCs (EPA 1311)	Hexavalent Chromium	~~Soil Bioassay~~	Dioxin (EPA 1613)		NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?
1. Plot 13 TP1 WR	6/8/17	8:20	Soil	1		X	X				X			X			X	X	X	X							4	
2. Plot13 TP1 CS 7ft		8:30		2		X	X	X																			2	
3. Plot13 TP2 WR		9:20		3		X	X				X			X			X	X	X	X							4	
4. Plot 13 TP2 CS 9.5ft		9:30		4		X	X	X																			2	
5. Plot 14 TP1 WR		11:45		5		X	X				X			X			X	X	X	X							4	
6. Plot14 TP1 CS 9.5ft		1140		6		X	X	X																			2	
7. Plot14 TP2 WR		1110		7		X	X				X			X		X	X	X	X	X	X	X	X	X	X		6	
8. Plot 14 TP2 CS 6ft		1100		8		X	X	X																			2	
9. Plot 14 TP3 WR		1030		9		X	X				X			X			X	X	X	X							4	
10. Plot 14 TP3 CS 9ft		1035		10		X	X	X																			2	

SPECIAL INSTRUCTIONS Samples collected via Method 5035A

SIGNATURES (Name, Company, Date, Time):
1. Relinquished By: [signature] WES 6/13/17 2:00
Received By:
2. Relinquished By:
Received By: Shawn Robinson ALS 6/14/17 10:05a

TURNAROUND REQUESTED in Business Days*
Organic, Metals & Inorganic Analysis
[X] 10 Standard ☐ 5 ☐ 3 ☐ 2 ☐ 1 ☐ SAME DAY
Fuels & Hydrocarbon Analysis
[X] 5 Standard ☐ 3 ☐ 1 ☐ SAME DAY
OTHER:
Specify:

*Turnaround request less than standard may incur Rush Charges

ALS Environmental
8620 Holly Drive, Suite 100
Everett, WA 98208
Phone (425) 356-2600
Fax (425) 356-2626
http://www.alsglobal.com

Chain Of Custody/ Laboratory Analysis Request

ALS Job# (Laboratory Use Only): EV17060086

Date 6/13/17 Page 2 Of 4

PROJECT ID: Shell PSR SWMU-55
REPORT TO COMPANY: Whatcom Environmental SVCS
PROJECT MANAGER: Eric Cibolt
ADDRESS: 228 E Champion St #101
Bellingham WA 98225
PHONE: 3607529571 FAX:
P.O. #: E-MAIL:
INVOICE TO COMPANY: Same
ATTENTION:
ADDRESS:

ANALYSIS REQUESTED / OTHER (Specify)

SAMPLE I.D.	DATE	TIME	TYPE	LAB#	NWTPH-HCID	NWTPH-DX (with silica gel)	NWTPH-GX	BTEX by EPA 8021 ☒ BTEX by EPA 8260 ☐	MTBE by EPA 8021 ☐ MTBE by EPA 8260 ☐	Halogenated Volatiles by EPA 8260	Volatile Organic Compounds by EPA 8260	EDB / EDC by EPA 8260 SIM (water)	EDB / EDC by EPA 8260 (soil)	Semivolatile Organic Compounds by EPA 8270	Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM	PCB by EPA 8082 ☒ Pesticides by EPA 8081 ☐	Metals-MTCA-5 ☐ RCRA-8 ☐ Pri Pol ☒ TAL ☐	Metals Other (Specify) Barium	TCLP-Metals ☒ RCRA-8 VOA ☐ Semi-Vol ☐ Pest ☐ Herbs ☐	soil pH	TCLP VOCs (EPA 1311)	TCLP SVOCs (EPA 1311)	Hexavalent Chromium	~~Soil bioassay~~	Dioxin (EPA 1613)		NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?
1. Plot 15 TP1 WR	6/8/17	205	Soil	11		X	X				X			X			X	X	X	X							4	
2. Plot 15 TP1 2ft	↓	810	↓	12		X	X				X			X			X	X	X	X							4	
3. Plot 15 TP1 CS 9ft	↓	200	↓	13		X	X	X																			2	
4. Plot 15 TP2 WR	↓	3:00	↓	14		X	X				X			X		X	X	X	X	X	X	X	X	X	X		6	
5. Plot 15 TP2 CS 8ft	↓	2:45	↓	15		X	X	X																			2	
6. Plot 16E TP1 WR	6/12/17	8 45	↓	16		X	X				X			X			X	X	X	X							4	
7. Plot 16E TP1 CS 9ft	↓	8:40	↓	17		X	X	X																			2	
8. Plot 16E TP2 WR	↓	9:45	↓	18		X	X				X			X			X	X	X	X							4	
9. Plot 16E TP2 CS 15ft	↓	9:40	↓	19		X	X	X																			2	
10. Plot 16W TP1 WR	↓	11 35	↓	20		X	X				X			X			X	X	X	X							4	

SPECIAL INSTRUCTIONS: Samples collected via Method 5035A

SIGNATURES (Name, Company, Date, Time):
1. Relinquished By: [signature] WES 6/13/17 2:00
Received By:
2. Relinquished By:
Received By: Shawn Robinson ALS 6/14/17 10:05a

TURNAROUND REQUESTED in Business Days*

Organic, Metals & Inorganic Analysis: ☒ 10 (Standard) ☐ 5 ☐ 3 ☐ 2 ☐ 1 ☐ SAME DAY

Fuels & Hydrocarbon Analysis: ☒ 5 (Standard) ☐ 3 ☐ 1 ☐ SAME DAY

OTHER:
Specify:

*Turnaround request less than standard may incur Rush Charges

ALS Environmental
8620 Holly Drive, Suite 100
Everett, WA 98208
Phone (425) 356-2600
Fax (425) 356-2626
http://www.alsglobal.com

Chain Of Custody/ Laboratory Analysis Request

ALS Job# (Laboratory Use Only): EV17060086

Date 6/13/17 Page 3 Of 4

PROJECT ID: Shell PSR SWMU-55
REPORT TO COMPANY: Whatcom Environmental Svcs
PROJECT MANAGER: Eric Libolt
ADDRESS: 228 E Champion St #101
Bellingham WA 98225
PHONE: 3607529571 FAX:
P.O. #: E-MAIL:
INVOICE TO COMPANY: Same
ATTENTION:
ADDRESS:

ANALYSIS REQUESTED / OTHER (Specify)

SAMPLE I.D.	DATE	TIME	TYPE	LAB#	NWTPH-HCID	NWTPH-DX (with silica gel)	NWTPH-GX	BTEX by EPA 8021 ☒ BTEX by EPA 8260 ☐	MTBE by EPA 8021 ☐ MTBE by EPA 8260 ☐	Halogenated Volatiles by EPA 8260	Volatile Organic Compounds by EPA 8260	EDB / EDC by EPA 8260 SIM (water)	EDB / EDC by EPA 8260 (soil)	Semivolatile Organic Compounds by EPA 8270	Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM	PCB by EPA 8082 ☒ Pesticides by EPA 8081 ☐	Metals-MTCA-5 ☐ RCRA-8 ☐ Pri Pol ☒ TAL ☐	Metals Other (Specify) Barium	TCLP-Metals ☒ RCRA-8 VOA ☐ Semi-Vol ☐ Pest ☐ Herbs ☐	Soil pH	TCLP VOCs (EPA 1311)	TCLP SVOCs (EPA 1311)	Hexavalent chromium	~~Soil bioassay~~	Dioxin (EPA 1613)	NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?
1. Plot 16W TP1 CS14ft	6/12/17	11:30	Soil	21		X	X	X																		2	
2. Plot 16W TP2 WR	↓	10:25	↓	22		X	X				X			X			X	X	X	X						4	
3. Plot 16W TP2 CS10ft	↓	10:20	↓	23		X	X	X																		2	
4. Plot 17 TP1 WR	↓	1:45	↓	24		X	X				X			X		X	X	X	X	X	X	X	X	X	X	6	
5. Plot 17 TP1 CS 8ft	↓	1:40	↓	25		X	X	X																		2	
6. Plot 17 TP2 WR	↓	2:20	↓	26		X	X				X			X		X	X	X	X	X	X	X	X	X	X	6	
7. Plot 17 TP2 CS11ft	↓	2:15	↓	27		X	X	X																		2	
8. Plot 18 TP1 WR	↓	3:00	↓	28		X	X				X			X			X	X	X	X						4	
9. Plot 18 TP1 CS 8ft	↓	2:50	↓	29		X	X	X																		2	
10. Plot 18 TP2 WR	↓	3:25	↓	30		X	X				X			X			X	X	X	X						4	

SPECIAL INSTRUCTIONS: Samples collected via Method 5035A

SIGNATURES (Name, Company, Date, Time):
1. Relinquished By: [signature] WES 6/13/17 2:00
Received By:
2. Relinquished By:
Received By: Shawn Robinson ALS 6/14/17 10:05a

TURNAROUND REQUESTED in Business Days*

Organic, Metals & Inorganic Analysis: ☒ 10 Standard ☐ 5 ☐ 3 ☐ 2 ☐ 1 ☐ SAME DAY

Fuels & Hydrocarbon Analysis: ☒ 5 Standard ☐ 3 ☐ 1 ☐ SAME DAY

OTHER:
Specify:

*Turnaround request less than standard may incur Rush Charges

ALS Environmental
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Everett, WA 98208
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Chain Of Custody/ Laboratory Analysis Request

ALS Job# (Laboratory Use Only): EV17060086

Date 6/13/17 Page 4 Of 4

PROJECT ID:	Shell PSR SWMU - 55
REPORT TO COMPANY:	Whatcom Environmental SVCS
PROJECT MANAGER:	Eric Libolt
ADDRESS:	228 E Champian St #101 Bellingham WA 98225
PHONE:	360 7529571
FAX:	
P.O. #:	
E-MAIL:	
INVOICE TO COMPANY:	Same
ATTENTION:	
ADDRESS:	

ANALYSIS REQUESTED / OTHER (Specify)

SAMPLE I.D.	DATE	TIME	TYPE	LAB#	NWTPH-HCID	NWTPH-DX (with silica gel)	NWTPH-GX	BTEX by EPA 8021 ☒ BTEX by EPA 8260 ☐	MTBE by EPA 8021 ☐ MTBE by EPA 8260 ☐	Halogenated Volatiles by EPA 8260	Volatile Organic Compounds by EPA 8260	EDB / EDC by EPA 8260 SIM (water)	EDB / EDC by EPA 8260 (soil)	Semivolatile Organic Compounds by EPA 8270	Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM	PCB by EPA 8082 ☐ Pesticides by EPA 8081 ☐	Metals-MTCA-5 ☐ RCRA-8 ☐ Pri Pol ☒ TAL ☐	Metals Other (Specify) Barium	TCLP-Metals ☒ RCRA-8 VOA ☐ Semi-Vol ☐ Pest ☐ Herbs ☐	Soil pH	NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?
1. Plot 18 TP2 CS 8ft	6/12/17	3:20	Soil	31		X	X	X													2	
2. WES-DUP-1	↓	800	↓	32		X	X	X													2	
3. WES-DUP-2	↓	805	↓	33		X	X				X			X			X	X	X	X	4	
4. WES-DUP-3	↓	810	↓	34		X	X	X													2	
5. WES-DUP-4	↓	8:15	↓	35		X	X				X			X			X	X	X	X	4	
6.																						
7.																						
8.																						
9.																						
10.																						

SPECIAL INSTRUCTIONS: Samples collected via Method 5035A

SIGNATURES (Name, Company, Date, Time):

1. Relinquished By: [signature] WES 6/13/17 200
   Received By:
2. Relinquished By:
   Received By: Shawn Robinson ALS 6/14/17 10:05a

TURNAROUND REQUESTED in Business Days*

Organic, Metals & Inorganic Analysis: ☒ 10 (Standard) ☐ 5 ☐ 3 ☐ 2 ☐ 1 ☐ SAME DAY

Fuels & Hydrocarbon Analysis: ☒ 5 (Standard) ☐ 3 ☐ 1 ☐ SAME DAY

OTHER:
Specify: ______

*Turnaround request less than standard may incur Rush Charges

June 29, 2017

Service Request No:E1700633

Rick Bagan
ALS Environmental
8620 Holly Drive #100
Everett, WA 98208

Laboratory Results for: EV17060086

Dear Rick,

Enclosed are the results of the sample(s) submitted to our laboratory June 16, 2017
For your reference, these analyses have been assigned our service request number **E1700633.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current TNI standards, where applicable, and except as noted in the laboratory case narrative provided. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the final complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. In accordance to the TNI 2009 Standard, a statement on the estimated uncertainty of measurement of any quantitative analysis will be supplied upon request.

Please contact me if you have any questions. My extension is 2284. You may also contact me via email at Nicole.Brown@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Nicole Brown

Nicole Brown
Project Manager

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ALS Group USA, Corp.
dba ALS Environmental

Certificate of Analysis

ALS Environmental - Houston HRMS
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www.alsglobal.com

ALS Environmental

Client:	ALS Environmental – Everett, WA	**Service Request No.:**	E1700633
Project:	EV17060086	**Date Received:**	06/16/17
Sample Matrix:	Soil		

CASE NARRATIVE

All analyses were performed in adherence to the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt

Four soil samples were received for analysis at ALS Environmental in Houston on 06/16/17.

The samples were received at 5.6 °C in good condition and are consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

Data Validation Notes and Discussion

B flags – Method Blanks

The Method Blank EQ1700274-01 contained low levels of various compounds below the Method Reporting Limit (MRL). The associated compounds in the samples are flagged with 'B' flags where the sample result is less than ten times the level detected in the method blank.

MS/MSD

EQ1700274: Laboratory Control Spike/Duplicate Laboratory Control Spike (LCS/DLCS) samples were analyzed and reported in lieu of an MS/MSD for this extraction batch.

2378-TCDF

Samples analyzed on the DB-5MSUI column were analyzed under conditions where sufficient separation between 2,3,7,8-TCDF and its closest eluter was achieved. Confirmation of this result was not required.

Y flags – Labeled Standards

Quantification of the native 2,3,7,8-substituted congeners is based on isotopic dilution, which automatically corrects for variation in extraction efficiency and provides accurate values even with poor recovery. Samples that had recoveries of labeled standards outside the acceptance limits are qualified with 'Y' flags on the Labeled Compound summary pages. In all cases, the signal-to-noise ratios are greater than 10:1 and detection limits were below the Method Reporting Limits.

K flags

EMPC - When the ion abundance ratios associated with a particular compound are outside the QC limits, samples are flagged with a 'K' flag. A 'K' flag indicates an estimated maximum possible concentration for the associated compound.

Detection Limits

Detection limits are calculated for each analyte in each sample by measuring the height of the noise level for each quantitation ion for the associated labeled standard. The concentration equivalent to 2.5 times the height of the noise is then calculated using the appropriate response factor and the weight of the sample. The calculated concentration equals the detection limit.

The TEQ Summary results for each sample have been calculated by ALS/Houston to include:

- WHO-2005 TEFs, The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds (M. Van den Berg et al., Toxicological Sciences 93(2):223-241, 2006)
- Non-detected compounds are not included in the 'Total'

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Client: ALS Environmental - Everett **Service Request:** E1700633
Project: EV17060086

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
E1700633-001	EV17060086-07	6/8/2017	1110
E1700633-002	EV17060086-14	6/8/2017	1500
E1700633-003	EV17060086-24	6/12/2017	1345
E1700633-004	EV17060086-26	6/12/2017	1420

Service Request Summary

Folder #: **E1700633**
Client Name: ALS Environmental - Everett
Project Name: EV17060086
Project Number:

Report To: Rick Bagan
ALS Environmental
8620 Holly Drive #100
Everett, WA 98208
USA

Phone Number: 425-356-2600
Cell Number:
Fax Number:
E-mail: rick.bagan@alsglobal.com

Project Chemist: Nicole Brown
Originating Lab: HOUSTON
Logged By: ALOPEZ
Date Received: 06/16/17
Internal Due Date: 7/5/2017
QAP: LAB QAP
Qualifier Set: HRMS Qualifier Set
Formset: Lab Standard
Merged?: N
Report to MDL?: Y
P.O. Number: EV17060086
EDD: No EDD Specified

4 8 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved
Location: EHRMS-WIC 4B
Pressure Gas:
Rush

				HOUSTON	
Lab Samp No.	**Client Samp No**	**Matrix**	**Collected**	Dioxins Furans/1613B	Total Solids/ALS SOP
E1700633-001	EV17060086-07	Soil	06/08/17 1110	ll	ll
E1700633-002	EV17060086-14	Soil	06/08/17 1500	ll	ll
E1700633-003	EV17060086-24	Soil	06/12/17 1345	ll	ll
E1700633-004	EV17060086-26	Soil	06/12/17 1420	ll	ll

Service Request Summary

Folder #:	**E1700633**	Project Chemist:	Nicole Brown	4	8 oz-Glass Jar WM CLEAR Teflon Liner Unpreserved
Client Name:	ALS Environmental - Everett	Originating Lab:	HOUSTON	**Location:**	EHRMS-WIC 4B
Project Name:	EV17060086	Logged By:	ALOPEZ	**Pressure Gas:**	
Project Number:		Date Received:	06/16/17	**Rush**	
		Internal Due Date:	7/5/2017		
Report To:	Rick Bagan ALS Environmental 8620 Holly Drive #100 Everett, WA 98208 USA	QAP:	LAB QAP		
		Qualifier Set:	HRMS Qualifier Set		
		Formset:	Lab Standard		
		Merged?:	N		
Phone Number:	425-356-2600	Report to MDL?:	Y		
Cell Number:		P.O. Number:	EV17060086		
Fax Number:		EDD:	No EDD Specified		
E-mail:	rick.bagan@alsglobal.com				

Test Comments:

Group	Test/Method	Samples	Comments
Semivoa GCMS	Dioxins Furans/1613B	4	full list,

Data Qualifiers

HRMS Qualifier Set

B	Indicates the associated analyte was found in the method blank at >1/10th the reported value.
E	Estimated value. The reported concentration is above the calibration range of the instrument.
H	Sample extracted and/or analyzed out of suggested holding time.
J	Estimated value. The reported concentration is below the MRL.
K	The ion abundance ratio between the primary and secondary ions were outside of theoretical acceptance limits.The concentration of this analyte should be considered as an estimate.
P	Chlorodiphenyl ether interference was present at the retention time of the target analyte. Reported result should be considered an estimate.
Q	Monitored lock-mass indicates matrix-interference. Reported result is estimated.
S	Signal saturated detector. Result reported from dilution.
U	Compound was analyzed for, but was not detected (ND).
X	See Case Narrative.
Y	Isotopically Labeled Standard recovery outside of acceptance limits. In all cases, the signal-to-nois ratios are greater than 10:1, making the recoveries acceptable.
i	The MDL/MRL have been elevated due to a matrix interference.

Acronyms

Cal	Calibration
Conc	CONCentration
Dioxin(s)	Polychlorinated dibenzo-p-dioxin(s)
EDL	Estimated Detection Limit
EMPC	Estimated Maximum Possible Concentration
Flags	Data qualifiers
Furan(s)	Polychlorinated dibenzofuran(s)
g	Grams
ICAL	Initial CALibration
ID	IDentifier
Ions	Masses monitored for the analyte during data acquisition
L	Liter (s)
LCS	Laboratory Control Sample
DLCS	Duplicate Laboratory Control Sample
MB	Method Blank
MCL	Method Calibration Limit
MDL	Method Detection Limit
mL	Milliliters
MS	Matrix Spiked sample
DMS	Duplicate Matrix Spiked sample
NO	Number of peaks meeting all identification criteria
PCDD(s)	Polychlorinated dibenzo-p-dioxin(s)
PCDF(s)	Polychlorinated dibenzofuran(s)
ppb	Parts per billion
ppm	Parts per million
ppq	Parts per quadrillion
ppt	Parts per trillion
QA	Quality Assurance
QC	Quality Control
Ratio	Ratio of areas from monitored ions for an analyte
% Rec.	Percent recovery
RPD	Relative Percent Difference
RRF	Relative Response Factor
RT	Retention Time
SDG	Sample Delivery Group
S/N	Signal-to-noise ratio
TEF	Toxicity Equivalence Factor
TEQ	Toxicity Equivalence Quotient

ALS Environmental

State Certifications, Accreditations, and Licenses

Agency	Number	Expire Date
American Association for Laboratory Accreditation	2897.01	11/30/2017
Arizona Department of Health Services	AZ0793	5/27/2018
Arkansas Department of Environmental Quality	17-027-0	3/27/2018
California Department of Health Services	2452	2/28/2018
Florida Department of Health	E87611	6/30/2017
Hawaii Department of Health	TX02694	4/30/2018
Illinois Environmental Protection Agency	004112	5/9/2018
Kansas Department of Health and Environment	E-10406	7/31/2017
Louisiana Department of Environmental Quality	03048	6/30/2018
Louisiana Department of Health and Hospitals	LA150026	12/31/2017
Maine Center for Disease Control and Prevention	2014019	6/5/2018
Maryland Department of the Environment	343	6/30/2018
Michigan Depratment of Environmental Quality	9971	6/5/2018
Minnesota Department of Health	840911	12/31/2017
Nebraska Department of Health and Human Services	NE-OS-25-13	4/30/2018
Nevada Department of Concervation and Natural Resources	TX014112013-2	7/31/2017
New Jersey Department of Environmental Protection	NLC140001	6/30/2017
New York Department of Health	11707	3/31/2018
Oklahoma Department of Environmental Quality	2014 124	8/21/2017
Oregon Environmental Laboratory Accreditation Program	TX200002-009	3/24/2018
Pennsylvania Department of Environmental Protection	68-03441	6/30/2018
Tennessee Department of Environment and Concervation	04016	6/30/2017
Texas Commision on Environmental Quality	TX104704231-17-18	4/30/2018
United States Department of Agriculture	P330-14-00067	6/19/2018
Utah Department of Health Environmental Laboratory Certification	TX02694	7/31/2017
Washington Department of Health	c819	11/14/2017
West Virginia Department of Environmental Protection	347	6/30/2017

Chain of Custody

ALS Environmental - Houston HRMS
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Chain Of Custody/ Laboratory Analysis Request

ALS Job# (Laboratory Use Only)

Date 6/15/17 Page 1 Of 1

PROJECT ID: EV17060086
REPORT TO COMPANY: ALS Environmental
PROJECT MANAGER: Rick Bagan
ADDRESS: 8620 Holly Drive #100 Everett WA 98208
PHONE: (425) 356-2600 FAX: (425) 356-2626
P.O. #: 32-EV17060086 E-MAIL: rick.bagan@alsglobal.com
INVOICE TO COMPANY:
ATTENTION: Same
ADDRESS:

ANALYSIS REQUESTED: NWTPH-HCID; NWTPH-DX; NWTPH-GX; BTEX by EPA 8021 ☐ BTEX by EPA 8260 ☐; MTBE by EPA 8021 ☐ MTBE by EPA 8260 ☐; Halogenated Volatiles by EPA 8260; Volatile Organic Compounds by EPA 8260; EDB / EDC by EPA 8260 SIM (water); EDB / EDC by EPA 8260 (soil); Semivolatile Organic Compounds by EPA 8270; Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM; PCB by EPA 8082 ☐ Pesticides by EPA 8081 ☐; Metals-MTCA-5 ☐ RCRA-8 ☐ Pri Pol ☐ TAL ☐; Metals Other (Specify); TCLP-Metals ☐ VOA ☐ Semi-Vol ☐ Pest ☐ Herbs ☐

OTHER (Specify): Dioxin by EPA 1613B

SAMPLE I.D.	DATE	TIME	TYPE	LAB#	Dioxin by EPA 1613B	NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?
1. EV17060086-07	6/8/17	1110	S		X	1	
2. EV17060086-14	↓	1500	↓		X	1	
3. EV17060086-24	6/12/17	1345	↓		X	1	
4. EV17060086-26	↓	1420	↓		X	1	
5.							
6.							
7.							
8.							
9.							
10.							

E1700633 5
ALS Environmental
Dioxin

SPECIAL INSTRUCTIONS Please email results by noon 7/5/17.

SIGNATURES (Name, Company, Date, Time):
1. Relinquished By: Shawn Robinson ALS 6/15/17 9:15 am
Received By: ALS 6/16/17 8:55
2. Relinquished By:

TURNAROUND REQUESTED in Business Days*
Organic, Metals & Inorganic Analysis: 10 (Standard) 5 3 2 1 SAME DAY
Fuels & Hydrocarbon Analysis: 5 (Standard) 3 1 SAME DAY

OTHER:
Specify: Please return Cooler + Ice packs.
Thank you

ALS Environmental

Cooler Receipt Form

Project Chemist NB

Client/Project ALS Everett

Thermometer ID SM04

Date/Time Received: 6/16/17 8:55 Initials: AL Date/Time Logged in: 6/16/17 Initials AL

1. Method of delivery: ◯ US Mail ✓ Fed Ex ◯ UPS ◯ DHL ◯ Courier ◯ Client

2. Samples received in: ✓ Cooler ◯ Box ◯ Envelope ◯ Other

3. Were custody seals on coolers? ◯ Yes ✓ No

   Were they intact? ◯ Yes ◯ No ✓ N/A

   Were they signed and dated? ◯ Yes ◯ No ✓ N/A

   If yes, how many and where? No Seals

4. Packing Material: ◯ Inserts ◯ Baggies ✓ Bubble Wrap ✓ Gel Packs ◯ Wet Ice ◯ Sleeves ◯ Other

5. Foreign or Regulated Soil? ◯ Yes ✓ No Location of Sampling:

Cooler Tracking Number	COC ID	Date Opened	Time Opened	Opened By	Temp. °C	Temp Blank?
8085 2716 6904		6/16/17	11:30	AL	4.9/5.6	☐
						☐
						☐
						☐

6. Were custody papers properly filled out (ink, signed, dated, etc)? ✓ Yes ◯ No
7. Did all bottles arrive in good condition (not broken, no signs of leakage)? ✓ Yes ◯ No
8. Were all sample labels complete (i.e., sample ID, analysis, preservation, etc)? ✓ Yes ◯ No
9. Were appropriate bottles/containers and volumes received for the requested tests? ✓ Yes ◯ No
10. Did sample labels and tags agree with custody documents? ✓ Yes ◯ No

Notes, Discrepancies, & Resolutions:

Service request Label: E1700633 5
ALS Environmental
Dioxin

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SAMPLE ACCEPTANCE POLICY

This policy outlines the criteria samples must meet to be accepted by ALS Environmental – Houston HRMS.

Cooler Custody Seals (desirable, mandatory if specified in SAP):

- ✓ Intact on outside of cooler, signed and dated

Chain-of-Custody (COC) documentation (mandatory):

The following is required on each COC:

- ✓ Sample ID, the location, date and time of collection, collector's name, preservation type, sample type, and any other special remarks concerning the sampleThe COC must be completed in ink.
- ✓ Signature and date of relinquishing party.

In the absence of a COC at sample receipt, the COC will be requested from the client.

Sample Integrity (mandatory):

Samples are inspected upon arrival to ensure that sample integrity was not compromised during transfer to the laboratory.

- ✓ Sample containers must arrive in good condition (not broken or leaking).
- ✓ Samples must be labeled appropriately, including Sample IDs, and requested test using durable labels and indelible ink.
- ✓ The correct type of sample bottle must be used for the method requested.
- ✓ An appropriate sample volume, or weight, must be received.
- ✓ Sample IDs and number of containers must reconcile with the COC.
- ✓ Samples must be received within the method defined holding time.

Temperature Requirement (varies by sample matrix):

- ✓ Aqueous and Non-aqueous samples must be shipped and stored cold, at 0 to 6ºC.
- ✓ Tissue samples must be shipped and stored frozen, at -20 to -10ºC.
- ✓ Air samples are shipped and stored cold, at 0 to 6ºC
- ✓ The sample temperature must be recorded on the COC

All cooler inspections are documented on the Cooler Receipt Form (CRF). A separate CRF is completed for each service request. Any samples not meeting the above criteria are noted on the CRF and the Project Manager notified. The Project Manager must resolve any sample integrity issues with the client prior to proceeding with the analysis. Such resolutions are documented in writing and filed with the project folder. Data associated with samples received outside of this acceptance policy will be qualified on the case narrative of the final report

Preparation Information Benchsheets

ALS Environmental - Houston HRMS
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Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

Preparation Information Benchsheet

Prep Run#: 291033 **Prep WorkFlow:** OrgExtS(365) **Status:** Prepped
Team: Semivoa GCMS/ALOPEZ **Prep Method:** Method Soxhlet **Prep Date/Time:** 6/21/17 01:00 PM

#	Lab Code	Client ID	B#	Method /Test	pH	Cl	Matrix	Amt. Ext.	Sample Description
1	E1700280-001RE	SMS 3.0-LOD - 1613	.01	1613B/Dioxins Furans			Soil	10.269g	150 ul MDL
2	E1700280-002RE	SMS 5-LOQ - 1613	.01	1613B/Dioxins Furans			Soil	10.115g	500 ul MDL
3	E1700616-002RE	MycoAD-AZ (17-CS060)	.01	1613B/Dioxins Furans			Solid	10.000g	Tan powder
4	E1700633-001	EV17060086-07	.01	1613B/Dioxins Furans			Soil	10.071g	brown dirt and rocks
5	E1700633-002	EV17060086-14	.01	1613B/Dioxins Furans			Soil	10.276g	brown dirt and rocks
6	E1700633-003	EV17060086-24	.01	1613B/Dioxins Furans			Soil	10.697g	brown dirt and rocks
7	E1700633-004	EV17060086-26	.01	1613B/Dioxins Furans			Soil	10.665g	brown dirt and rocks
8	E1700639-001	Emergency Clarifier Sludge	.01	1613B/Dioxins Furans			Sludge, Solid	10.178g	black mud + rocks + water
9	EQ1700274-01	MB		1613B/Dioxins Furans			Solid	10.260g	
10	EQ1700274-02	LCS		1613B/Dioxins Furans			Solid	10.204g	
11	EQ1700274-03	DLCS		1613B/Dioxins Furans			Solid	10.399g	
12	EQ1700274-04	SMS 5-LOQ - 1613 DUP	.01	1613B/Dioxins Furans			Solid	10.047g	
13	K1706316-001	Bottom Ash 17-0625-001	.01	1613B/Dioxins Furans			Ash	10.518g	brown dirt and rocks
14	K1706316-002	Fly Ash 17-0625-002	.01	1613B/Dioxins Furans			Ash	10.385g	black ash and rocks
15	K1706316-003	Reburn Lime 17-0625-003	.01	1613B/Dioxins Furans			Ash	10.451g	white powder and rocks

Spiking Solutions

Name: 1613B/23/TO-9A MDL Native Solution Inventory ID 179628 Logbook Ref: TW 179628 022717 0.02-0.20 Expires On: 08/26/2017

E1700280-001 150.00µL E1700280-002 150.00µL EQ1700274-04 150.00µL

Name: 1613B Matrix Working Standard Inventory ID 181984 Logbook Ref: 181984 AL 6/15/17 2-20 ng/mL Expires On: 12/12/2017

EQ1700274-02 100.00µL EQ1700274-03 100.00µL

Name: 8290/1613B Cleanup Working Standard Inventory ID 182023 Logbook Ref: tw 06/16/17 8ng/ml Expires On: 10/29/2017

E1700280-001 100.00µL E1700280-002 100.00µL E1700616-002 100.00µL E1700633-001 100.00µL E1700633-002 100.00µL E1700633-003 100.00µL
E1700633-004 100.00µL E1700639-001 100.00µL EQ1700274-01 100.00µL EQ1700274-02 100.00µL EQ1700274-03 100.00µL EQ1700274-04 100.00µL
K1706316-001 100.00µL K1706316-002 100.00µL K1706316-003 100.00µL

Name: 1613B Labeled Working Standard Inventory ID 182090 Logbook Ref: 182090 AL 6/21/17 2-4 ng/mL Expires On: 10/31/2017

E1700280-001 1,000.00µL E1700280-002 1,000.00µL E1700616-002 1,000.00µL E1700633-001 1,000.00µL E1700633-002 1,000.00µL E1700633-003 1,000.00µL
E1700633-004 1,000.00µL E1700639-001 1,000.00µL EQ1700274-01 1,000.00µL EQ1700274-02 1,000.00µL EQ1700274-03 1,000.00µL EQ1700274-04 1,000.00µL
K1706316-001 1,000.00µL K1706316-002 1,000.00µL K1706316-003 1,000.00µL

Preparation Information Benchsheet

Prep Run#: 291033 **Prep WorkFlow:** OrgExtS(365) **Status:** Prepped
Team: Semivoa GCMS/ALOPEZ **Prep Method:** Method Soxhlet **Prep Date/Time:** 6/21/17 01:00 PM

Preparation Materials

Carbon, High Purity	JG 06/01/2017 (181913)	Ethyl Acetate 99.9% Minimum EtOAc	AL 3/3/17 (179750)	Glass Wool	AL 5/11/17 (181221)
Dichloromethane (Methylene Chloride) 99.9% MeCl2	AL 5/17/17 (181340)	Sodium Hydroxide 1N NaOH	sodium hydroxide (180303)	Sodium Sulfate Anhydrous Reagent Grade Na2SO4	AL 6/8/17 (181861)
Tridecane (n-Tridecane)	AL 5/5/17 (181125)	Silica Gel	tw 05/25/17 (181510)	sulfuric acid	sulfuric acid 42417 (180788)
Toluene 99.9% Minimum	JG 04/28/2017 (180908)				

Preparation Steps

Step:	Extraction	Step:	Acid Clean	Step:	Silica Gel Clean	Step:	Final Volume
Started:	6/21/17 13:00	Started:	6/22/17 08:00	Started:	6/22/17 12:00	Started:	6/23/17 10:00
Finished:	6/22/17 07:30	Finished:	6/22/17 09:00	Finished:	6/22/17 13:00	Finished:	6/23/17 11:00
By:	ALOPEZ	By:	JGHOSH	By:	JGHOSH	By:	JGHOSH
Comments		Comments		Comments		Comments	

Comments: ____________________

Reviewed By: KN Date: 6/27/17

Chain of Custody

Relinquished By: ____________ Date: ____________

Received By: ____________ Date: ____________

Extracts Examined

Yes No

ALS ENVIRONMENTAL – Houston
Data Processing/Form Production and Peer Review Signatures

SR# Unique ID E1700633 DB-5MSUI SPB-Octyl

First Level - Data Processing - to be filled by person generating the forms

Date:	Analyst:	Samples:
06/29/17	LKL	001- 004

Second Level - Data Review – to be filled by person doing peer review

Date:	Analyst:	Samples:
06/29/17	Kw	001-004

Analytical Results

ALS Environmental - Houston HRMS
10450 Stancliff Rd., Suite 210, Houston, TX 77099
Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/08/17 11:10
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-07	**Units:**	ng/Kg
Lab Code:	E1700633-001	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 17:10
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.071g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407096	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
2,3,7,8-TCDD	ND	U	0.625	0.625			1
1,2,3,7,8-PeCDD	3.05**JK**		0.387	3.10	1.28	1.000	1
1,2,3,4,7,8-HxCDD	3.22**K**		0.271	3.10	0.92	1.000	1
1,2,3,6,7,8-HxCDD	9.87		0.329	3.10	1.43	1.000	1
1,2,3,7,8,9-HxCDD	5.42**K**		0.279	3.10	0.97	1.007	1
1,2,3,4,6,7,8-HpCDD	152		0.435	3.10	1.04	1.000	1
OCDD	1290		0.821	6.19	0.90	1.000	1
2,3,7,8-TCDF	2.60		0.833	0.833	0.77	1.001	1
1,2,3,7,8-PeCDF	4.74		1.71	3.10	1.69	1.001	1
2,3,4,7,8-PeCDF	5.24		1.54	3.10	1.43	1.000	1
1,2,3,4,7,8-HxCDF	19.1		0.387	3.10	1.27	1.000	1
1,2,3,6,7,8-HxCDF	12.7		0.407	3.10	1.34	1.000	1
1,2,3,7,8,9-HxCDF	4.29		0.511	3.10	1.20	1.000	1
2,3,4,6,7,8-HxCDF	7.21		0.539	3.10	1.20	1.000	1
1,2,3,4,6,7,8-HpCDF	66.6		0.670	3.10	0.93	1.000	1
1,2,3,4,7,8,9-HpCDF	16.7		0.541	3.10	0.93	1.000	1
OCDF	133		1.40	6.19	0.82	1.005	1

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/08/17 11:10
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-07	**Units:**	ng/Kg
Lab Code:	E1700633-001	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 17:10
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.071g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407096	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Tetra-Dioxins	2.93		0.625	0.625	0.77		1
Total Penta-Dioxins	14.3		0.387	3.10	1.47		1
Total Hexa-Dioxins	49.8		0.291	3.10	1.24		1
Total Hepta-Dioxins	320		0.435	3.10	0.99		1
Total Tetra-Furans	30.8		0.833	0.833	0.77		1
Total Penta-Furans	52.4		0.0776	3.10	1.41		1
Total Hexa-Furans	114		0.451	3.10	1.32		1
Total Hepta-Furans	167		0.592	3.10	0.93		1

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/08/17 11:10
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-07	**Units:**	Percent
Lab Code:	E1700633-001	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 17:10
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.071g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407096	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Labeled Standard Results

Labeled Compounds	Spike Conc.(pg)	Conc. Found (pg)	% Rec	Q	Control Limits	Ion Ratio	RRT
13C-2,3,7,8-TCDD	2000	711.034	36		25-164	0.75	1.019
13C-1,2,3,7,8-PeCDD	2000	830.584	42		25-181	1.60	1.165
13C-1,2,3,4,7,8-HxCDD	2000	713.462	36		32-141	1.30	0.992
13C-1,2,3,6,7,8-HxCDD	2000	576.370	29		28-130	1.24	0.994
13C-1,2,3,4,6,7,8-HpCDD	2000	534.174	27		23-140	1.05	1.063
13C-OCDD	4000	663.791	17		17-157	0.89	1.139
13C-2,3,7,8-TCDF	2000	583.000	29		24-169	0.75	0.996
13C-1,2,3,7,8-PeCDF	2000	861.959	43		24-185	1.55	1.128
13C-2,3,4,7,8-PeCDF	2000	788.495	39		21-178	1.55	1.156
13C-1,2,3,4,7,8-HxCDF	2000	736.302	37		26-152	0.50	0.974
13C-1,2,3,6,7,8-HxCDF	2000	659.668	33		26-123	0.51	0.977
13C-1,2,3,7,8,9-HxCDF	2000	565.748	28	**Y**	29-147	0.51	1.007
13C-2,3,4,6,7,8-HxCDF	2000	534.525	27	**Y**	28-136	0.50	0.989
13C-1,2,3,4,6,7,8-HpCDF	2000	323.951	16	**Y**	28-143	0.44	1.040
13C-1,2,3,4,7,8,9-HpCDF	2000	524.227	26		26-138	0.45	1.077
37Cl-2,3,7,8-TCDD	800	311.525	39		35-197	NA	1.020

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/08/17 11:10
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-07	**Units:**	ng/Kg
Lab Code:	E1700633-001	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method: 1613B
Prep Method: Method Soxhlet

Toxicity Equivalency Quotient

Analyte Name	Result	DL	MRL	Dilution Factor	TEF	TEF - Adjusted Concentration
2,3,7,8-TCDD	ND	0.625	0.625	1	1	
1,2,3,7,8-PeCDD	**3.05**	0.387	3.10	1	1	3.05
1,2,3,4,7,8-HxCDD	**3.22**	0.271	3.10	1	0.1	0.322
1,2,3,6,7,8-HxCDD	**9.87**	0.329	3.10	1	0.1	0.987
1,2,3,7,8,9-HxCDD	**5.42**	0.279	3.10	1	0.1	0.542
1,2,3,4,6,7,8-HpCDD	**152**	0.435	3.10	1	0.01	1.52
OCDD	**1290**	0.821	6.19	1	0.0003	0.387
2,3,7,8-TCDF	**2.60**	0.833	0.833	1	0.1	0.260
1,2,3,7,8-PeCDF	**4.74**	1.71	3.10	1	0.03	0.142
2,3,4,7,8-PeCDF	**5.24**	1.54	3.10	1	0.3	1.57
1,2,3,4,7,8-HxCDF	**19.1**	0.387	3.10	1	0.1	1.91
1,2,3,6,7,8-HxCDF	**12.7**	0.407	3.10	1	0.1	1.27
1,2,3,7,8,9-HxCDF	**4.29**	0.511	3.10	1	0.1	0.429
2,3,4,6,7,8-HxCDF	**7.21**	0.539	3.10	1	0.1	0.721
1,2,3,4,6,7,8-HpCDF	**66.6**	0.670	3.10	1	0.01	0.666
1,2,3,4,7,8,9-HpCDF	**16.7**	0.541	3.10	1	0.01	0.167
OCDF	**133**	1.40	6.19	1	0.0003	0.0399
		Total TEQ				14.0

2005 WHO TEFs, ND = 0

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/08/17 11:10
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-07	**Units:**	Percent
Lab Code:	E1700633-001	**Basis:**	As Received

Total Solids

Analysis Method:	ALS SOP	**Date Analyzed:**	06/26/17 14:41
	5.781g		NA
			E-Balance-01

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Solids	80.2		-	-			1

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/08/17 15:00
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-14	**Units:**	ng/Kg
Lab Code:	E1700633-002	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 17:59
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.276g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407097	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
2,3,7,8-TCDD	ND	U	0.561	0.628			1
1,2,3,7,8-PeCDD	1.32**J**		0.499	3.14	1.61	1.000	1
1,2,3,4,7,8-HxCDD	1.93**J**		0.512	3.14	1.39	1.000	1
1,2,3,6,7,8-HxCDD	6.20		0.530	3.14	1.15	1.000	1
1,2,3,7,8,9-HxCDD	4.26		0.489	3.14	1.38	1.006	1
1,2,3,4,6,7,8-HpCDD	115		0.786	3.14	1.02	1.000	1
OCDD	1230		1.84	6.28	0.87	1.000	1
2,3,7,8-TCDF	ND	U	0.596	0.628			1
1,2,3,7,8-PeCDF	1.17**J**		0.498	3.14	1.38	1.000	1
2,3,4,7,8-PeCDF	1.28**J**		0.403	3.14	1.56	1.000	1
1,2,3,4,7,8-HxCDF	3.58		0.385	3.14	1.15	1.000	1
1,2,3,6,7,8-HxCDF	2.42**J**		0.405	3.14	1.28	1.000	1
1,2,3,7,8,9-HxCDF	0.823**J**		0.496	3.14	1.17	1.000	1
2,3,4,6,7,8-HxCDF	2.27**J**		0.449	3.14	1.25	1.000	1
1,2,3,4,6,7,8-HpCDF	23.9		0.645	3.14	1.03	1.000	1
1,2,3,4,7,8,9-HpCDF	3.09**JK**		0.848	3.14	0.76	1.000	1
OCDF	66.1		1.83	6.28	0.84	1.005	1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/08/17 15:00
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-14	**Units:**	ng/Kg
Lab Code:	E1700633-002	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 17:59
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.276g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407097	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Tetra-Dioxins	ND	U	0.561	0.628			1
Total Penta-Dioxins	3.46		0.499	3.14	1.60		1
Total Hexa-Dioxins	39.3		0.510	3.14	1.22		1
Total Hepta-Dioxins	239		0.786	3.14	1.03		1
Total Tetra-Furans	1.37		0.596	0.628	0.72		1
Total Penta-Furans	12.5		0.0787	3.14	1.41		1
Total Hexa-Furans	34.7		0.430	3.14	1.15		1
Total Hepta-Furans	72.3		0.737	3.14	1.03		1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/08/17 15:00
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-14	**Units:**	Percent
Lab Code:	E1700633-002	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 17:59
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.276g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407097	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Labeled Standard Results

Labeled Compounds	Spike Conc.(pg)	Conc. Found (pg)	% Rec	Q	Control Limits	Ion Ratio	RRT
13C-2,3,7,8-TCDD	2000	873.073	44		25-164	0.78	1.018
13C-1,2,3,7,8-PeCDD	2000	950.313	48		25-181	1.56	1.164
13C-1,2,3,4,7,8-HxCDD	2000	916.806	46		32-141	1.23	0.992
13C-1,2,3,6,7,8-HxCDD	2000	812.145	41		28-130	1.24	0.994
13C-1,2,3,4,6,7,8-HpCDD	2000	587.040	29		23-140	1.03	1.065
13C-OCDD	4000	784.665	20		17-157	0.89	1.141
13C-2,3,7,8-TCDF	2000	833.272	42		24-169	0.77	0.994
13C-1,2,3,7,8-PeCDF	2000	956.742	48		24-185	1.53	1.127
13C-2,3,4,7,8-PeCDF	2000	1118.017	56		21-178	1.56	1.155
13C-1,2,3,4,7,8-HxCDF	2000	966.586	48		26-152	0.51	0.974
13C-1,2,3,6,7,8-HxCDF	2000	833.716	42		26-123	0.51	0.976
13C-1,2,3,7,8,9-HxCDF	2000	846.915	42		29-147	0.51	1.008
13C-2,3,4,6,7,8-HxCDF	2000	784.633	39		28-136	0.51	0.989
13C-1,2,3,4,6,7,8-HpCDF	2000	579.873	29		28-143	0.45	1.041
13C-1,2,3,4,7,8,9-HpCDF	2000	562.792	28		26-138	0.42	1.078
37Cl-2,3,7,8-TCDD	800	381.251	48		35-197	NA	1.019

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/08/17 15:00
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-14	**Units:**	ng/Kg
Lab Code:	E1700633-002	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method: 1613B

Prep Method: Method Soxhlet

Toxicity Equivalency Quotient

Analyte Name	Result	DL	MRL	Dilution Factor	TEF	TEF - Adjusted Concentration
2,3,7,8-TCDD	ND	0.561	0.628	1	1	
1,2,3,7,8-PeCDD	**1.32**	0.499	3.14	1	1	1.32
1,2,3,4,7,8-HxCDD	**1.93**	0.512	3.14	1	0.1	0.193
1,2,3,6,7,8-HxCDD	**6.20**	0.530	3.14	1	0.1	0.620
1,2,3,7,8,9-HxCDD	**4.26**	0.489	3.14	1	0.1	0.426
1,2,3,4,6,7,8-HpCDD	**115**	0.786	3.14	1	0.01	1.15
OCDD	**1230**	1.84	6.28	1	0.0003	0.369
2,3,7,8-TCDF	ND	0.596	0.628	1	0.1	
1,2,3,7,8-PeCDF	**1.17**	0.498	3.14	1	0.03	0.0351
2,3,4,7,8-PeCDF	**1.28**	0.403	3.14	1	0.3	0.384
1,2,3,4,7,8-HxCDF	**3.58**	0.385	3.14	1	0.1	0.358
1,2,3,6,7,8-HxCDF	**2.42**	0.405	3.14	1	0.1	0.242
1,2,3,7,8,9-HxCDF	**0.823**	0.496	3.14	1	0.1	0.0823
2,3,4,6,7,8-HxCDF	**2.27**	0.449	3.14	1	0.1	0.227
1,2,3,4,6,7,8-HpCDF	**23.9**	0.645	3.14	1	0.01	0.239
1,2,3,4,7,8,9-HpCDF	**3.09**	0.848	3.14	1	0.01	0.0309
OCDF	**66.1**	1.83	6.28	1	0.0003	0.0198
		Total TEQ				5.70

2005 WHO TEFs, ND = 0

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/08/17 15:00
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-14	**Units:**	Percent
Lab Code:	E1700633-002	**Basis:**	As Received

Total Solids

Analysis Method:	ALS SOP	**Date Analyzed:**	06/26/17 14:41
	5.401g		NA
			E-Balance-01

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Solids	77.5		-	-			1

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/12/17 13:45
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-24	**Units:**	ng/Kg
Lab Code:	E1700633-003	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 18:49
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.697g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407098	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
2,3,7,8-TCDD	ND	U	0.353	0.567			1
1,2,3,7,8-PeCDD	1.74**J**		0.192	2.84	1.44	1.001	1
1,2,3,4,7,8-HxCDD	2.35**JK**		0.272	2.84	0.99	1.000	1
1,2,3,6,7,8-HxCDD	5.91		0.277	2.84	1.13	1.000	1
1,2,3,7,8,9-HxCDD	3.62		0.258	2.84	1.40	1.006	1
1,2,3,4,6,7,8-HpCDD	81.5		0.466	2.84	1.03	1.000	1
OCDD	594		0.975	5.67	0.87	1.000	1
2,3,7,8-TCDF	1.88**K**		0.345	0.567	1.04	1.001	1
1,2,3,7,8-PeCDF	3.03		0.249	2.84	1.59	1.000	1
2,3,4,7,8-PeCDF	3.52		0.213	2.84	1.53	1.000	1
1,2,3,4,7,8-HxCDF	11.3		0.298	2.84	1.20	1.000	1
1,2,3,6,7,8-HxCDF	7.24		0.270	2.84	1.27	1.000	1
1,2,3,7,8,9-HxCDF	2.60**J**		0.351	2.84	1.23	1.000	1
2,3,4,6,7,8-HxCDF	5.02		0.299	2.84	1.21	1.000	1
1,2,3,4,6,7,8-HpCDF	35.5		0.391	2.84	1.04	1.000	1
1,2,3,4,7,8,9-HpCDF	9.15		0.571	2.84	1.06	1.000	1
OCDF	65.9		1.15	5.67	0.86	1.005	1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/12/17 13:45
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-24	**Units:**	ng/Kg
Lab Code:	E1700633-003	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 18:49
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.697g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407098	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Tetra-Dioxins	ND	U	0.353	0.567			1
Total Penta-Dioxins	12.8		0.192	2.84	1.75		1
Total Hexa-Dioxins	36.2		0.269	2.84	1.28		1
Total Hepta-Dioxins	155		0.466	2.84	1.02		1
Total Tetra-Furans	13.0		0.345	0.567	0.87		1
Total Penta-Furans	35.8		0.0711	2.84	1.57		1
Total Hexa-Furans	69.2		0.302	2.84	1.13		1
Total Hepta-Furans	83.5		0.468	2.84	1.04		1

Client: ALS Environmental - Everett
Service Request: E1700633
Project: EV17060086
Date Collected: 06/12/17 13:45
Sample Matrix: Soil
Date Received: 06/16/17 08:55

Sample Name: EV17060086-24
Units: Percent
Lab Code: E1700633-003
Basis: Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method: 1613B
Date Analyzed: 06/26/17 18:49
Prep Method: Method Soxhlet
Date Extracted: 6/21/17
Sample Amount: 10.697g
Instrument Name: E-HRMS-06
GC Column: DB-5MSUI
Data File Name: P407098
Blank File Name: P407079
ICAL Date: 04/28/16
Cal Ver. File Name: P407090

Labeled Standard Results

Labeled Compounds	Spike Conc.(pg)	Conc. Found (pg)	% Rec	Q	Control Limits	Ion Ratio	RRT
13C-2,3,7,8-TCDD	2000	948.195	47		25-164	0.78	1.019
13C-1,2,3,7,8-PeCDD	2000	954.767	48		25-181	1.56	1.165
13C-1,2,3,4,7,8-HxCDD	2000	954.312	48		32-141	1.27	0.992
13C-1,2,3,6,7,8-HxCDD	2000	876.024	44		28-130	1.25	0.994
13C-1,2,3,4,6,7,8-HpCDD	2000	609.545	30		23-140	1.06	1.065
13C-OCDD	4000	743.946	19		17-157	0.90	1.142
13C-2,3,7,8-TCDF	2000	919.922	46		24-169	0.77	0.994
13C-1,2,3,7,8-PeCDF	2000	980.022	49		24-185	1.54	1.128
13C-2,3,4,7,8-PeCDF	2000	1162.467	58		21-178	1.54	1.156
13C-1,2,3,4,7,8-HxCDF	2000	911.070	46		26-152	0.51	0.973
13C-1,2,3,6,7,8-HxCDF	2000	905.556	45		26-123	0.51	0.976
13C-1,2,3,7,8,9-HxCDF	2000	872.349	44		29-147	0.51	1.008
13C-2,3,4,6,7,8-HxCDF	2000	844.965	42		28-136	0.51	0.989
13C-1,2,3,4,6,7,8-HpCDF	2000	614.492	31		28-143	0.44	1.041
13C-1,2,3,4,7,8,9-HpCDF	2000	539.672	27		26-138	0.43	1.079
37Cl-2,3,7,8-TCDD	800	403.541	50		35-197	NA	1.019

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/12/17 13:45
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-24	**Units:**	ng/Kg
Lab Code:	E1700633-003	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method: 1613B
Prep Method: Method Soxhlet

Toxicity Equivalency Quotient

Analyte Name	Result	DL	MRL	Dilution Factor	TEF	TEF - Adjusted Concentration
2,3,7,8-TCDD	ND	0.353	0.567	1	1	
1,2,3,7,8-PeCDD	**1.74**	0.192	2.84	1	1	1.74
1,2,3,4,7,8-HxCDD	**2.35**	0.272	2.84	1	0.1	0.235
1,2,3,6,7,8-HxCDD	**5.91**	0.277	2.84	1	0.1	0.591
1,2,3,7,8,9-HxCDD	**3.62**	0.258	2.84	1	0.1	0.362
1,2,3,4,6,7,8-HpCDD	**81.5**	0.466	2.84	1	0.01	0.815
OCDD	**594**	0.975	5.67	1	0.0003	0.178
2,3,7,8-TCDF	**1.88**	0.345	0.567	1	0.1	0.188
1,2,3,7,8-PeCDF	**3.03**	0.249	2.84	1	0.03	0.0909
2,3,4,7,8-PeCDF	**3.52**	0.213	2.84	1	0.3	1.06
1,2,3,4,7,8-HxCDF	**11.3**	0.298	2.84	1	0.1	1.13
1,2,3,6,7,8-HxCDF	**7.24**	0.270	2.84	1	0.1	0.724
1,2,3,7,8,9-HxCDF	**2.60**	0.351	2.84	1	0.1	0.260
2,3,4,6,7,8-HxCDF	**5.02**	0.299	2.84	1	0.1	0.502
1,2,3,4,6,7,8-HpCDF	**35.5**	0.391	2.84	1	0.01	0.355
1,2,3,4,7,8,9-HpCDF	**9.15**	0.571	2.84	1	0.01	0.0915
OCDF	**65.9**	1.15	5.67	1	0.0003	0.0198
		Total TEQ				8.34

2005 WHO TEFs, ND = 0

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/12/17 13:45
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-24	**Units:**	Percent
Lab Code:	E1700633-003	**Basis:**	As Received

Total Solids

Analysis Method:	ALS SOP	**Date Analyzed:**	06/26/17 14:41
	5.131g		NA
			E-Balance-01

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Solids	82.4		-	-			1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/12/17 14:20
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-26	**Units:**	ng/Kg
Lab Code:	E1700633-004	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 19:38
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.665g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407099	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
2,3,7,8-TCDD	ND	U	0.288	0.526			1
1,2,3,7,8-PeCDD	ND	U	0.276	2.63			1
1,2,3,4,7,8-HxCDD	0.659**J**		0.288	2.63	1.10	1.000	1
1,2,3,6,7,8-HxCDD	1.35**J**		0.301	2.63	1.17	1.000	1
1,2,3,7,8,9-HxCDD	0.814**J**		0.276	2.63	1.05	1.007	1
1,2,3,4,6,7,8-HpCDD	27.7		0.670	2.63	1.03	1.000	1
OCDD	223		1.52	5.26	0.85	1.000	1
2,3,7,8-TCDF	0.403**JK**		0.310	0.526	0.94	1.001	1
1,2,3,7,8-PeCDF	0.316**JK**		0.188	2.63	1.23	1.001	1
2,3,4,7,8-PeCDF	0.324**JK**		0.173	2.63	1.96	1.000	1
1,2,3,4,7,8-HxCDF	0.653**JK**		0.286	2.63	0.97	1.000	1
1,2,3,6,7,8-HxCDF	0.519**J**		0.284	2.63	1.18	1.000	1
1,2,3,7,8,9-HxCDF	ND	U	0.968	2.63			1
2,3,4,6,7,8-HxCDF	ND	U	0.321	2.63			1
1,2,3,4,6,7,8-HpCDF	9.34**K**		1.30	2.63	0.28	1.000	1
1,2,3,4,7,8,9-HpCDF	1.13**JK**		0.693	2.63	1.64	1.000	1
OCDF	16.9		1.58	5.26	0.76	1.005	1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/12/17 14:20
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-26	**Units:**	ng/Kg
Lab Code:	E1700633-004	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 19:38
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.665g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407099	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Tetra-Dioxins	1.32		0.288	0.526	0.86		1
Total Penta-Dioxins	0.947**J**		0.276	2.63	1.40		1
Total Hexa-Dioxins	6.81		0.288	2.63	1.19		1
Total Hepta-Dioxins	56.6		0.670	2.63	1.01		1
Total Tetra-Furans	ND	U	0.310	0.526			1
Total Penta-Furans	ND	U	0.180	2.63			1
Total Hexa-Furans	9.40		0.361	2.63	1.32		1
Total Hepta-Furans	28.3		0.923	2.63	0.93		1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/12/17 14:20
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-26	**Units:**	Percent
Lab Code:	E1700633-004	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/26/17 19:38
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.665g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407099	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407090

Labeled Standard Results

Labeled Compounds	Spike Conc.(pg)	Conc. Found (pg)	% Rec	Q	Control Limits	Ion Ratio	RRT
13C-2,3,7,8-TCDD	2000	899.462	45		25-164	0.79	1.017
13C-1,2,3,7,8-PeCDD	2000	941.743	47		25-181	1.58	1.163
13C-1,2,3,4,7,8-HxCDD	2000	963.629	48		32-141	1.25	0.992
13C-1,2,3,6,7,8-HxCDD	2000	890.294	45		28-130	1.24	0.993
13C-1,2,3,4,6,7,8-HpCDD	2000	591.784	30		23-140	1.04	1.065
13C-OCDD	4000	727.414	18		17-157	0.88	1.143
13C-2,3,7,8-TCDF	2000	953.160	48		24-169	0.77	0.993
13C-1,2,3,7,8-PeCDF	2000	996.325	50		24-185	1.54	1.126
13C-2,3,4,7,8-PeCDF	2000	1105.928	55		21-178	1.55	1.155
13C-1,2,3,4,7,8-HxCDF	2000	979.827	49		26-152	0.51	0.973
13C-1,2,3,6,7,8-HxCDF	2000	921.518	46		26-123	0.51	0.975
13C-1,2,3,7,8,9-HxCDF	2000	341.881	17	**Y**	29-147	0.51	1.008
13C-2,3,4,6,7,8-HxCDF	2000	859.270	43		28-136	0.51	0.988
13C-1,2,3,4,6,7,8-HpCDF	2000	189.065	9	**Y**	28-143	0.44	1.041
13C-1,2,3,4,7,8,9-HpCDF	2000	348.953	17	**Y**	26-138	0.42	1.079
37Cl-2,3,7,8-TCDD	800	369.817	46		35-197	NA	1.018

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/12/17 14:20
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-26	**Units:**	ng/Kg
Lab Code:	E1700633-004	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method: 1613B
Prep Method: Method Soxhlet

Toxicity Equivalency Quotient

Analyte Name	Result	DL	MRL	Dilution Factor	TEF	TEF - Adjusted Concentration
2,3,7,8-TCDD	ND	0.288	0.526	1	1	
1,2,3,7,8-PeCDD	ND	0.276	2.63	1	1	
1,2,3,4,7,8-HxCDD	**0.659**	0.288	2.63	1	0.1	0.0659
1,2,3,6,7,8-HxCDD	**1.35**	0.301	2.63	1	0.1	0.135
1,2,3,7,8,9-HxCDD	**0.814**	0.276	2.63	1	0.1	0.0814
1,2,3,4,6,7,8-HpCDD	**27.7**	0.670	2.63	1	0.01	0.277
OCDD	**223**	1.52	5.26	1	0.0003	0.0669
2,3,7,8-TCDF	**0.403**	0.310	0.526	1	0.1	0.0403
1,2,3,7,8-PeCDF	**0.316**	0.188	2.63	1	0.03	0.00948
2,3,4,7,8-PeCDF	**0.324**	0.173	2.63	1	0.3	0.0972
1,2,3,4,7,8-HxCDF	**0.653**	0.286	2.63	1	0.1	0.0653
1,2,3,6,7,8-HxCDF	**0.519**	0.284	2.63	1	0.1	0.0519
1,2,3,7,8,9-HxCDF	ND	0.968	2.63	1	0.1	
2,3,4,6,7,8-HxCDF	ND	0.321	2.63	1	0.1	
1,2,3,4,6,7,8-HpCDF	**9.34**	1.30	2.63	1	0.01	0.0934
1,2,3,4,7,8,9-HpCDF	**1.13**	0.693	2.63	1	0.01	0.0113
OCDF	**16.9**	1.58	5.26	1	0.0003	0.00507
		Total TEQ				1.00

2005 WHO TEFs, ND = 0

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	06/12/17 14:20
Sample Matrix:	Soil	**Date Received:**	06/16/17 08:55
Sample Name:	EV17060086-26	**Units:**	Percent
Lab Code:	E1700633-004	**Basis:**	As Received

Total Solids

Analysis Method:	ALS SOP	**Date Analyzed:**	06/26/17 14:41
	5.281g		NA
			E-Balance-01

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Solids	89.1		-	-			1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	ng/Kg
Lab Code:	EQ1700274-01	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/24/17 06:58
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.260g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407079	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407075

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
2,3,7,8-TCDD	ND	U	0.105	0.487			1
1,2,3,7,8-PeCDD	ND	U	0.0851	2.44			1
1,2,3,4,7,8-HxCDD	ND	U	0.0483	2.44			1
1,2,3,6,7,8-HxCDD	ND	U	0.0500	2.44			1
1,2,3,7,8,9-HxCDD	ND	U	0.0461	2.44			1
1,2,3,4,6,7,8-HpCDD	0.0889**JK**		0.0409	2.44	1.59	1.000	1
OCDD	0.388**J**		0.170	4.87	0.99	1.001	1
2,3,7,8-TCDF	ND	U	0.114	0.487			1
1,2,3,7,8-PeCDF	ND	U	0.0830	2.44			1
2,3,4,7,8-PeCDF	ND	U	0.0680	2.44			1
1,2,3,4,7,8-HxCDF	ND	U	0.0407	2.44			1
1,2,3,6,7,8-HxCDF	ND	U	0.0395	2.44			1
1,2,3,7,8,9-HxCDF	ND	U	0.0526	2.44			1
2,3,4,6,7,8-HxCDF	ND	U	0.0476	2.44			1
1,2,3,4,6,7,8-HpCDF	0.0607**JK**		0.0211	2.44	0.79	1.000	1
1,2,3,4,7,8,9-HpCDF	0.0600**J**		0.0327	2.44	0.98	1.000	1
OCDF	ND	U	0.223	4.87			1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	ng/Kg
Lab Code:	EQ1700274-01	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/24/17 06:58
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.260g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407079	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407075

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Tetra-Dioxins	ND	U	0.105	0.487			1
Total Penta-Dioxins	ND	U	0.0851	2.44			1
Total Hexa-Dioxins	ND	U	0.0481	2.44			1
Total Hepta-Dioxins	ND	U	0.0409	2.44			1
Total Tetra-Furans	ND	U	0.114	0.487			1
Total Penta-Furans	ND	U	0.0746	2.44			1
Total Hexa-Furans	ND	U	0.0446	2.44			1
Total Hepta-Furans	0.0600**J**		0.0260	2.44	0.98		1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	Percent
Lab Code:	EQ1700274-01	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/24/17 06:58
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.260g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407079	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407075

Labeled Standard Results

Labeled Compounds	Spike Conc.(pg)	Conc. Found (pg)	% Rec	Q	Control Limits	Ion Ratio	RRT
13C-2,3,7,8-TCDD	2000	664.597	33		25-164	0.78	1.018
13C-1,2,3,7,8-PeCDD	2000	780.428	39		25-181	1.57	1.165
13C-1,2,3,4,7,8-HxCDD	2000	851.769	43		32-141	1.24	0.992
13C-1,2,3,6,7,8-HxCDD	2000	784.719	39		28-130	1.23	0.994
13C-1,2,3,4,6,7,8-HpCDD	2000	688.428	34		23-140	1.04	1.065
13C-OCDD	4000	821.023	21		17-157	0.89	1.142
13C-2,3,7,8-TCDF	2000	623.483	31		24-169	0.76	0.993
13C-1,2,3,7,8-PeCDF	2000	742.227	37		24-185	1.53	1.127
13C-2,3,4,7,8-PeCDF	2000	939.304	47		21-178	1.53	1.155
13C-1,2,3,4,7,8-HxCDF	2000	828.393	41		26-152	0.51	0.973
13C-1,2,3,6,7,8-HxCDF	2000	784.286	39		26-123	0.50	0.976
13C-1,2,3,7,8,9-HxCDF	2000	734.825	37		29-147	0.50	1.008
13C-2,3,4,6,7,8-HxCDF	2000	712.539	36		28-136	0.51	0.988
13C-1,2,3,4,6,7,8-HpCDF	2000	743.633	37		28-143	0.44	1.041
13C-1,2,3,4,7,8,9-HpCDF	2000	627.270	31		26-138	0.43	1.079
37Cl-2,3,7,8-TCDD	800	284.103	36		35-197	NA	1.018

Accuracy & Precision

ALS Environmental - Houston HRMS
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Phone (713)266-1599 Fax (713)266-0130
www.alsglobal.com

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Analyzed:**	06/24/17
Sample Matrix:	Soil	**Date Extracted:**	06/21/17

Duplicate Lab Control Sample Summary
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Units:**	ng/Kg
Prep Method:	Method Soxhlet	**Basis:**	Dry
		Analysis Lot:	551405

	Lab Control Sample EQ1700274-02			Duplicate Lab Control Sample EQ1700274-03					
Analyte Name	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
1,2,3,4,6,7,8-HpCDD	95.0	98.0	97	105	96.2	109	70-140	10	50
1,2,3,4,7,8-HxCDD	99.2	98.0	101	107	96.2	111	70-164	8	50
1,2,3,6,7,8-HxCDD	97.8	98.0	100	104	96.2	108	76-134	6	50
1,2,3,7,8,9-HxCDD	80.5	98.0	82	97.9	96.2	102	64-162	19	50
1,2,3,7,8-PeCDD	104	98.0	106	113	96.2	117	70-142	8	50
2,3,7,8-TCDD	20.4	19.6	104	22.5	19.2	117	67-158	10	50
OCDD	209	196	107	224	192	116	78-144	7	50
1,2,3,4,6,7,8-HpCDF	95.9	98.0	98	102	96.2	106	82-122	7	50
1,2,3,4,7,8,9-HpCDF	95.3	98.0	97	104	96.2	108	78-138	8	50
1,2,3,4,7,8-HxCDF	97.6	98.0	100	106	96.2	110	72-134	8	50
1,2,3,6,7,8-HxCDF	97.3	98.0	99	105	96.2	110	84-130	8	50
1,2,3,7,8,9-HxCDF	90.5	98.0	92	99.9	96.2	104	78-130	10	50
1,2,3,7,8-PeCDF	92.9	98.0	95	100	96.2	104	80-134	8	50
2,3,4,6,7,8-HxCDF	96.0	98.0	98	102	96.2	106	70-156	6	50
2,3,4,7,8-PeCDF	75.0	98.0	77	81.9	96.2	85	68-160	9	50
2,3,7,8-TCDF	20.7	19.6	105	21.9	19.2	114	75-158	6	50
OCDF	255	196	130	231	192	120	63-170	10	50

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Analyzed:**	06/24/17
Sample Matrix:	Soil	**Date Extracted:**	06/21/17

Lab Control Sample Summary
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Units:**	ng/Kg
Prep Method:	Method Soxhlet	**Basis:**	Dry
		Analysis Lot:	551405

Lab Control Sample
EQ1700274-02

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
1,2,3,4,6,7,8-HpCDD	95.0	98.0	97	70-140
1,2,3,4,7,8-HxCDD	99.2	98.0	101	70-164
1,2,3,6,7,8-HxCDD	97.8	98.0	100	76-134
1,2,3,7,8,9-HxCDD	80.5	98.0	82	64-162
1,2,3,7,8-PeCDD	104	98.0	106	70-142
2,3,7,8-TCDD	20.4	19.6	104	67-158
OCDD	209	196	107	78-144
1,2,3,4,6,7,8-HpCDF	95.9	98.0	98	82-122
1,2,3,4,7,8,9-HpCDF	95.3	98.0	97	78-138
1,2,3,4,7,8-HxCDF	97.6	98.0	100	72-134
1,2,3,6,7,8-HxCDF	97.3	98.0	99	84-130
1,2,3,7,8,9-HxCDF	90.5	98.0	92	78-130
1,2,3,7,8-PeCDF	92.9	98.0	95	80-134
2,3,4,6,7,8-HxCDF	96.0	98.0	98	70-156
2,3,4,7,8-PeCDF	75.0	98.0	77	68-160
2,3,7,8-TCDF	20.7	19.6	105	75-158
OCDF	255	196	130	63-170

Client: ALS Environmental - Everett
Project: EV17060086
Sample Matrix: Soil

Service Request: E1700633
Date Collected: NA
Date Received: NA

Sample Name: Lab Control Sample
Lab Code: EQ1700274-02

Units: ng/Kg
Basis: Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method: 1613B
Prep Method: Method Soxhlet
Sample Amount: 10.204g

Data File Name: P407088
ICAL Date: 04/28/16

Date Analyzed: 06/24/17 14:20
Date Extracted: 6/21/17
Instrument Name: E-HRMS-06
GC Column: DB-5MSUI
Blank File Name: P407079
Cal Ver. File Name: P407075

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
2,3,7,8-TCDD	20.4		0.0616	0.490	0.73	1.001	1
1,2,3,7,8-PeCDD	104		0.0849	2.45	1.50	1.001	1
1,2,3,4,7,8-HxCDD	99.2		0.0283	2.45	1.28	1.000	1
1,2,3,6,7,8-HxCDD	97.8		0.0301	2.45	1.16	1.000	1
1,2,3,7,8,9-HxCDD	80.5		0.0274	2.45	1.25	1.007	1
1,2,3,4,6,7,8-HpCDD	95.0		0.0782	2.45	1.04	1.000	1
OCDD	209		0.372	4.90	0.90	1.000	1
2,3,7,8-TCDF	20.7		0.0635	0.490	0.73	1.001	1
1,2,3,7,8-PeCDF	92.9		0.0660	2.45	1.51	1.000	1
2,3,4,7,8-PeCDF	75.0		0.0517	2.45	1.51	1.001	1
1,2,3,4,7,8-HxCDF	97.6		0.0440	2.45	1.20	1.000	1
1,2,3,6,7,8-HxCDF	97.3		0.0433	2.45	1.19	1.000	1
1,2,3,7,8,9-HxCDF	90.5		0.0711	2.45	1.25	1.000	1
2,3,4,6,7,8-HxCDF	96.0		0.0578	2.45	1.21	1.000	1
1,2,3,4,6,7,8-HpCDF	95.9		0.0844	2.45	1.00	1.000	1
1,2,3,4,7,8,9-HpCDF	95.3		0.130	2.45	1.00	1.000	1
OCDF	255		0.328	4.90	0.89	1.005	1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Lab Control Sample	**Units:**	ng/Kg
Lab Code:	EQ1700274-02	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/24/17 14:20
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.204g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407088	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407075

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Tetra-Dioxins	20.4		0.0616	0.490	0.73		1
Total Penta-Dioxins	104		0.0849	2.45	1.50		1
Total Hexa-Dioxins	278		0.0286	2.45	1.28		1
Total Hepta-Dioxins	95.0		0.0782	2.45	1.04		1
Total Tetra-Furans	20.9		0.0635	0.490	0.79		1
Total Penta-Furans	168		0.0579	2.45	1.39		1
Total Hexa-Furans	381		0.0520	2.45	1.20		1
Total Hepta-Furans	191		0.104	2.45	1.00		1

Client: ALS Environmental - Everett | **Service Request:** E1700633
Project: EV17060086 | **Date Collected:** NA
Sample Matrix: Soil | **Date Received:** NA

Sample Name: Lab Control Sample | **Units:** Percent
Lab Code: EQ1700274-02 | **Basis:** Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method: 1613B | **Date Analyzed:** 06/24/17 14:20
Prep Method: Method Soxhlet | **Date Extracted:** 6/21/17
Sample Amount: 10.204g | **Instrument Name:** E-HRMS-06
GC Column: DB-5MSUI
Data File Name: P407088 | **Blank File Name:** P407079
ICAL Date: 04/28/16 | **Cal Ver. File Name:** P407075

Labeled Standard Results

Labeled Compounds	Spike Conc.(pg)	Conc. Found (pg)	% Rec	Q	Control Limits	Ion Ratio	RRT
13C-2,3,7,8-TCDD	2000	753.052	38		25-164	0.78	1.018
13C-1,2,3,7,8-PeCDD	2000	879.619	44		25-181	1.54	1.165
13C-1,2,3,4,7,8-HxCDD	2000	1147.530	57		32-141	1.29	0.992
13C-1,2,3,6,7,8-HxCDD	2000	1028.356	51		28-130	1.18	0.994
13C-1,2,3,4,6,7,8-HpCDD	2000	672.614	34		23-140	1.03	1.065
13C-OCDD	4000	449.594	11	**Y**	17-157	0.88	1.142
13C-2,3,7,8-TCDF	2000	758.888	38		24-169	0.75	0.993
13C-1,2,3,7,8-PeCDF	2000	828.222	41		24-185	1.52	1.127
13C-2,3,4,7,8-PeCDF	2000	1081.326	54		21-178	1.52	1.155
13C-1,2,3,4,7,8-HxCDF	2000	1114.321	56		26-152	0.50	0.973
13C-1,2,3,6,7,8-HxCDF	2000	1038.917	52		26-123	0.50	0.976
13C-1,2,3,7,8,9-HxCDF	2000	784.813	39		29-147	0.50	1.008
13C-2,3,4,6,7,8-HxCDF	2000	871.278	44		28-136	0.51	0.988
13C-1,2,3,4,6,7,8-HpCDF	2000	765.590	38		28-143	0.44	1.041
13C-1,2,3,4,7,8,9-HpCDF	2000	638.612	32		26-138	0.44	1.079
37Cl-2,3,7,8-TCDD	800	318.790	40		35-197	NA	1.018

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Duplicate Lab Control Sample	**Units:**	ng/Kg
Lab Code:	EQ1700274-03	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/24/17 15:18
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.399g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407089	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407075

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
2,3,7,8-TCDD	22.5		0.118	0.481	0.74	1.001	1
1,2,3,7,8-PeCDD	113		0.192	2.40	1.52	1.000	1
1,2,3,4,7,8-HxCDD	107		0.0659	2.40	1.23	1.000	1
1,2,3,6,7,8-HxCDD	104		0.0698	2.40	1.23	1.000	1
1,2,3,7,8,9-HxCDD	97.9		0.0636	2.40	1.21	1.007	1
1,2,3,4,6,7,8-HpCDD	105		0.153	2.40	1.02	1.000	1
OCDD	224		0.465	4.81	0.82	1.000	1
2,3,7,8-TCDF	21.9		0.134	0.481	0.77	1.001	1
1,2,3,7,8-PeCDF	100		0.184	2.40	1.51	1.000	1
2,3,4,7,8-PeCDF	81.9		0.150	2.40	1.53	1.000	1
1,2,3,4,7,8-HxCDF	106		0.0847	2.40	1.21	1.000	1
1,2,3,6,7,8-HxCDF	105		0.0794	2.40	1.19	1.000	1
1,2,3,7,8,9-HxCDF	99.9		0.102	2.40	1.21	1.000	1
2,3,4,6,7,8-HxCDF	102		0.0959	2.40	1.21	1.000	1
1,2,3,4,6,7,8-HpCDF	102		0.104	2.40	1.01	1.000	1
1,2,3,4,7,8,9-HpCDF	104		0.148	2.40	1.01	1.000	1
OCDF	231		0.508	4.81	0.87	1.005	1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Duplicate Lab Control Sample	**Units:**	ng/Kg
Lab Code:	EQ1700274-03	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/24/17 15:18
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.399g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407089	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407075

Native Analyte Results

Analyte Name	Result	Q	EDL	MRL	Ion Ratio	RRT	Dilution Factor
Total Tetra-Dioxins	22.5		0.118	0.481	0.74		1
Total Penta-Dioxins	113		0.192	2.40	1.52		1
Total Hexa-Dioxins	309		0.0663	2.40	1.23		1
Total Hepta-Dioxins	105		0.153	2.40	1.02		1
Total Tetra-Furans	22.0		0.134	0.481	0.77		1
Total Penta-Furans	182		0.165	2.40	1.36		1
Total Hexa-Furans	413		0.0896	2.40	1.21		1
Total Hepta-Furans	206		0.123	2.40	1.01		1

Client:	ALS Environmental - Everett	**Service Request:**	E1700633
Project:	EV17060086	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Duplicate Lab Control Sample	**Units:**	Percent
Lab Code:	EQ1700274-03	**Basis:**	Dry

Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans by HRGC/HRMS

Analysis Method:	1613B	**Date Analyzed:**	06/24/17 15:18
Prep Method:	Method Soxhlet	**Date Extracted:**	6/21/17
Sample Amount:	10.399g	**Instrument Name:**	E-HRMS-06
		GC Column:	DB-5MSUI
Data File Name:	P407089	**Blank File Name:**	P407079
ICAL Date:	04/28/16	**Cal Ver. File Name:**	P407075

Labeled Standard Results

Labeled Compounds	Spike Conc.(pg)	Conc. Found (pg)	% Rec	Q	Control Limits	Ion Ratio	RRT
13C-2,3,7,8-TCDD	2000	622.363	31		25-164	0.80	1.018
13C-1,2,3,7,8-PeCDD	2000	799.043	40		25-181	1.56	1.164
13C-1,2,3,4,7,8-HxCDD	2000	745.719	37		32-141	1.27	0.992
13C-1,2,3,6,7,8-HxCDD	2000	645.693	32		28-130	1.21	0.994
13C-1,2,3,4,6,7,8-HpCDD	2000	499.714	25		23-140	1.01	1.065
13C-OCDD	4000	455.274	11	**Y**	17-157	0.87	1.142
13C-2,3,7,8-TCDF	2000	574.172	29		24-169	0.75	0.993
13C-1,2,3,7,8-PeCDF	2000	762.730	38		24-185	1.52	1.127
13C-2,3,4,7,8-PeCDF	2000	966.981	48		21-178	1.55	1.155
13C-1,2,3,4,7,8-HxCDF	2000	699.500	35		26-152	0.51	0.973
13C-1,2,3,6,7,8-HxCDF	2000	663.015	33		26-123	0.51	0.976
13C-1,2,3,7,8,9-HxCDF	2000	663.265	33		29-147	0.51	1.008
13C-2,3,4,6,7,8-HxCDF	2000	618.461	31		28-136	0.50	0.988
13C-1,2,3,4,6,7,8-HpCDF	2000	540.890	27	**Y**	28-143	0.43	1.041
13C-1,2,3,4,7,8,9-HpCDF	2000	473.710	24	**Y**	26-138	0.44	1.079
37Cl-2,3,7,8-TCDD	800	362.483	45		35-197	NA	1.018

Rainier ENVIRONMENTAL

Dangerous Waste Characterization

Sample ID's:
Plot14TP2WR; Plot15TP2WR;
Plot17TP1WR; Plot17TP2WR

Report date: June 26, 2017

Submitted to:

Whatcom Environmental
228 E. Champion Suite 101
Bellingham, WA 98225

Rainier Environmental
5013 Pacific Hwy East
Suite 20
Tacoma, WA 98424

1.0 INTRODUCTION

A dangerous waste characterization using the test organism *Oncorhynchus mykiss* (rainbow trout) was conducted on four samples submitted by Whatcom Environmental to Rainier Environmental. Testing was conducted following the Washington State Department of Ecology Publication 80-12.

2.0 METHODS

The samples, identified as Plot14TP2WR, Plot15TP2WR, Plot17TP1WR and Plot17TP2WR were received in the laboratory on June 14, 2017. Upon arrival at the laboratory the samples were inspected and contents verified against information provided on the chain-of-custody form. The samples were stored at 4°C in the dark until use. The test procedure is outlined in Table 1.

Table 1. Summary of Dangerous Waste Characterization Test Conditions

Parameter	Standard Fish Toxicity Test
Test number's	1706-016; 1706-017; 1706-018; 1706-019
Sample ID's	Plot14TP2WR; Plot15TP2WR; Plot17TP1WR; Plot17TP2WR
Test initiation date; time	6/16/2017; 1250h
Test termination date; time	6/20/2017; 1300h
Endpoint	Mortality at 96-hours
Test chamber	7.5 L plastic tank
Test temperature	12 ± 1°C
Dilution water	Moderately hard synthetic water
Test solution volume	6 L
Test concentrations (mg/L)	100, 10, 0
Number of organisms/ chamber	10
Number of replicates	3
Test organism	*Oncorhynchus mykiss* (rainbow trout)
Feeding	No feeding during test
Photoperiod	16 hours light/ 8 hours dark
Extraction	Rotary agitation (30 +/- 2 rpm) for 18 hours
Reference Toxicant	Copper sulfate
Deviations	None

The test organisms used in the test are outlined in Table 2. The samples were tested using fish received on April 28, 2017.

Table 2. Test organisms (*Oncorhynchus mykiss*)

Test organism age	71 days post swim-up (hatch date 3/12/2017)
Mean weight	0.42 g
Mean length	43 mm
Ratio of longest to shortest	1.2
Loading	0.70 g/L
Test organism source	Trout Lodge; Sumner, WA

3.0 RESULTS

A summary of results for the dangerous waste characterization conducted on samples Plot14TP2WR, Plot15TP2WR, Plot17TP1WR and Plot17TP2WR are contained in Table 3. There was no mortality in any of the samples. Based on these results, the samples do not designate as either dangerous or extremely hazardous waste. Copies of the laboratory bench sheets, statistical summaries of reference toxicant tests, and chain-of-custody form are provided in Appendices A through C.

Table 3. Summary of Results

Sample ID	Concentration (mg/L)	Survival (# fish, N=30)	Percent Mortality	Dangerous Waste Designation
Control	0	30	0	NA
Plot14TP2WR	10 100	30 30	0 0	None
Plot15TP2WR	10 100	30 30	0 0	None
Plot17TP1WR	10 100	30 30	0 0	None
Plot17TP2WR	10 100	30 30	0 0	None

4.0 QUALITY ASSURANCE

The most recently completed reference toxicant test was initiated on June 2, 2017. The LC_{50} of 141 g/L copper fell within the acceptable range of mean ± two standard deviations of historical test results indicating that the test organisms were of an appropriate degree of sensitivity. The coefficient of variation (CV) for the last 21 tests was 23.5 percent, which is considered excellent by the Biomonitoring Science Advisory Board.

5.0 REFERENCES

WDOE. 2008. Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria. Washington State Department of Ecology. Water Quality Program. Publication number: WQ-R-95-80, Revised December 2008.

WDOE. 2009. Biological Testing Methods 80-12 for the Designation of Dangerous Waste. Washington State Department of Ecology. Hazardous Waste and Toxics Reduction Program. Publication number: 80-12, Revised June 2009.

Appendix A
Oncorhynchus mykiss Dangerous Waste Toxicity Test
Raw Bench Sheets

Dangerous Waste Toxicity Test

Client: Whatcom Environmental

Sample ID: Plot14TP2WR; Plot15TP2WR; Plot17TP1WR; Plot17TP2WR

Test #: 1706-016; 1706-017; 1706-018; 1706-019

Log In #: T17-181; T17-182; T17-183; T17-184

Start Date & Time: 6/16/17 1250

End Date & Time: 6/20/17 1300

Test Organism: *Oncorhynchus mykiss*

Test Protocol: **Washington State Department of Ecology Publ. 80-12**

Rep	Conc.	Cont #	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (units)					Conductivity (umhos/cm)					Temperature (°C)					Percent Survival
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
1	CON	16	10	10	10	10	10	8.0	7.8	7.7	7.5	7.2	7.65	7.46	7.30	7.21	7.17	257				308	12.2	12.1	12.4	11.7	11.6	
2		27	10	10	10	10	10	8.1	7.5	7.5	7.3	7.2	7.71	7.43	7.41	7.22	7.11	255				306						
3		23	10	10	10	10	10	8.1	7.9	7.8	7.6	7.3	7.72	7.42	7.37	7.25	7.12	260				301						
1	10 ppm	1	10	10	10	10	10	8.2	8.0	7.9	7.7	7.4	7.69	7.44	7.37	7.27	7.18	262				284	12.2	12.1	12.1	11.5	11.6	
2	(T17-181)	18	10	10	10	10	10	8.1	7.9	7.7	7.7	7.3	7.70	7.44	7.37	7.24	7.19	262				286						
3	(14TP2)	24	10	10	10	10	10	8.2	7.9	8.0	8.1	7.5	7.68	7.41	7.36	7.24	7.14	264				287						
1	100 ppm	8	10	10	10	10	10	8.0	7.8	7.9	7.6	7.3	7.74	7.45	7.41	7.25	7.14	259				291	12.3	12.0	12.2	11.6	11.7	
2	(T17-181)	13	10	10	10	10	10	8.3	8.1	8.0	8.1	7.5	7.72	7.44	7.40	7.29	7.16	258				288						
3	(14TP2)	19	10	10	10	10	10	8.4	8.3	8.2	7.9	7.5	7.75	7.45	7.39	7.26	7.16	258				289						
1	10 ppm	12	10	10	10	10	10	8.2	8.0	7.8	7.6	7.4	7.66	7.45	7.41	7.26	7.09	252				279	12.4	12.0	12.2	11.6	11.6	
2	(T17-182)	2	10	10	10	10	10	8.3	7.9	7.6	7.5	7.3	7.61	7.45	7.40	7.24	7.10	250				280						
3	(15TP2)	14	10	10	10	10	10	8.3	8.1	8.0	7.9	7.7	7.68	7.47	7.41	7.25	7.11	251				281						
1	100 ppm	6	10	10	10	10	10	8.2	8.0	7.8	7.6	7.5	7.69	7.46	7.38	7.22	7.12	251				284	12.3	12.1	12.2	11.7	11.7	
2	(T17-182)	25	10	10	10	10	10	8.1	7.9	7.5	7.3	7.3	7.07	7.46	7.35	7.27	7.11	250				284						
3	(15TP2)	20	10	10	10	10	10	8.2	7.8	7.6	7.4	7.3	7.05	7.44	7.39	7.24	7.18	250				283						
1	10 ppm	21	10	10	10	10	10	8.2	8.0	7.9	7.5	7.4	7.54	7.43	7.39	7.26	7.19	253				290	12.3	12.1	12.1	11.5	11.7	
2	(T17-183)	17	10	10	10	10	10	8.3	7.8	7.5	7.3	7.1	7.58	7.46	7.37	7.28	7.20	254				291						
3	(17TP1)	7	10	10	10	10	10	8.4	8.2	7.9	7.6	7.2	7.58	7.45	7.35	7.25	7.21	253				290						
1	100 ppm	10	10	10	10	10	10	8.4	8.3	8.2	8.0	7.8	7.59	7.48	7.35	7.24	7.18	260				289	12.5	12.1	12.3	11.5	11.8	
2	(T17-183)	3	10	10	10	10	10	8.5	8.4	8.2	8.1	7.8	7.60	7.46	7.40	7.24	7.17	260				290						
3	(17TP1)	22	10	10	10	10	10	8.3	8.2	8.0	7.9	7.7	7.60	7.45	7.38	7.25	7.18	261				288						
Technician Initials			m	ut	ut	ut	m	m	ut	ut	ut	m																

Sample	Alk. (init.)	Hard. (init.)	Alk. (fin.)	Hard. (fin.)	Chlorine
	(mg/L as CaCO3)				(mg/L Cl2)
Control	64	84	68	86	<0.03
T17-181	66	88	68	88	
T17-182	64	84	72	88	
T17-183	68	96	~~67.6~~ 76	104	

Animal Source: Trout Lodge

Date Received: 4/28/17

Test Volume: 6L

Date of Hatch: 3/12/17

Date of Swim up: 4/5/17

Weights (g): .44 .42 .40 .39 .45 .44 .42 .42 .43 .40 μ = .42

Lengths(mm): 42 46 41 39 44 42 44 45 44 41 μ = 43

Length max/min: 45/39 1.2

Loading: 0.70g/L

Rainier Environmental
Washington Laboratory
5013 Pacific HWY E Suite 20
Tacoma, WA 98424

Dilution Water Source: MHSW 049

QA Check ut

Dangerous Waste Toxicity Test

Client: Whatcom Environmental
Sample ID: Plot14TP2WR; Plot15TP2WR; Plot17TP1WR; Plot17TP2WR
Test #: 1706-016; 1706-017; 1706-018; 1706-019
Log In #: T17-181; T17-182; T17-183; T17-184

Start Date & Time: 6/16/17 1250
End Date & Time: 6/20/17 1300
Test Organism: *Oncorhynchus mykiss*
Test Protocol: **Washington State Department of Ecology Publ. 80-12**

Rep	Conc.	Cont #	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (units)					Conductivity (umhos/cm)					Temperature (°C)					Percent Survival
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
1	10 ppm	5	10	10	10	10	10	8.1	7.9	7.7	7.5	7.4	7.55	7.44	7.39	7.24	7.19	258				284	12.5	12.1	12.3	11.4	11.6	
2	(T17-184	4	10	10	10	10	10	8.1	8.1	8.0	8.1	7.7	7.56	7.45	7.37	7.27	7.18	258				284						
3	17TP2)	15	10	10	10	10	10	8.2	8.1	7.8	7.7	7.6	7.60	7.45	7.38	7.25	7.18	257				281						
1	100 ppm	26	10	10	10	10	10	8.3	8.0	7.9	7.6	7.2	7.52	7.43	7.41	7.25	7.16	254				280	12.6	12.1	12.4	11.7	11.5	
2	(T17-184	9	10	10	10	10	10	8.0	7.8	7.5	7.4	7.2	7.49	7.42	7.35	7.24	7.17	255				288						
3	17TP2)	11	10	10	10	10	10	8.2	8.1	7.9	7.8	7.4	7.53	7.44	7.38	7.27	7.15	254				287						
1																												
2																												
3																												
1																												
2																												
3																												
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2																												
3																												
1																												
2																												
3																												
Technician Initials			m	Et	Et	Et		m	Et	Et	Et	m																

Sample	Alk. (init.)	Hard. (init.)	Alk. (fin.)	Hard. (fin.)	Chlorine
	(mg/L as CaCO3)				(mg/L Cl2)
Control	64	84	68	80	<0.03
T17-184	64	88	68	88	

Animal Source: Trout Lodge
Date Received: 4/28/17

Test Volume: 10L
Date of Hatch: 3/12/17
Date of Swim up: 4/5/17

Weights (g): .44 .42 .40 .39 .45 .44 .42 .42 .43 .40 μ = .42
Lengths(mm): 42 45 41 38 44 42 44 45 44 41 μ = 43
Length max/min: 45/38 1.2
Loading: 0.70g/L

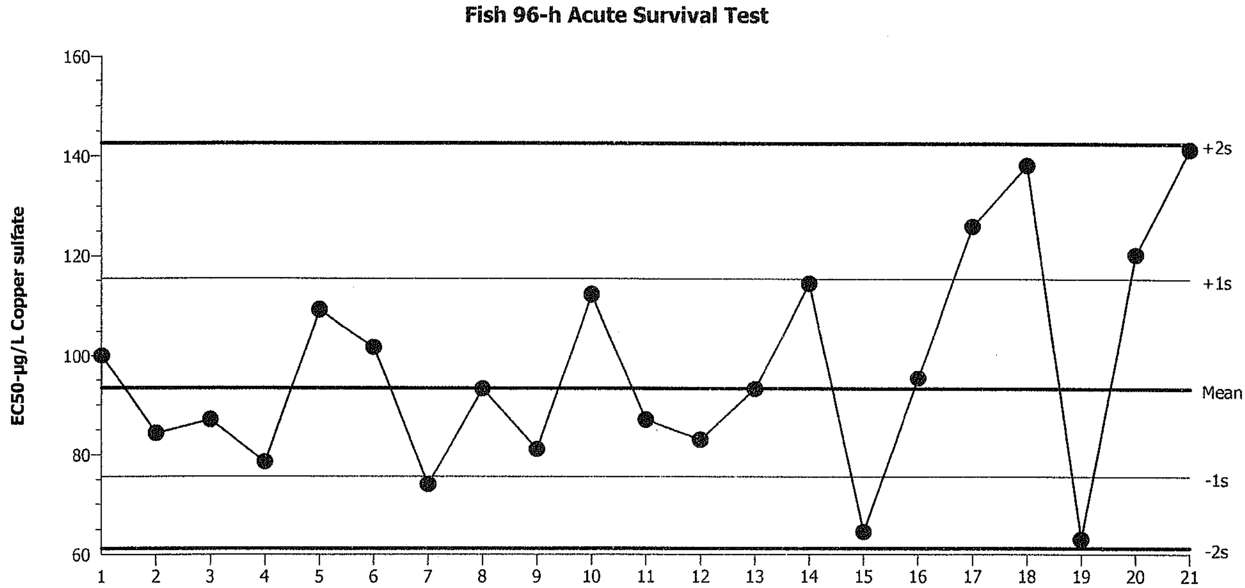
Rainier Environmental
Washington Laboratory
5013 Pacific HWY E Suite 20
Tacoma, WA 98424

Dilution Water Source: MHSW 049
QA Check Et

Appendix B
Reference Toxicant Test
Control Chart and Statistical Summary

Fish 96-h Acute Survival Test | **Rainier Environmental Laboratory**

Test Type: Survival (96h) **Organism:** Oncorhynchus mykiss (Rainbow Tro **Material:** Copper sulfate
Protocol: Not Applicable **Endpoint:** 96h Survival Rate **Source:** Reference Toxicant-REF



Mean: 93.41 **Count:** 20 **-1s Warning Limit:** 75.61 **-2s Action Limit:** 61.2
Sigma: NA **CV:** 23.50% **+1s Warning Limit:** 115.4 **+2s Action Limit:** 142.6

Quality Control Data

Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2015	Aug	1	100	6.59	0.3225			04-9563-2562	07-9301-1324
2			27	84.34	-9.073	-0.4833			14-9278-6104	03-1603-2957
3		Oct	2	87.06	-6.355	-0.3333			07-5049-7357	00-0455-0404
4		Nov	4	78.6	-14.81	-0.8168			15-5309-1620	09-4295-1286
5		Dec	3	109.2	15.8	0.7393			00-4302-0811	06-8646-3269
6	2016	Jan	6	101.8	8.368	0.4058			03-0126-0157	10-2418-7192
7		Feb	12	74.05	-19.36	-1.098	(-)		20-1307-5735	00-6625-2007
8		Mar	11	93.3	-0.1068	-0.00541			04-5855-6937	21-4494-8529
9		Apr	14	81.23	-12.18	-0.6612			12-6392-6480	08-8601-0446
10		May	13	112.2	18.84	0.8689			06-1725-7107	05-5954-7512
11		Jun	28	87.06	-6.355	-0.3333			17-2019-6071	03-3667-6651
12		Aug	2	83.12	-10.29	-0.5519			18-3529-7359	04-6169-6946
13		Sep	9	93.3	-0.1068	-0.00541			14-8001-5549	17-5446-1853
14		Oct	13	114.5	21.06	0.9616			01-3356-4134	03-9174-4425
15		Nov	16	64.47	-28.94	-1.754	(-)		00-9981-0415	01-2788-3133
16		Dec	21	95.48	2.074	0.1039			00-4678-3392	07-2943-2050
17	2017	Jan	25	126	32.58	1.415	(+)		00-0066-8952	04-6372-2628
18		Mar	2	138.2	44.78	1.853	(+)		06-3918-0228	07-9779-4134
19		Apr	4	63	-30.41	-1.863	(-)		03-6593-7512	17-2989-4259
20		May	3	120.3	26.89	1.197	(+)		11-5596-3648	06-1016-9279
21		Jun	2	141.4	48.01	1.962	(+)		12-4358-3517	15-4391-5735

CETIS Summary Report

Fish 96-h Acute Survival Test — **Rainier Environmental Laboratory**

Batch ID:	16-3391-7644	**Test Type:**	Survival (96h)	**Analyst:**	Eric Tollefson
Start Date:	02 Jun-17 15:15	**Protocol:**	Not Applicable	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	06 Jun-17 15:45	**Species:**	Oncorhynchus mykiss	**Brine:**	
Duration:	4d 1h	**Source:**	Trout Lodge Fish Farm	**Age:**	57d

Sample ID:	02-8669-5428	**Code:**	RA060217OM	**Client:**	Internal Lab
Sample Date:	02 Jun-17	**Material:**	Copper sulfate	**Project:**	
Receive Date:	06 Jun-17	**Source:**	Reference Toxicant		
Sample Age:	15h	**Station:**	In House		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
01-5287-2913	96h Survival Rate	50	100	70.71	13.7%		Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	µg/L	95% LCL	95% UCL	TU	Method
15-4391-5735	96h Survival Rate	LC50	141.4	118.7	168.5		Spearman-Kärber

96h Survival Rate Summary

C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	1	1	1	1	1	0	0	0.0%	0.0%
25		3	1	1	1	1	1	0	0	0.0%	0.0%
50		3	0.9333	0.9118	0.9549	0.9	1	0.03333	0.05774	6.19%	6.67%
100		3	0.7333	0.6763	0.7904	0.6	0.9	0.08819	0.1528	20.83%	26.67%
200		3	0.3333	0.2902	0.3765	0.2	0.4	0.06667	0.1155	34.64%	66.67%
400		3	0	0	0	0	0	0	0		100.0%

96h Survival Rate Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
25		1	1	1
50		0.9	1	0.9
100		0.7	0.6	0.9
200		0.4	0.4	0.2
400		0	0	0

96h Survival Rate Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	10/10	10/10
25		10/10	10/10	10/10
50		9/10	10/10	9/10
100		7/10	6/10	9/10
200		4/10	4/10	2/10
400		0/10	0/10	0/10

Appendix C
Chain-of-Custody Form

Rainier ENVIRONMENTAL

Washington
5013 Pacific Highway East, Suite 20 Fife,
WA 98424
Phone253.922.8898

Chain of Custody

Date______ Page___of___

Sample Collection By:

Report to:
- **Company** Whatcom Environmental
- **Address** 228 E Champion St #101
- **City/State/Zip** Bellingham WA
- **Contact** Eric Libolt
- **Phone** 360-752-9571
- **Email** elibolt@whatcomenvironmental.com

Invoice To:
- **Company** Same
- **Address**
- **City/State/Zip**
- **Contact**
- **Phone**
- **Email**

	SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NO. OF CONTAINERS	COMMENTS	ANALYSES REQUIRED: Bioassay		Receipt Temperature (°C)
1	Plot14TP2WR	6/8/17	11:10	Soil	8oz jar	1		X	T17-181	
2	Plot15TP2WR	6/8/17	3:00	Soil	8oz jar	1		X	T17-182	
3	Plot17TP1WR	6/12/17	1:45	Soil	8oz jar	1		X	T17-183	
4	Plot17TP2WR	6/12/17	2:20	Soil	8oz jar	1		X	T17-184	
5										
6										
7										
8										
9										
10										

PROJECT INFORMATION

Client:	Shell PSR SWMU 55
PO No.:	
Shipped Via:	UPS

SAMPLE RECEIPT

Total No. of Containers	4
Received Good Condition?	Y
Matches Test Schedule?	Y

SPECIAL INSTRUCTIONS/COMMENTS:
Standard TAT

RELINQUISHED BY (CLIENT)
(Signature) [signature] (Time) 2:00PM
(Printed Name) Britta Nelson (Date) 6/13/17
(Company)

RELINQUISHED BY (COURIER)
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (COURIER)
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY)
(Signature) Eric Tollefson (Time) 1000
(Printed Name) ERIC TOLLEFSON (Date) 6/14/17
(Log in #) See Above

November 28, 2017

Mr. Eric Libolt
Whatcom Environmental Svcs., Inc.
228 E. Champion St., Suite 101
Bellingham, WA 98225

Dear Mr. Libolt,

On November 16th, 10 samples were received by our laboratory and assigned our laboratory project number EV17110111. The project was identified as your SWMV-55 Test Pits. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan
Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	11/28/2017
		ALS JOB#:	EV17110111
		ALS SAMPLE#:	EV17110111-01
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 9:25:00 AM
CLIENT SAMPLE ID	Plot14 TP4 2ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	0.10	1	MG/KG	11/22/2017	SNC
Benzene	EPA-8021	**0.075**	0.030	1	MG/KG	11/22/2017	SNC
Toluene	EPA-8021	**0.24**	0.050	1	MG/KG	11/22/2017	SNC
Ethylbenzene	EPA-8021	**0.19**	0.050	1	MG/KG	11/22/2017	SNC
Xylenes	EPA-8021	**0.91**	0.20	1	MG/KG	11/22/2017	SNC
C5-C6 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	**5.3**	5.0	1	MG/KG	11/17/2017	SNC
Hexane	NWVPH	U	0.20	1	MG/KG	11/17/2017	SNC
>C10-C12 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	**470**	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	**2000**	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	**5800**	5.0	1	MG/KG	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	25	5	MG/KG	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	U	25	5	MG/KG	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	**1400**	25	5	MG/KG	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	**6000**	25	5	MG/KG	11/17/2017	EBS
Naphthalene	EPA-8270 SIM	**140**	20	1	UG/KG	11/17/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	**290**	20	1	UG/KG	11/17/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	**280**	20	1	UG/KG	11/17/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Acenaphthene	EPA-8270 SIM	**120**	20	1	UG/KG	11/17/2017	PAB
Fluorene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Phenanthrene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Pyrene	EPA-8270 SIM	**1900**	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Chrysene	EPA-8270 SIM	**8400**	200	10	UG/KG	11/20/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	**4100**	200	10	UG/KG	11/20/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	**2400**	20	1	UG/KG	11/17/2017	PAB

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-01
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 9:25:00 AM
CLIENT SAMPLE ID	Plot14 TP4 2ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**83.6**	11/22/2017	SNC
TFT - Aliphatic	NWVPH	**108**	11/17/2017	SNC
TFT - Aromatic	NWVPH	**116**	11/17/2017	SNC
TFT - Hexane	NWVPH	**112**	11/17/2017	SNC
C25	NWEPH	**29.8**	11/17/2017	EBS
p-Terphenyl 5X Dilution	NWEPH	**35.1**	11/17/2017	EBS
Terphenyl-d14	EPA-8270 SIM	**65.3**	11/17/2017	PAB
Terphenyl-d14 10X Dilution	EPA-8270 SIM	**76.4**	11/20/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-02
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 9:30:00 AM
CLIENT SAMPLE ID	Plot14 TP4 4ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	0.10	1	MG/KG	11/22/2017	SNC
Benzene	EPA-8021	**0.077**	0.030	1	MG/KG	11/22/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Xylenes	EPA-8021	**0.25**	0.20	1	MG/KG	11/22/2017	SNC
C5-C6 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
Hexane	NWVPH	U	0.20	1	MG/KG	11/17/2017	SNC
>C10-C12 Aliphatics	NWEPH	U	10	2	MG/KG	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	**970**	10	2	MG/KG	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	**3100**	10	2	MG/KG	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	**7700**	10	2	MG/KG	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	25	5	MG/KG	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	U	25	5	MG/KG	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	**2100**	25	5	MG/KG	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	**9700**	25	5	MG/KG	11/17/2017	EBS
Naphthalene	EPA-8270 SIM	**260**	20	1	UG/KG	11/17/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	**920**	20	1	UG/KG	11/17/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	**570**	20	1	UG/KG	11/17/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Acenaphthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Fluorene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Phenanthrene	EPA-8270 SIM	**1200**	20	1	UG/KG	11/17/2017	PAB
Anthracene	EPA-8270 SIM	**350**	20	1	UG/KG	11/17/2017	PAB
Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Pyrene	EPA-8270 SIM	**2600**	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	**1900**	20	1	UG/KG	11/17/2017	PAB
Chrysene	EPA-8270 SIM	**2900**	200	10	UG/KG	11/20/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	**3100**	20	1	UG/KG	11/17/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	**1900**	20	1	UG/KG	11/17/2017	PAB

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-02
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 9:30:00 AM
CLIENT SAMPLE ID	Plot14 TP4 4ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**60.7**	11/22/2017	SNC
TFT - Aliphatic	NWVPH	**115**	11/17/2017	SNC
TFT - Aromatic	NWVPH	**116**	11/17/2017	SNC
TFT - Hexane	NWVPH	**116**	11/17/2017	SNC
C25 2X Dilution	NWEPH	**27.6**	11/17/2017	EBS
p-Terphenyl 5X Dilution	NWEPH	**30.5**	11/17/2017	EBS
Terphenyl-d14	EPA-8270 SIM	**73.6**	11/17/2017	PAB
Terphenyl-d14 10X Dilution	EPA-8270 SIM	**79.2**	11/20/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-03
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 9:40:00 AM
CLIENT SAMPLE ID	Plot14 TP4 6ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	0.10	1	MG/KG	11/22/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	11/22/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	11/22/2017	SNC
C5-C6 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
Hexane	NWVPH	U	0.20	1	MG/KG	11/17/2017	SNC
>C10-C12 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	**14**	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	**48**	5.0	1	MG/KG	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	**11**	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	**53**	5.0	1	MG/KG	11/17/2017	EBS
Naphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Acenaphthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Fluorene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Phenanthrene	EPA-8270 SIM	**70**	20	1	UG/KG	11/17/2017	PAB
Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Fluoranthene	EPA-8270 SIM	**31**	20	1	UG/KG	11/17/2017	PAB
Pyrene	EPA-8270 SIM	**230**	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	**160**	20	1	UG/KG	11/17/2017	PAB
Chrysene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	**130**	20	1	UG/KG	11/17/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	**210**	20	1	UG/KG	11/17/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	**170**	20	1	UG/KG	11/17/2017	PAB

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-03
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 9:40:00 AM
CLIENT SAMPLE ID	Plot14 TP4 6ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**87.0**	11/22/2017	SNC
TFT - Aliphatic	NWVPH	**124**	11/17/2017	SNC
TFT - Aromatic	NWVPH	**126**	11/17/2017	SNC
TFT - Hexane	NWVPH	**125**	11/17/2017	SNC
C25	NWEPH	**107**	11/17/2017	EBS
p-Terphenyl	NWEPH	**97.5**	11/17/2017	EBS
Terphenyl-d14	EPA-8270 SIM	**82.4**	11/17/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

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ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-04
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 9:45:00 AM
CLIENT SAMPLE ID	Plot14 TP4 8ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	0.10	1	MG/KG	11/22/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	11/22/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	11/22/2017	SNC
C5-C6 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
Hexane	NWVPH	U	0.20	1	MG/KG	11/17/2017	SNC
>C10-C12 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	**26**	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	**52**	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	**120**	5.0	1	MG/KG	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	**30**	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	**88**	5.0	1	MG/KG	11/17/2017	EBS
Naphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Acenaphthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Fluorene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Phenanthrene	EPA-8270 SIM	**25**	20	1	UG/KG	11/17/2017	PAB
Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Pyrene	EPA-8270 SIM	**83**	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Chrysene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	**80**	20	1	UG/KG	11/17/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	**59**	20	1	UG/KG	11/17/2017	PAB

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-04
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 9:45:00 AM
CLIENT SAMPLE ID	Plot14 TP4 8ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**90.0**	11/22/2017	SNC
TFT - Aliphatic	NWVPH	**139**	11/17/2017	SNC
TFT - Aromatic	NWVPH	**139**	11/17/2017	SNC
TFT - Hexane	NWVPH	**141**	11/17/2017	SNC
C25	NWEPH	**97.4**	11/17/2017	EBS
p-Terphenyl	NWEPH	**84.0**	11/17/2017	EBS
Terphenyl-d14	EPA-8270 SIM	**92.7**	11/17/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-05
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 9:50:00 AM
CLIENT SAMPLE ID	Plot14 TP4 10ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	0.10	1	MG/KG	11/22/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	11/22/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	11/22/2017	SNC
C5-C6 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
Hexane	NWVPH	U	0.20	1	MG/KG	11/17/2017	SNC
>C10-C12 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
Naphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Acenaphthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Fluorene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Phenanthrene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Chrysene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-05
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 9:50:00 AM
CLIENT SAMPLE ID	Plot14 TP4 10ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**107**	11/22/2017	SNC
TFT - Aliphatic	NWVPH	**127**	11/17/2017	SNC
TFT - Aromatic	NWVPH	**128**	11/17/2017	SNC
TFT - Hexane	NWVPH	**128**	11/17/2017	SNC
C25	NWEPH	**101**	11/17/2017	EBS
p-Terphenyl	NWEPH	**64.3**	11/17/2017	EBS
Terphenyl-d14	EPA-8270 SIM	**89.0**	11/17/2017	PAB

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-06
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 10:50:00 AM
CLIENT SAMPLE ID	Plot14 TP5 2ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	0.10	1	MG/KG	11/22/2017	SNC
Benzene	EPA-8021	**0.099**	0.030	1	MG/KG	11/22/2017	SNC
Toluene	EPA-8021	**0.069**	0.050	1	MG/KG	11/22/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Xylenes	EPA-8021	**0.26**	0.20	1	MG/KG	11/22/2017	SNC
C5-C6 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
Hexane	NWVPH	U	0.20	1	MG/KG	11/17/2017	SNC
>C10-C12 Aliphatics	NWEPH	U	10	2	MG/KG	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	**720**	10	2	MG/KG	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	**2800**	10	2	MG/KG	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	**7700**	10	2	MG/KG	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	25	5	MG/KG	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	U	25	5	MG/KG	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	**2000**	25	5	MG/KG	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	**8900**	25	5	MG/KG	11/17/2017	EBS
Naphthalene	EPA-8270 SIM	**110**	20	1	UG/KG	11/17/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	**310**	20	1	UG/KG	11/17/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	**190**	20	1	UG/KG	11/17/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Acenaphthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Fluorene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Phenanthrene	EPA-8270 SIM	**390**	20	1	UG/KG	11/17/2017	PAB
Anthracene	EPA-8270 SIM	**340**	20	1	UG/KG	11/17/2017	PAB
Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Pyrene	EPA-8270 SIM	**1100**	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Chrysene	EPA-8270 SIM	**4700**	200	10	UG/KG	11/20/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	**2800**	200	10	UG/KG	11/20/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/17/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	**2300**	20	1	UG/KG	11/17/2017	PAB

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-06
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 10:50:00 AM
CLIENT SAMPLE ID	Plot14 TP5 2ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**55.0 SUR12**	11/22/2017	SNC
TFT - Aliphatic	NWVPH	**112**	11/17/2017	SNC
TFT - Aromatic	NWVPH	**113**	11/17/2017	SNC
TFT - Hexane	NWVPH	**110**	11/17/2017	SNC
C25 2X Dilution	NWEPH	**28.9**	11/17/2017	EBS
p-Terphenyl 5X Dilution	NWEPH	**28.9**	11/17/2017	EBS
Terphenyl-d14	EPA-8270 SIM	**48.0**	11/17/2017	PAB
Terphenyl-d14 10X Dilution	EPA-8270 SIM	**49.8**	11/20/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
SUR12 -Surrogate recoveries were outside of the control limits due to matrix interference.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-07
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 10:55:00 AM
CLIENT SAMPLE ID	Plot14 TP5 4ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	0.10	1	MG/KG	11/22/2017	SNC
Benzene	EPA-8021	**0.47**	0.030	1	MG/KG	11/22/2017	SNC
Toluene	EPA-8021	**1.4**	0.050	1	MG/KG	11/22/2017	SNC
Ethylbenzene	EPA-8021	**0.67**	0.050	1	MG/KG	11/22/2017	SNC
Xylenes	EPA-8021	**2.7**	0.20	1	MG/KG	11/22/2017	SNC
C5-C6 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	**8.7**	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	**24**	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	**25**	5.0	1	MG/KG	11/17/2017	SNC
Hexane	NWVPH	U	0.20	1	MG/KG	11/17/2017	SNC
>C10-C12 Aliphatics	NWEPH	**470**	10	2	MG/KG	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	**2700**	10	2	MG/KG	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	**5000**	10	2	MG/KG	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	**12000**	10	2	MG/KG	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	25	5	MG/KG	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	**550**	25	5	MG/KG	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	**4700**	25	5	MG/KG	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	**14000**	25	5	MG/KG	11/17/2017	EBS
Naphthalene	EPA-8270 SIM	**2200**	20	1	UG/KG	11/18/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	**7800**	400	20	UG/KG	11/20/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	**7500**	400	20	UG/KG	11/20/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Acenaphthene	EPA-8270 SIM	**2100**	20	1	UG/KG	11/18/2017	PAB
Fluorene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Phenanthrene	EPA-8270 SIM	**12000**	400	20	UG/KG	11/20/2017	PAB
Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Pyrene	EPA-8270 SIM	**28000**	400	20	UG/KG	11/20/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Chrysene	EPA-8270 SIM	**43000**	400	20	UG/KG	11/20/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	**10000**	400	20	UG/KG	11/20/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	**15000**	400	20	UG/KG	11/20/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	**16000**	400	20	UG/KG	11/20/2017	PAB

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-07
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 10:55:00 AM
CLIENT SAMPLE ID	Plot14 TP5 4ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**50.2 SUR12**	11/22/2017	SNC
TFT - Aliphatic	NWVPH	**81.5**	11/17/2017	SNC
TFT - Aromatic	NWVPH	**91.4**	11/17/2017	SNC
TFT - Hexane	NWVPH	**86.5**	11/17/2017	SNC
C25 2X Dilution	NWEPH	**25.9**	11/17/2017	EBS
p-Terphenyl 5X Dilution	NWEPH	**31.5**	11/17/2017	EBS
Terphenyl-d14	EPA-8270 SIM	**70.4**	11/18/2017	PAB
Terphenyl-d14 20X Dilution	EPA-8270 SIM	**99.7**	11/20/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
SUR12 -Surrogate recoveries were outside of the control limits due to matrix interference.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-08
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 11:00:00 AM
CLIENT SAMPLE ID	Plot14 TP5 6ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	0.10	1	MG/KG	11/22/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	11/22/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	11/22/2017	SNC
C5-C6 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
Hexane	NWVPH	U	0.20	1	MG/KG	11/17/2017	SNC
>C10-C12 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	**53**	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	**97**	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	**210**	5.0	1	MG/KG	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	**13**	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	**98**	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	**260**	5.0	1	MG/KG	11/17/2017	EBS
Naphthalene	EPA-8270 SIM	**33**	20	1	UG/KG	11/18/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	**150**	20	1	UG/KG	11/18/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	**170**	20	1	UG/KG	11/18/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Acenaphthene	EPA-8270 SIM	**87**	20	1	UG/KG	11/18/2017	PAB
Fluorene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Phenanthrene	EPA-8270 SIM	**550**	20	1	UG/KG	11/18/2017	PAB
Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Fluoranthene	EPA-8270 SIM	**240**	20	1	UG/KG	11/18/2017	PAB
Pyrene	EPA-8270 SIM	**1500**	20	1	UG/KG	11/18/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	**870**	20	1	UG/KG	11/18/2017	PAB
Chrysene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	**710**	20	1	UG/KG	11/18/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	**890**	20	1	UG/KG	11/18/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	**150**	20	1	UG/KG	11/18/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	**580**	20	1	UG/KG	11/18/2017	PAB

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-08
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 11:00:00 AM
CLIENT SAMPLE ID	Plot14 TP5 6ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**82.6**	11/22/2017	SNC
TFT - Aliphatic	NWVPH	**131**	11/17/2017	SNC
TFT - Aromatic	NWVPH	**131**	11/17/2017	SNC
TFT - Hexane	NWVPH	**130**	11/17/2017	SNC
C25	NWEPH	**94.4**	11/17/2017	EBS
p-Terphenyl	NWEPH	**86.6**	11/17/2017	EBS
Terphenyl-d14	EPA-8270 SIM	**82.1**	11/18/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

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ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-09
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 11:05:00 AM
CLIENT SAMPLE ID	Plot14 TP5 8ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	0.10	1	MG/KG	11/22/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	11/22/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	11/22/2017	SNC
C5-C6 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
Hexane	NWVPH	U	0.20	1	MG/KG	11/17/2017	SNC
>C10-C12 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	**12**	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	**27**	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	**71**	5.0	1	MG/KG	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	**25**	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	**93**	5.0	1	MG/KG	11/17/2017	EBS
Naphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Acenaphthene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Fluorene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Phenanthrene	EPA-8270 SIM	**55**	20	1	UG/KG	11/18/2017	PAB
Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Pyrene	EPA-8270 SIM	**150**	20	1	UG/KG	11/18/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Chrysene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	**88**	20	1	UG/KG	11/18/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	**130**	20	1	UG/KG	11/18/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	**74**	20	1	UG/KG	11/18/2017	PAB

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-09
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 11:05:00 AM
CLIENT SAMPLE ID	Plot14 TP5 8ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**85.6**	11/22/2017	SNC
TFT - Aliphatic	NWVPH	**108**	11/17/2017	SNC
TFT - Aromatic	NWVPH	**107**	11/17/2017	SNC
TFT - Hexane	NWVPH	**105**	11/17/2017	SNC
C25	NWEPH	**108**	11/17/2017	EBS
p-Terphenyl	NWEPH	**93.1**	11/17/2017	EBS
Terphenyl-d14	EPA-8270 SIM	**85.9**	11/18/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-10
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 11:15:00 AM
CLIENT SAMPLE ID	Plot14 TP5 10ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	0.10	1	MG/KG	11/22/2017	SNC
Benzene	EPA-8021	U	0.030	1	MG/KG	11/22/2017	SNC
Toluene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Ethylbenzene	EPA-8021	U	0.050	1	MG/KG	11/22/2017	SNC
Xylenes	EPA-8021	U	0.20	1	MG/KG	11/22/2017	SNC
C5-C6 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	U	5.0	1	MG/KG	11/17/2017	SNC
Hexane	NWVPH	U	0.20	1	MG/KG	11/17/2017	SNC
>C10-C12 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	U	5.0	1	MG/KG	11/17/2017	EBS
Naphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Acenaphthene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Fluorene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Phenanthrene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Chrysene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	U	20	1	UG/KG	11/18/2017	PAB

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	11/28/2017 EV17110111 EV17110111-10
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	11/16/2017
CLIENT PROJECT:	SWMV-55 Test Pits	COLLECTION DATE:	11/15/2017 11:15:00 AM
CLIENT SAMPLE ID	Plot14 TP5 10ft	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**94.2**	11/22/2017	SNC
TFT - Aliphatic	NWVPH	**111**	11/17/2017	SNC
TFT - Aromatic	NWVPH	**111**	11/17/2017	SNC
TFT - Hexane	NWVPH	**112**	11/17/2017	SNC
C25	NWEPH	**110**	11/17/2017	EBS
p-Terphenyl	NWEPH	**79.8**	11/17/2017	EBS
Terphenyl-d14	EPA-8270 SIM	**91.1**	11/18/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	11/28/2017 EV17110111 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	SWMV-55 Test Pits		

LABORATORY BLANK RESULTS

MB-111617S - Batch 122293 - Soil by EPA-8021

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	MG/KG	0.10	11/16/2017	SNC
Benzene	EPA-8021	U	MG/KG	0.030	11/16/2017	SNC
Toluene	EPA-8021	U	MG/KG	0.050	11/16/2017	SNC
Ethylbenzene	EPA-8021	U	MG/KG	0.050	11/16/2017	SNC
Xylenes	EPA-8021	U	MG/KG	0.20	11/16/2017	SNC

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-R306088 - Batch R306088 - Soil by NWVPH

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
C5-C6 Aliphatics	NWVPH	U	MG/KG	5.0	11/17/2017	SNC
>C6-C8 Aliphatics	NWVPH	U	MG/KG	5.0	11/17/2017	SNC
>C8-C10 Aliphatics	NWVPH	U	MG/KG	5.0	11/17/2017	SNC
>C8-C10 Aromatics	NWVPH	U	MG/KG	5.0	11/17/2017	SNC
Hexane	NWVPH	U	MG/KG	0.20	11/17/2017	SNC

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-R306089 - Batch R306089 - Soil by NWEPH

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
>C10-C12 Aliphatics	NWEPH	U	MG/KG	5.0	11/17/2017	EBS
>C12-C16 Aliphatics	NWEPH	U	MG/KG	5.0	11/17/2017	EBS
>C16-C21 Aliphatics	NWEPH	U	MG/KG	5.0	11/17/2017	EBS
>C21-C34 Aliphatics	NWEPH	U	MG/KG	5.0	11/17/2017	EBS
>C10-C12 Aromatics	NWEPH	U	MG/KG	5.0	11/17/2017	EBS
>C12-C16 Aromatics	NWEPH	U	MG/KG	5.0	11/17/2017	EBS
>C16-C21 Aromatics	NWEPH	U	MG/KG	5.0	11/17/2017	EBS
>C21-C34 Aromatics	NWEPH	U	MG/KG	5.0	11/17/2017	EBS

U - Analyte analyzed for but not detected at level above reporting limit.

MB-111717S - Batch 122367 - Soil by EPA-8270 SIM

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Naphthalene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
2-Methylnaphthalene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
1-Methylnaphthalene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Acenaphthylene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Acenaphthene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	11/28/2017 EV17110111 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	SWMV-55 Test Pits		

LABORATORY BLANK RESULTS

MB-111717S - Batch 122367 - Soil by EPA-8270 SIM

Fluorene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Phenanthrene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Anthracene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Fluoranthene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Pyrene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Chrysene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Benzo[A]Pyrene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	U	UG/KG	20	11/17/2017	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

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ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	11/28/2017 EV17110111 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	SWMV-55 Test Pits		

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: 122293 - Soil by EPA-8021

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether - BS	EPA-8021	**100**			66	116	11/16/2017	SNC
Methyl T-Butyl Ether - BSD	EPA-8021	**100**	**0**		66	116	11/16/2017	SNC
Benzene - BS	EPA-8021	**106**			67.7	124	11/16/2017	SNC
Benzene - BSD	EPA-8021	**107**	**1**		67.7	124	11/16/2017	SNC
Toluene - BS	EPA-8021	**106**			71	123	11/16/2017	SNC
Toluene - BSD	EPA-8021	**105**	**1**		71	123	11/16/2017	SNC
Ethylbenzene - BS	EPA-8021	**108**			69.8	117	11/16/2017	SNC
Ethylbenzene - BSD	EPA-8021	**108**	**0**		69.8	117	11/16/2017	SNC
Xylenes - BS	EPA-8021	**105**			70	119	11/16/2017	SNC
Xylenes - BSD	EPA-8021	**104**	**1**		70	119	11/16/2017	SNC

ALS Test Batch ID: R306088 - Soil by NWVPH

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
C5-C6 Aliphatics - BS	NWVPH	**98.1**			70	130	11/17/2017	SNC
C5-C6 Aliphatics - BSD	NWVPH	**93.7**	**5**		70	130	11/17/2017	SNC
>C6-C8 Aliphatics - BS	NWVPH	**97.3**			70	130	11/17/2017	SNC
>C6-C8 Aliphatics - BSD	NWVPH	**93.1**	**4**		70	130	11/17/2017	SNC
>C8-C10 Aliphatics - BS	NWVPH	**94.4**			70	130	11/17/2017	SNC
>C8-C10 Aliphatics - BSD	NWVPH	**89.5**	**5**		70	130	11/17/2017	SNC
>C8-C10 Aromatics - BS	NWVPH	**100**			70	130	11/17/2017	SNC
>C8-C10 Aromatics - BSD	NWVPH	**97.3**	**3**		70	130	11/17/2017	SNC
Hexane - BS	NWVPH	**92.3**			70	130	11/17/2017	SNC
Hexane - BSD	NWVPH	**89.2**	**3**		70	130	11/17/2017	SNC

ALS Test Batch ID: R306089 - Soil by NWEPH

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
>C10-C12 Aliphatics - BS	NWEPH	**104**			70	130	11/17/2017	EBS
>C10-C12 Aliphatics - BSD	NWEPH	**96.3**	**8**		70	130	11/17/2017	EBS
>C12-C16 Aliphatics - BS	NWEPH	**107**			70	130	11/17/2017	EBS
>C12-C16 Aliphatics - BSD	NWEPH	**101**	**6**		70	130	11/17/2017	EBS
>C16-C21 Aliphatics - BS	NWEPH	**108**			70	130	11/17/2017	EBS
>C16-C21 Aliphatics - BSD	NWEPH	**103**	**5**		70	130	11/17/2017	EBS
>C21-C34 Aliphatics - BS	NWEPH	**88.0**			70	130	11/17/2017	EBS
>C21-C34 Aliphatics - BSD	NWEPH	**88.8**	**1**		70	130	11/17/2017	EBS
>C10-C12 Aromatics - BS	NWEPH	**84.5**			70	130	11/17/2017	EBS
>C10-C12 Aromatics - BSD	NWEPH	**86.1**	**2**		70	130	11/17/2017	EBS
>C12-C16 Aromatics - BS	NWEPH	**86.2**			70	130	11/17/2017	EBS

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ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225		DATE: ALS SDG#: WDOE ACCREDITATION:	11/28/2017 EV17110111 C601
CLIENT CONTACT:	Eric Libolt			
CLIENT PROJECT:	SWMV-55 Test Pits			

LABORATORY CONTROL SAMPLE RESULTS

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
>C12-C16 Aromatics - BSD	NWEPH	**88.9**	**3**		70	130	11/17/2017	EBS
>C16-C21 Aromatics - BS	NWEPH	**86.3**			70	130	11/17/2017	EBS
>C16-C21 Aromatics - BSD	NWEPH	**90.9**	**5**		70	130	11/17/2017	EBS
>C21-C34 Aromatics - BS	NWEPH	**73.1**			70	130	11/17/2017	EBS
>C21-C34 Aromatics - BSD	NWEPH	**71.6**	**2**		70	130	11/17/2017	EBS

ALS Test Batch ID: 122367 - Soil by EPA-8270 SIM

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Naphthalene - BS	EPA-8270 SIM	**39.4**			49.2	140	11/17/2017	PAB
Naphthalene - BSD	EPA-8270 SIM	**83.2**	**6**		49.2	140	11/17/2017	PAB
Acenaphthene - BS	EPA-8270 SIM	**41.1**			55	147	11/17/2017	PAB
Acenaphthene - BSD	EPA-8270 SIM	**87.9**	**7**		55	147	11/17/2017	PAB
Pyrene - BS	EPA-8270 SIM	**46.7**			47.9	176	11/17/2017	PAB
Pyrene - BSD	EPA-8270 SIM	**103**	**10**		47.9	176	11/17/2017	PAB
Benzo[G,H,I]Perylene - BS	EPA-8270 SIM	**45.1**			40.4	143	11/17/2017	PAB
Benzo[G,H,I]Perylene - BSD	EPA-8270 SIM	**97.5**	**8**		40.4	143	11/17/2017	PAB

APPROVED BY

Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental
8620 Holly Drive, Suite 100
Everett, WA 98208
Phone (425) 356-2600
Fax (425) 356-2626
http://www.alsglobal.com

Chain Of Custody/ Laboratory Analysis Request

ALS Job# (Laboratory Use Only): EV17110111

Date 11/15/17 Page 1 Of 1

PROJECT ID: SWMU-55 Test Pits
REPORT TO COMPANY: Whatcom Environmental Svcs
PROJECT MANAGER: Eric Libolt
ADDRESS: 228 E Champion #101
Bellingham WA 98225
PHONE: 3607529571 P.O. #:
E-MAIL:
INVOICE TO COMPANY: Same as above
ATTENTION:
ADDRESS:

SAMPLE I.D.	DATE	TIME	TYPE	LAB#	NWTPH-HCID	NWTPH-DX	NWTPH-GX	BTEX by EPA 8021 ☐ BTEX by EPA 8260 ☐	MTBE by EPA 8021 ☐ MTBE by EPA 8260 ☐	Halogenated Volatiles by EPA 8260	Volatile Organic Compounds by EPA 8260	EDB / EDC by EPA 8260 SIM (water)	EDB / EDC by EPA 8260 (soil)	Semivolatile Organic Compounds by EPA 8270	Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM	PCB by EPA 8082 ☐ Pesticides by EPA 8081 ☐	Metals-MTCA-5 ☐ RCRA-8 ☐ Pri Pol ☐ TAL ☐	Metals Other (Specify)	TCLP-Metals ☐ VOA ☐ Semi-Vol ☐ Pest ☐ Herbs ☐	OTHER (Specify): VPH / EPH +	targetted analytes						NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?
1. Plot14TP4 2ft	11/15/17	9:25	30:1	1																X	X						4	
2. Plot14TP4 4ft		9:30		2																X	X							
3. Plot14TP4 6ft		9:40		3																X	X							
4. Plot14TP4 8ft		9:45		4																X	X							
5. Plot14 TP4 10ft		9:50		5																X	X							
6. Plot14TP5 2ft		10:50		6																X	X							
7. Plot 14TP5 4ft		10:55		7																X	X							
8. Plot 14TP5 6ft		11:00		8																X	X							
9. Plot 14TP5 8ft		11:05		9																X	X							
10. Plot 14TP5 10ft		11:15		10																X	X							

SPECIAL INSTRUCTIONS Collected via 5035

SIGNATURES (Name, Company, Date, Time):
1. Relinquished By: [signature] WES, 11/15/17 2:00pm
Received By:
2. Relinquished By:
Received By: Shawn Rohrer ALS 11/16/17 10:10

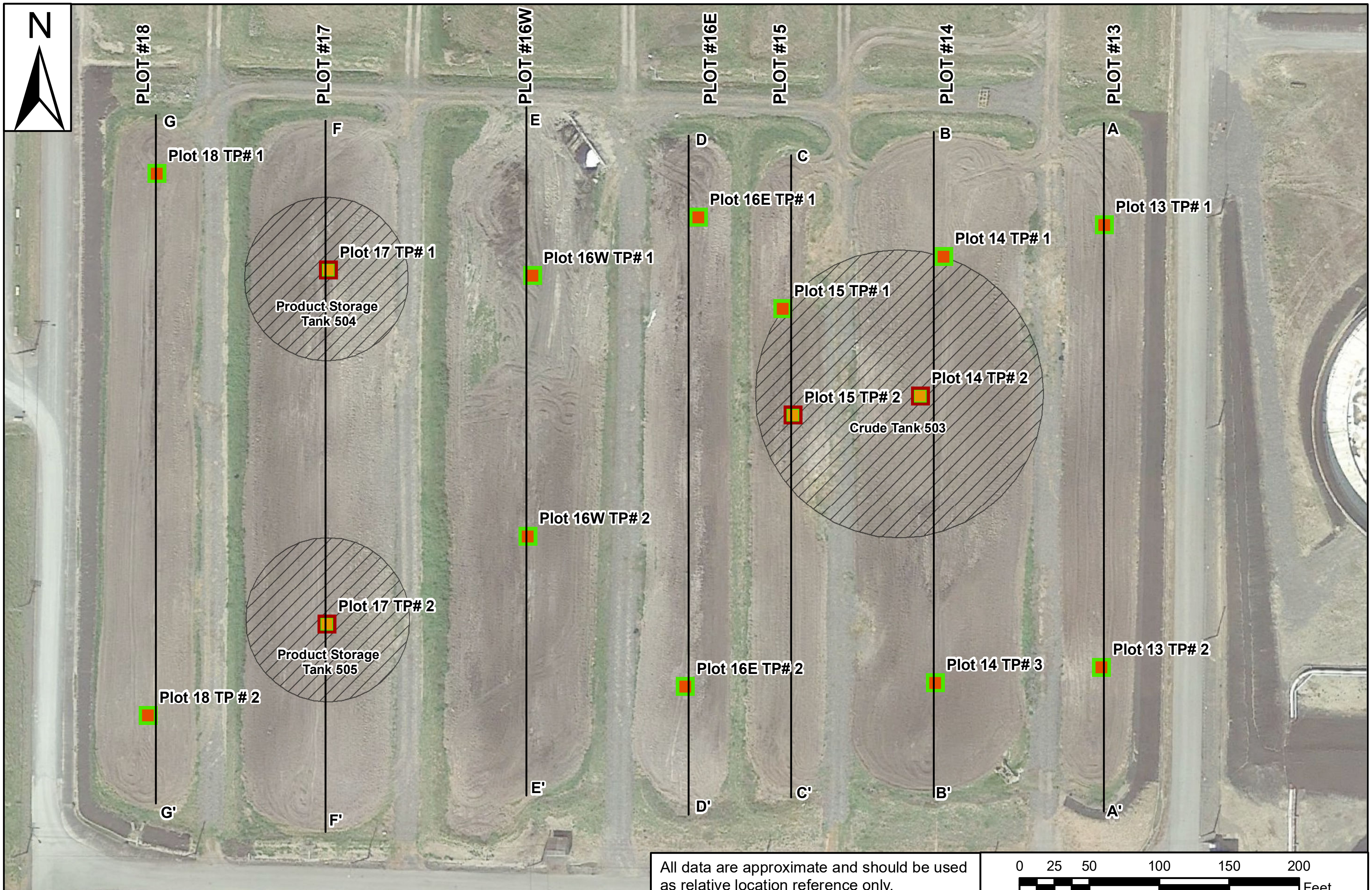
TURNAROUND REQUESTED in Business Days*
Organic, Metals & Inorganic Analysis
☒ 10 Standard ☐ 5 ☐ 3 ☐ 2 ☐ 1 ☐ SAME DAY
Fuels & Hydrocarbon Analysis
☒ 5 Standard ☐ 3 ☐ 1 ☐ SAME DAY

OTHER:
Specify:

*Turnaround request less than standard may incur Rush Charges

APPENDIX C

Cross-Sections



Cross Section Transects

Test Pit Locations

Analysis

Waste Residual Sample and Confirmation Sample

Waste Residual Sample with additional analytes and Confirmation Sample

New Tanks

All data are approximate and should be used as relative location reference only.

2002 Aerial Photograph

0 25 50 100 150 200 Feet

1 inch = 100 feet

Prepared by:

whatcom ENVIRONMENTAL

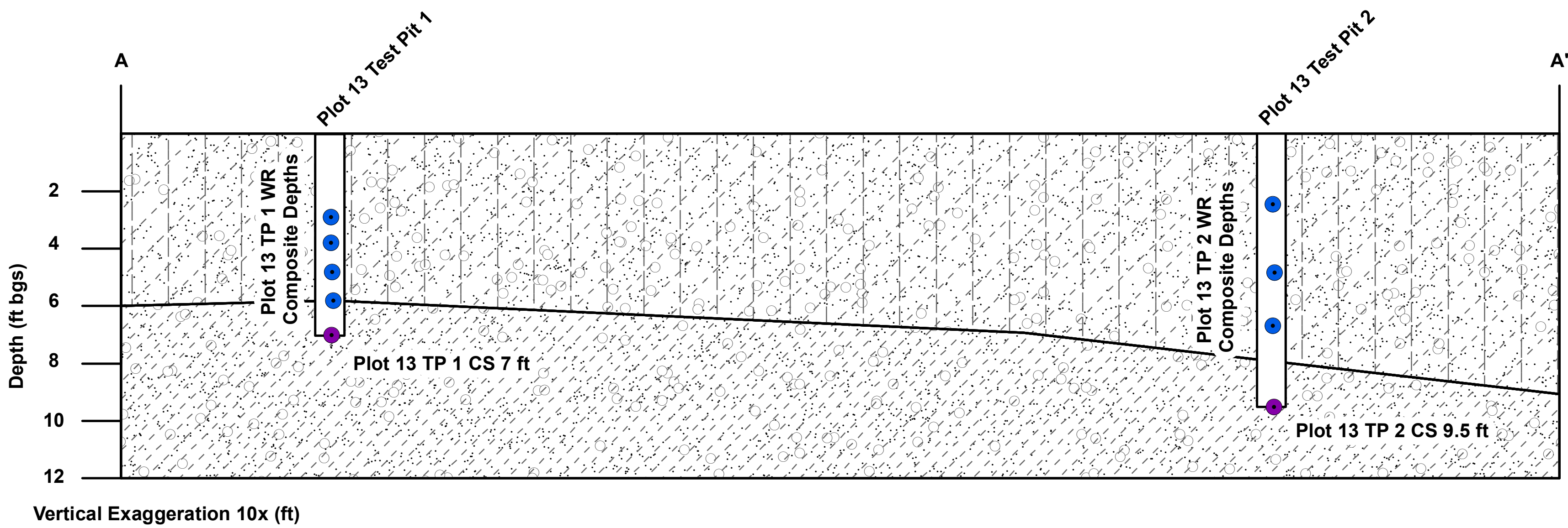
SWMU 55

Cross Section Transects

SHELL PSR

07/17/17

Figure C-1



Sample Type

- Composite
- Confirmation
- Test Pits

Soil Type

- Waste Residual Soil
- Presumed Native Soil

All data are approximate and should be used as relative location reference only.

Prepared by:

whatcom ENVIRONMENTAL

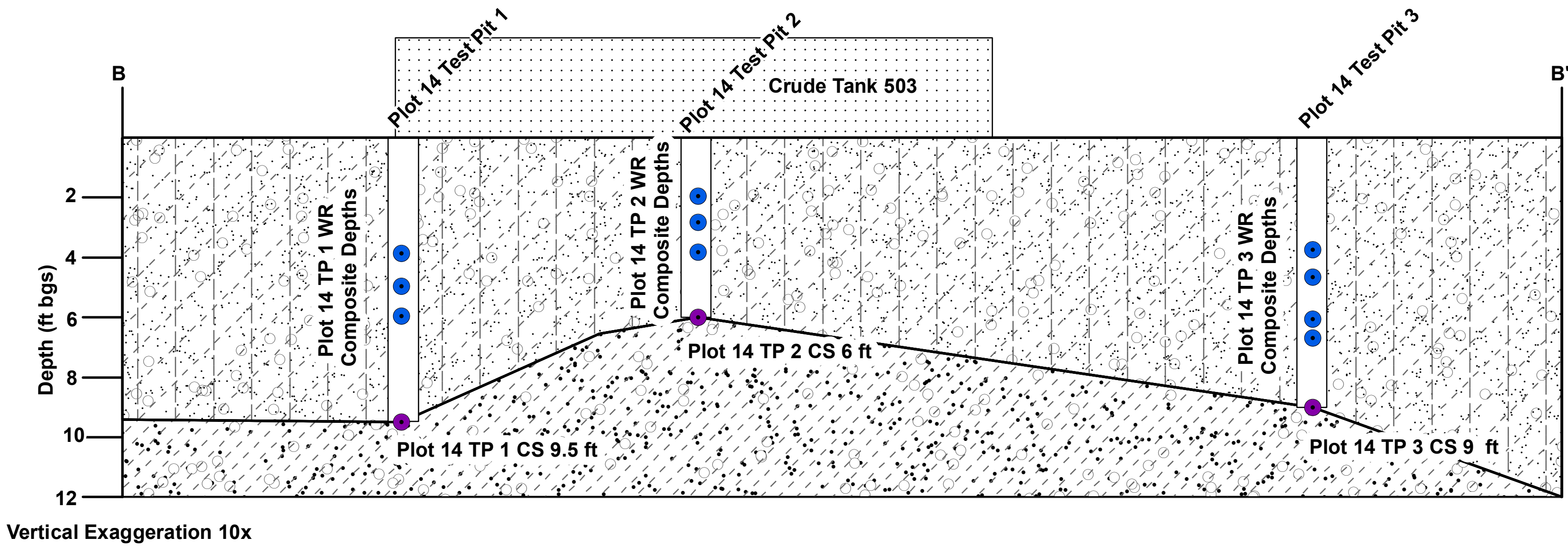
0 10 20 40 60 80 100 120 Feet

1 inch = 60 feet

Plot 13 Cross Section
SWMU-55

SHELL
PSR
07/17/17

Figure C-2



Soil Sample Locations

- Composite
- Confirmation
- Test Pits
- Proposed Tank

Soil Type

- Waste Residual Soil
- Presumed Native Soil

All data are approximate and should be used as relative location reference only.

0 10 20 40 60 80 100 120 Feet

1 inch = 60 feet

Prepared by:

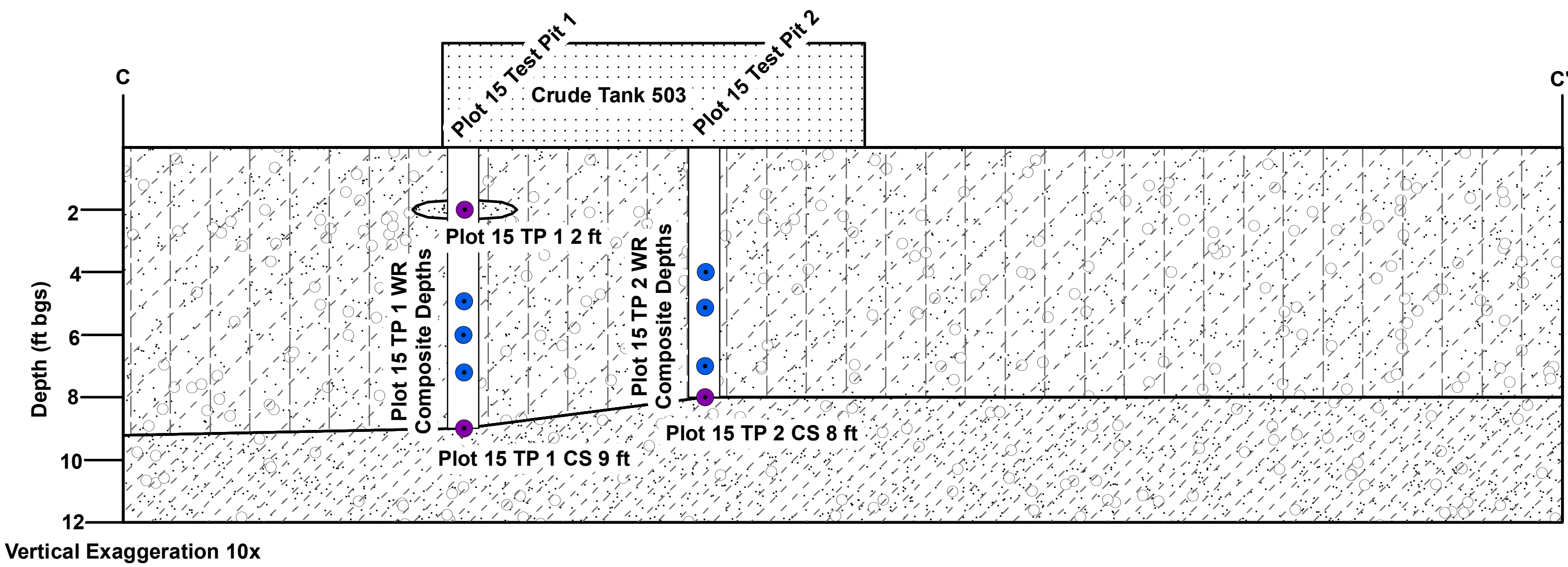
whatcom ENVIRONMENTAL

Plot 14 Cross Section SWMU-55

SHELL PSR

7/17/17

Figure C-3



Sample Type

- Composite
- Confirmation
- Test Pits
- Proposed Tank

Soil Type

- Waste Residual Soil
- Solid strata, salt and pepper, petroleum odor.
- Presumed Native Soil

All data are approximate and should be used as relative location reference only.

0 10 20 40 60 80 100 120 Feet

1 inch = 60 feet

Prepared by:

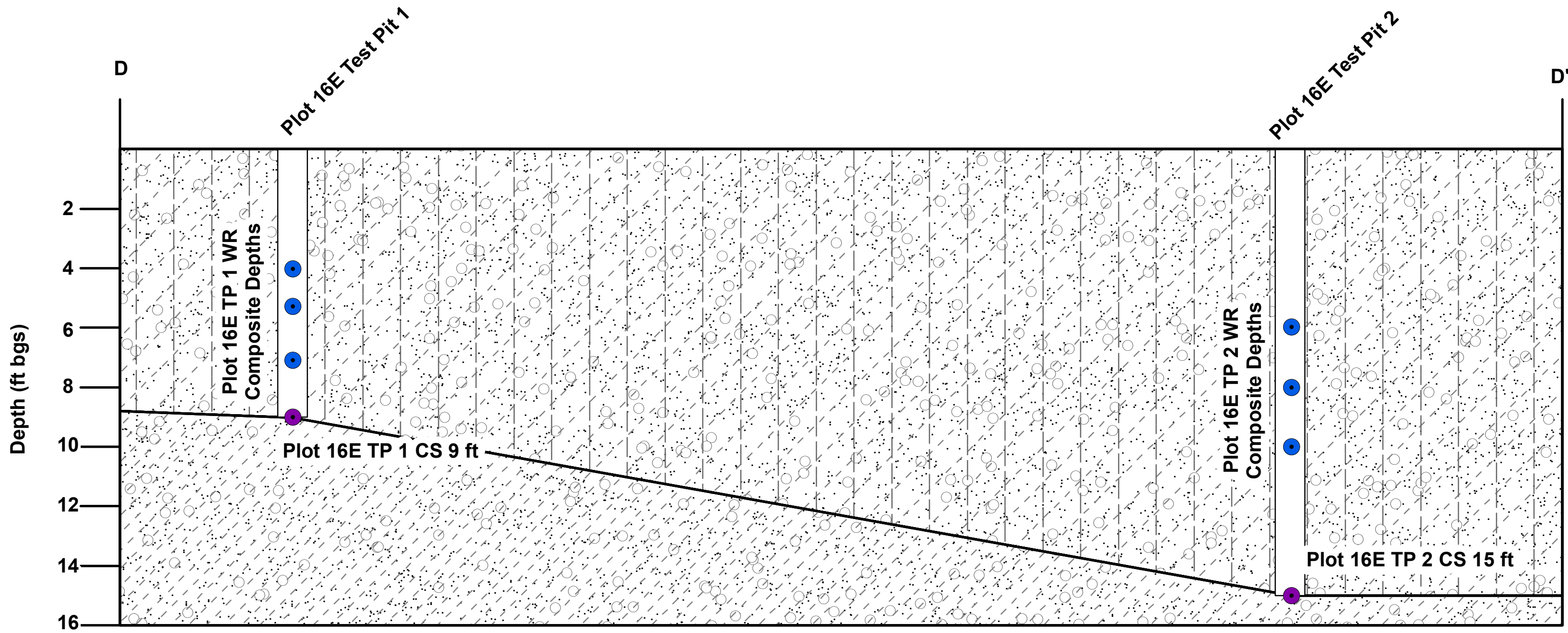
whatcom ENVIRONMENTAL

Plot 15 Cross Section
SWMU-55

SHELL
PSR

7/17/17

Figure C-4



Vertical Exaggeration 10x

Sample Type

- Composite
- Confirmation
- Test Pit

Soil Type

- Waste Residual Soil
- Presumed Native Soil

All data are approximate and should be used as relative location reference only.

0 10 20 40 60 80 100 120 Feet

1 inch = 60 feet

Prepared by:

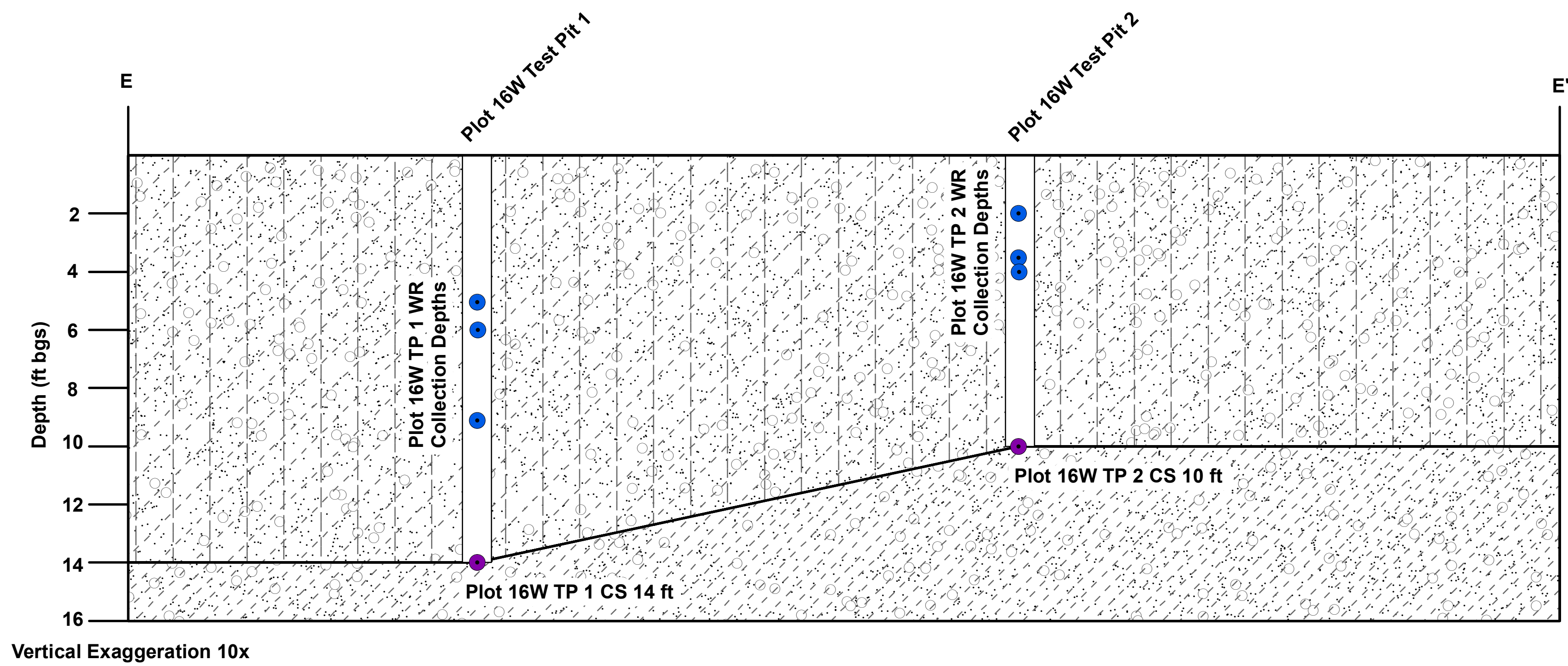
whatcom ENVIRONMENTAL

Plot 16E Cross Section
SWMU-55

SHELL PSR

7/17/17

Figure C-5



Sample Type

- Composite
- Confirmation
- Test Pits

Soil Type

- Waste Residual Soil
- Presumed Native Soil

All data are approximate and should be used as relative location reference only.

0 10 20 40 60 80 100 120 Feet

1 inch = 60 feet

Prepared by:

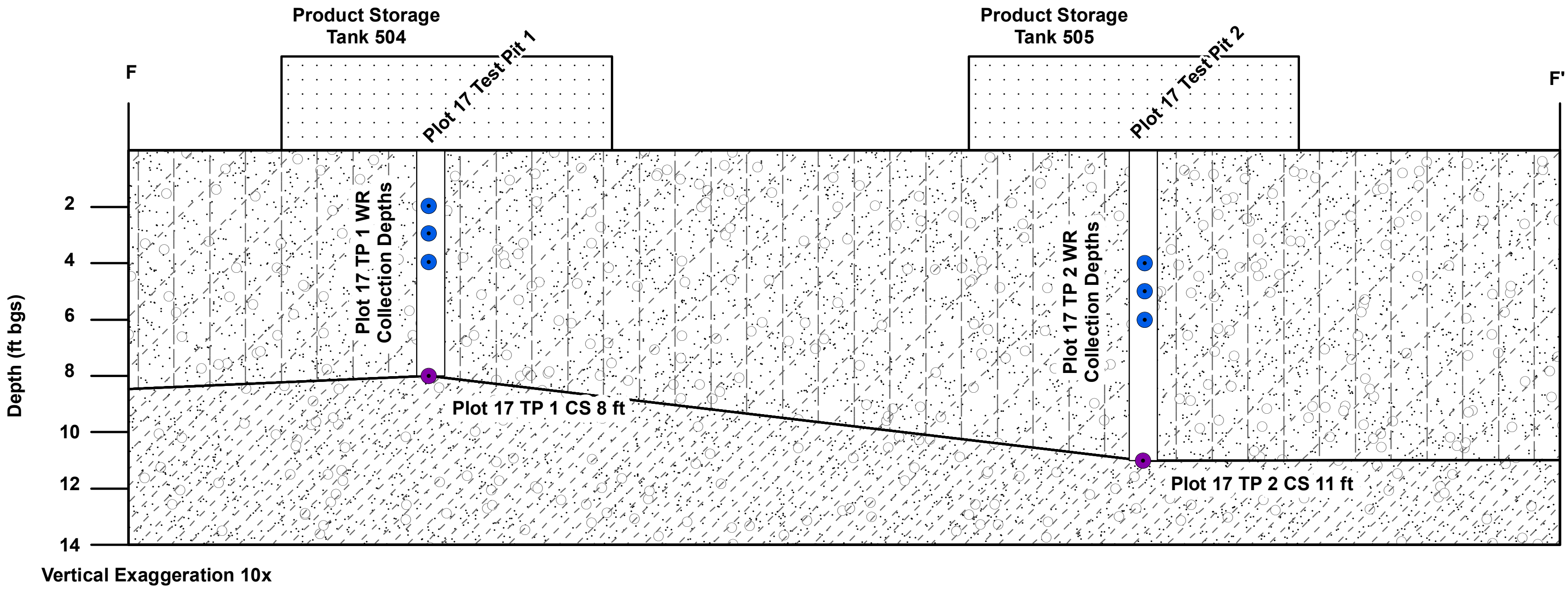
whatcom ENVIRONMENTAL

Plot 16W Cross Section SWMU-55

SHELL PSR

7/17/17

Figure C-6



Sample Type

- Composite
- Confirmation
- Test Pits
- Proposed Tanks

Soil Type

- Waste Residual Soil
- Presumed Native Soil

All data are approximate and should be used as relative location reference only.

0 10 20 40 60 80 100 120 Feet

1 inch = 60 feet

Prepared by:

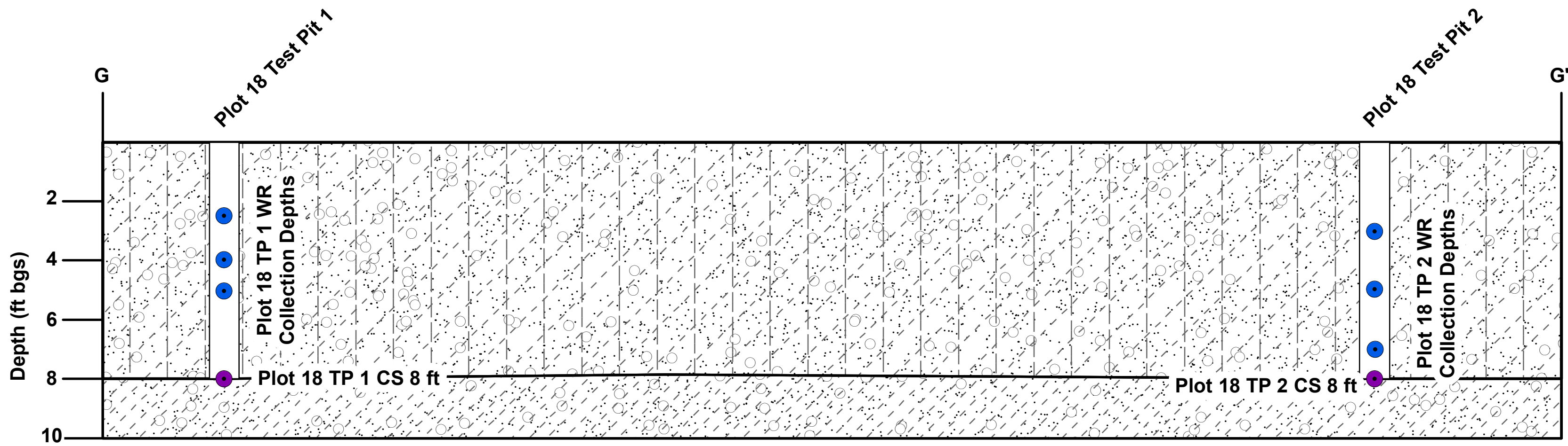
whatcom ENVIRONMENTAL

Plot 17 Cross Section
SWMU-55

SHELL
PSR

7/17/17

Figure C-7



Vertical Exaggeration 10x

Sample Type

- Composite
- Confirmation
- Test Pits

Soil Type

- Waste Residual Soil
- Presumed Native Soil

All data are approximate and should be used as relative location reference only.

0 10 20 40 60 80 100 120 Feet

1 inch = 60 feet

Prepared by:

whatcom ENVIRONMENTAL

Plot 18 Cross Section SWMU 55

SHELL PSR

7/17/17

Figure C-8

APPENDIX B

Geotechnical Report

RP&S NEW CRUDE TANK AND PRODUCT TANKS PROJECTS (TANKS 503, 504, AND 505)

SHELL PUGET SOUND REFINERY ANACORTES, WASHINGTON

REPORT OF GEOTECHNICAL INVESTIGATION

Prepared for

Shell Puget Sound Refinery
8505 South Texas Road
Anacortes, Washington 98221-9340

October 12, 2017

AECOM

AECOM

AECOM
1111 3rd Avenue, Suite 1600
Seattle, WA 98101
www.aecom.com

October 12, 2017

Mr. Gene Akiaten
US16 PSnd Refinery Materials & Services
EQUILON ENTERPRISES LLC
Shell Puget Sound Refinery
8505 South Texas Road
Anacortes, Washington 98221-9340

Report of Geotechnical Investigation
RP&S New Crude Tank and Product Tanks
Projects (Tanks 503, 504, and 505)
Shell Puget Sound Refinery
Anacortes, Washington
AECOM Job No. 60544813
Shell Project No. USMF/03356
Shell Purchase Order No. 4522318816

Dear Mr. Akiaten:

AECOM (formerly URS Corporation) is pleased to submit herewith our Report of Geotechnical Investigation for the RP&S New Crude Tank and Product Tanks Projects at the Shell Puget Sound Refinery in Anacortes, Washington. Services provided on this project were performed in general accordance with the AECOM proposals dated May 11 and May 30, 2016, and were authorized by Equilon Enterprises LLC Purchase Order No. 4522318816 dated May 15, 2017, issued under the Local Agreement DS59042 between Shell Oil Products US LLC and AECOM Technical Services Inc. dated October 1, 2015.

We thank you for the opportunity to be of service on this project, and appreciate continuing to provide services at the Shell Refinery. Please call if questions should arise or additional information is required.

Sincerely,

AECOM

MARKUS WALBAUM
STATE OF WASHINGTON
44861
REGISTERED PROFESSIONAL ENGINEER
10/12/2017

Markus Walbaum

Markus Walbaum, PE
Senior Geotechnical Engineer

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TANKS 503, 504, AND 505
SHELL PUGET SOUND REFINERY, ANACORTES, WASHINGTON

1.0 INTRODUCTION

This report presents the results of the AECOM geotechnical investigation for the proposed RP&S New Crude Tank and Product Tank Projects (Project, Site) at the Shell Puget Sound Refinery (Refinery) in Anacortes, Washington. The report addresses the current understanding of subsurface conditions at the Site, and provides recommendations for site development, foundation design, and construction of the proposed facilities. The scope of services for this Project was identified in the AECOM baseline and Addendum #1 proposals for geotechnical services dated May 11, 2017 and May 30, 2017, respectively.

Although the Crude Tank Project and the Product Tanks Project are separate Shell projects, they are being considered as one project in this report in order to simplify discussion. The Product Tanks are also identified herein as the Product Storage Tanks. The Crude Tank will be used to store crude oil and the Product Tanks will be used to store diesel fuel and gasoline.

2.0 BACKGROUND INFORMATION

A Site Location Map is presented as Figure 1 of this report, and a Site Plan is shown in Figure 2. The purpose of the Project is to construct new storage tanks for crude oil and refinery products and to provide pipe and electrical duct bank connections to other tanks and facilities within the Refinery. The tanks and the primary facilities associated with them will be constructed within the southern half of the current West Land Treatment Farm (West Landfarm). Additional facilities will be constructed south and east of the West Landfarm. The proposed tanks and facilities include (see Figures 2 and 3) the following based on plans and information provided by the Project designer Anvil Corporation (Anvil):

- One new 190-foot-diameter by 72-foot-tall Crude Tank (Tank 503 [TK-503]) with a nominal capacity of 335,000-barrels (BBL), a design/hydrotest weight of 122,500 kips, and an operating weight of 102,000 kips. The base of this tank will be constructed at Elevation 174 feet, which is about 3 to 5 feet below existing grades, and the foundation is expected to consist of a cast-in-place concrete ringwall foundation with a width of approximately 4 feet and a thickness of about 4 feet. The static gross loads imposed on the ground by the tank will be 4,270 pounds per square foot (psf) under hydrostatic testing conditions, and 3,650 psf under operating conditions with a normal operating tank fluid level of 66 feet, and a maximum fill level of 68 feet. The ringwall load is approximately 3,500 psf, which includes the tributary liquid load. The tank will have a floating roof.

- Two 134-foot-diameter by 44-foot-tall Product Storage Tanks (Tanks 504 and 505 [TK-504 and TK-505]) with a nominal capacity of 100,000 BBL, a design/hydrotest weight of 36,000 kips, and an operating weight of 31,800 kips. These tanks will be constructed about 400 feet west of the Crude Tank. The base of Tank 504 will be constructed at Elevation 158 and the base of Tank 505 will be constructed at Elevation 153; these elevations range from about 0 to 7 feet below existing grades. The foundations for both tanks are expected to consist of cast-in-place concrete ringwall foundations with a width of approximately 3 feet and a thickness of about 4 feet. Static gross loads imposed on the ground by the tanks will be 2,520 pounds per square foot (psf) under hydrostatic testing conditions, and 2,270 psf under operating conditions with a maximum tank content fluid level of 40 feet. The ringwall load is approximately 2,700 for the diesel tank and

2,800 psf for the gasoline tank; these loads include the tributary liquid load. The gasoline product tank will have a floating roof whereas the diesel tank will have a fixed cone roof.

- Soil berms (bunds) will be constructed around the Crude Tank and Product Storage Tanks to create a containment area (bunded area) for liquids that could potentially leak from the tanks. The berms will be constructed with fills up to about 28 feet thick, which will exert a corresponding vertical ground pressure of up to about 3,700 psf. The berms and bottom of the containment area are expected to consist of or be constructed with low-permeability soils, with a portion of the soils imported from the existing Clean Soils Pile near the northeast corner of the Refinery (refer to Figure 1 for the location of the Clean Soils Pile). If necessary, the entire containment area will be lined with a geosynthetic membrane (geomembrane) to contain tank leakage. Anvil's information indicates that about 38,000 cubic yards (CY) of net fill will be required for constructing the berms. The overall containment area footprint measures approximately 770 feet by 530 feet (9.4 acres).

- Pipe and/or cable tray supports will be constructed within the Crude and Product Tanks containment areas. In addition, offsite pipeways will extend east of the Crude Tank containment area to existing Tank TK-1 located approximately 250 feet east of "B" Street, and south of the Product Tanks containment area to about 500 feet south of 8th Street. Figure 3 shows the pipeway extending south from the proposed Product Storage Tanks area to the vicinity of existing Tanks TK-55, TK-56, and TK-57. The pipeway from the Crude Tank east to the south side of existing Tank TK-1 is not shown in Figures 2 or 3. The pipeways are expected to be supported on shallow drilled concrete piers (drilled shafts), similar to typical past pipeway construction at the Refinery. Anticipated pier axial service loads for the pipeway supports range from 7 to 12 kips, with cable tray loads somewhat lower. Pier lateral loads have not been provided.

- The pipeway from the Product Storage Tanks will cross 8th Street underground in a casing, via underground vaults having an up to 8-foot by 20-foot footprint constructed on either side of 8th Street. The larger vault on the north side of 8th Street will impose a load of approximately 96 kips (for the structure only) on its 8-foot by 20-foot footprint. A smaller vault will also be constructed east of the Crude Tank for the crossing under "B" Street. The vaults will be constructed at the toe of the slopes of the adjacent containment berms as shown in Figure 2.

- Vapor recovery equipment, including two pieces of equipment plus a vapor recovery skid, will be constructed on an approximately 20-foot by 40-foot rectangular concrete mat foundation between the two Product Tanks. The total weight of the equipment will be about 80 kips.

- Several pieces of electrical equipment are anticipated to be installed adjacent to the north edge of 8th Street near the southwest corner of the Crude Tank containment area. Information on the size or weight of the equipment was not available at the time of this investigation; however, we anticipate the equipment will be installed on a concrete mat foundation.

- Several access platforms will be constructed west of the Product Tanks, and these are expected to be supported on shallow foundations (footprint of 4 feet by 8 feet) or drilled piers. The load on these foundations will include a dead load of 17 kips (structure plus footing), and a live load of 6 kips Also, stair stiles will be constructed over the berms for emergency egress; the stile locations are shown in Figure 2.

Elevations referenced in this report, which are based on a January 2017 laser scan by Anvil, are referenced to the Refinery survey markers at the intersection of "A" Street and 8th Street and "B" Street and 8th Street. Location coordinates are referenced to the north-south and east-west baselines origin, which is located about 30 feet north and 30 feet east of the intersection of 4th Street and "C" Street. The baselines origin has the coordinate N 10,000/ E 10,000.

3.0 SCOPE OF SERVICES

The scope of services for this Project was identified in the AECOM baseline and Addendum #1 proposals for geotechnical services dated May 11, 2017 and May 30, 2017, respectively, which incorporated the requirements and expectations of the geotechnical SOW document by Anvil as identified above. The scope included the following:

1. Task 1 – Field Exploration Program: Engaged drilling subcontractor Environmental Drilling Inc. (EDI) to drill new borings using primarily a truck-mounted hollow stem auger rig. AECOM drilled eight new borings, including three up to 50 feet below existing ground surface (bgs) and five others to about 30 feet bgs. One groundwater monitoring well was installed to a depth of 30 feet bgs. During drilling, samples for subsequent laboratory testing were collected using standard penetration tests, and one sample of potentially higher compressibility clayey soils was obtained using a Shelby tube. Soil samples were screened in the field for soil contamination using an organic vapor meter having a photoionization detector (PID).

   In addition to the drilling program, four test pits were also excavated across the footprint of the Project area to further evaluate the nature of the existing fill soils and to collect samples for laboratory testing. Shell's on-call contractor WRS excavated the test pits to depths of up to 9 feet using a backhoe.

2. Task 2 – Laboratory Testing Program: Performed tests related to physical, chemical and engineering characteristics of selected soil samples from the borings and test pits. The tests included soil moisture content, grain size distribution, and liquid and plastic limits (i.e., Atterberg limits). Tests for corrosivity parameters including pH, conductivity (resistivity), chloride, and sulfate content were performed by AECOM subcontractor Fremont Analytical, Inc.

3. Task 3 – Technical Analyses and Preparation of Reports: Used the results of the new borings, test pits, and laboratory tests together with the results of previous explorations and laboratory testing to assess soil profiles and establish design parameters for use in preparing recommendations for foundation design and construction. A table of recommended geotechnical design parameters was prepared, seismic design parameters were developed and the potential for adverse performance of ground subject to seismic shaking was evaluated, and allowable bearing pressures and estimated settlements for the storage tanks and shallow foundations for equipment were developed. For shallow drilled pier (pile) foundations, anticipated downward and uplift loads versus depth of embedment figures were prepared, and LPILE software was used to evaluate the performance of piers under lateral loading. We also evaluated the collected data to develop recommendation for the containment berms and on-site gravel roads, and to address earthwork issues such as foundation subgrade preparation measures and compaction requirements for fill placement.

   This report has been prepared which presents the results of field explorations, laboratory testing, and technical analyses, and provides recommendations for the design and construction of foundations, earthfill containment berms, and gravel roads.

4.0 GEOLOGIC SETTING

Published information by Dragovich et al. (2000) and Dragovich et al. (2002) on the geologic setting for this area indicates that the Site is occupied at the ground surface primarily by the geologic unit identified as "Artificial fill (af)." The larger scale geologic map in Dragovich et al. (2002) shows the Site occupied by the similarly-designated unit "Modified Land (Qml)," and describes this unit as consisting of controlled (engineered) and uncontrolled fill. Also mapped in the vicinity of the Site are three glacially-deposited Pleistocene geologic units including Everson Interstade "$Qgdm_e$ Glaciomarine drift," Everson Interstade "$Qgom_e$ Glaciomarine outwash," and Vashon Stade "Qgt_v Till." (Note: The term "interstade "refers to a period of temporary retreat during a glacial stage, generally during a warming period. The term "stade" refers to a short period of time (less than 10,000 years) characterized by climatic conditions associated with maximum glacial extent.

The Glaciomarine drift consists of low-density deposits (loose or soft) of clayey silt, silt, silty clay, clay and clay-rich diamicton, locally containing lenses and layers of sandy or gravelly outwash. The Glaciomarine outwash consists of low-density deposits of sand, sandy gravel, and gravel with minor interlayered silt and silty sand, and is locally interlayered with glaciomarine drift. The drift and outwash deposits are underlain by the moderate- to high-density (compact, hard or stiff) Till, which is nonstratified diamicton consisting of clay, silt, sand, and gravel in various proportions, with scattered cobbles and boulders, and containing rare lenses of sand or gravel. The soil conditions encountered at the Site are generally consistent with the published information; however, most of the native soils deposits were typically very stiff or very dense, i.e., low-density deposits were not encountered.

5.0 SITE AND SUBSURFACE CONDITIONS

5.1 SITE DESCRIPTION

The Site is located in the northwest portion of the Refinery and, with the exception of the Offsite Pipeways, is bounded by "A" Street to the west, "B" Street to the east, 8th Street to the south, and an access road to the north that bisects the West Landfarm. "A" Street is surfaced with gravel, and "B" Street and 8th Street are asphalt paved. Information available in the AECOM files for previous explorations in the vicinity of the Project indicates that one previous geotechnical investigation that included the Site area was conducted by Dames & Moore (D&M) in 1957. That investigation included the drilling of three borings (B-28-57, B-29-57, and B-30-57) to depths of 46 and 54 feet within approximately 230 to 630 feet of the center of the proposed Crude Tank. These borings were drilled before the West Landfarm was constructed and filled to current grades. The amount of fill placed was estimated at 5 to 15 feet based on comparison of the 2017 and 1957 topography. In addition to the D&M geotechnical investigation, several hydrogeologic investigations were conducted by D&M and Landau Associates (Landau) for the West Landfarm and the East Landfarm during the period from 1981 to 1989.

5.2 SURFACE

The surface cover at the Site consists mostly of brown cohesive silty clay fill within the "cells" of the Landfarm, and gray granular crushed rocks, gravel and silty sand fill at the existing access roads that separate the Landfarm cells. The ground surface is gently sloped from north to south, and terraced from east to west where several 5- to 8-foot-high steep slopes separate the cells. Preliminary site plans provided by Anvil, which show topographic contours based on a January 2017 LiDAR scan, show that the ground surface elevations range from about Elevations 170 to 181 feet along the east boundary of the Site, to 143 to 153 feet along the west boundary of the Site.

5.3 SUBSURFACE SOILS

Subsurface conditions were investigated by drilling eight borings, RPS-1-17 through RPS-8-17, to depths of 31.5 to 51.5 feet, and excavating four test pits, TP-1-17 through TP-4-17, to depths of 7 to 9 feet below ground surface (bgs) at the locations shown in Figure 2. A description of the exploration program as well as the logs of the borings and test pits are presented in Appendix A. Additional information on the subsurface conditions was obtained by reviewing the results of previous exploration programs that have been conducted at the Site by Dames & Moore and URS (both now AECOM), and Landau Associates. The following reports from the geotechnical investigations at or near the Site were reviewed:

1. Dames & Moore (1957a). Report of Preliminary Foundation Investigation – Part I, Proposed Northwest Refinery, Anacortes, Washington, prepared for Texaco, Inc., URS/Dames & Moore File 68-AN Part I, February 14.

2. Dames & Moore (1980). Consultation Services, Proposed Oil Tanks, Puget Sound Works, Anacortes, Washington, for Texas Inc.," prepared for The Rust Engineering Co., URS/Dames & Moore File 68-191-04, May 15. (Note: Preceded by December 12, 1980 letter report entitled "Settlement Estimates" in same bound document.) This report includes recommendations for two tanks that were previously proposed, but not built, at the RP&S Site.

3. Dames & Moore (1981). Report of Geotechnical Investigation, Proposed MTBE Storage Tank, Puget Sound Plant, Anacortes, Washington," prepared for Texaco Refining and Marketing, Inc., Job No. 00068-372-016, August 29. This report addresses existing Tanks No. 38 and 39 located southeast of the proposed Crude Tank.

4. Dames & Moore (1981). Report of As-Built Conditions, Ground Water Monitoring Wells and Lysimeters, Texaco March Point Refinery, Anacortes, Washington, for Texaco, Inc., Dames & Moore File 00068-200-05, November 18. (Note: Preceded by November 19, 1981 letter report entitled "Outline of Water Quality Assessment Program" in same bound document.)

5. Landau Associates (1988). Final Report, Hydrogeologic Investigation, Texaco Puget Sound Plant, prepared for Texaco Refining and Marketing, Inc., Anacortes, Washington, June 17.

6. Landau Associates (1989). Final Report, Hydrogeologic Investigation, Texaco Puget Sound Plant, Jan. – Feb. 1989, prepared for Texaco Refining and Marketing, Inc., March 3.

7. URS Corporation (2014). Report of Geotechnical Investigation, Crude Rail Unloading Facility East, Shell Puget Sound Refinery, prepared for Anvil Corp., URS Project No. 33764104, April 28. This report includes geotechnical information for the soils at the Clean Soils Pile.

8. AECOM (2016). Geotechnical Report, Unit 20 Tank Farm – PLT Project, Shell Refinery, Anacortes, Washington, prepared for Shell Puget Sound Refinery, AECOM Project No. 60513864, August 5.

The locations of the applicable borings drilled and a test pit excavated during these prior investigations are shown in Figures 2 and 3. The logs of the previous borings and test pit are presented in Appendices B.1 through B.6. The results from laboratory testing on samples from some of these borings, which were used in developing the design parameters provided in this report, are provided in these appendices also.

The generalized soil profile encountered in the current and previous borings in the vicinity of the Site consists of about 5 to 15 feet of silty clay to silty sand fill, over 4 to 12 feet of native very stiff to hard lean clay, underlain by 12 to 22 feet of dense to very dense sand to silty sand, overlying very stiff to hard silt to clay at depths beginning at roughly 25 to 35 feet bgs. The clayey/silty soil strata, especially the cohesive fill, are compressible. Figure 4 shows two estimated subsurface profiles through the Site. Additional soil profiles, as prepared for the 1988 hydrogeologic investigation report for the Texaco Puget Sound Plant Project by Landau Associates, Inc., are included in Appendix B.4 (Figures 3-3 and 3-5); the approximate proposed tank locations and elevations have been added to Figure 3-5 in the appendix. The locations of the current and historic profile lines are shown in Figures 2 and 3.

Review of the aforementioned historic reports for the Site and comparison of ground surface contour plans from 1957 and 2017 show that approximately 5 to 15 feet of fill was placed since the Refinery was established.

A more detailed discussion of the soil layers encountered, starting at the surface and progressing downward is, presented below. The soil layers have been numbered to simplify future references to them throughout the report:

Stratum 1a: Cohesive Fill – Silty Clay

About 5 to 9 feet of this fill was encountered in most of the current and previous borings, but it is estimated to be up to about 15 feet thick across the Site based on comparison between the existing grade and interpolated depths to the top of the underlying Stratum 2. The 2017 AECOM borings show most of this layer consists of brown to gray, stiff to very stiff, dry to moist silty lean clay or silt, with standard penetration test (SPT) N-values of 8 to 18 blows per foot (bpf). Approximate soil strength measured in the field with "pocket" penetrometer testing (PP on the boring logs) indicated that the undrained shear strength of the Cohesive Fill mostly ranges from 2,000 to 4,500 psf, corresponding to a stiff to very stiff consistency. Occasionally, pocket penetrometer testing indicated undrained shear strengths of 500 to 750 psf, i.e., medium stiff consistency, such as in Borings RPS-6-17 and RPS-7-17 at Tanks 504 and 505.

Stratum 1b: Granular Fill – Silty Sand

At the northeast corner of the Site near Boring RPS-3-17, and in the southwest area near Borings RPS-5-17 and RPS-8-17, about 5 to 10 feet of fill comprising silty fine to medium sand to sandy silt was encountered. This layer is usually brown to orange, moist, and medium dense; occasionally it is loose such as near the top of the layer in Boring RPS-8-17. The SPT N-values of this layer ranged from 6 to 24 bpf.

Inside the Site, the approximately upper 1 foot of the fill along the north-south access roads consists of crushed rocks (cobbles) and coarse gravel, which is typically gray to light gray, dry, and dense.

Stratum 2: Brown to Brownish Gray Stiff to Hard Silty Clay

This competent fine-grained soil, which can contain a trace of gravel and occasional pockets of sand, is frequently used for shallow foundation support in the Refinery. At this Site the top of the stratum ranges from about 5 to 15 feet bgs. The layer is typically 5 to 12 feet thick, with the thickness increasing from east to west, but was found absent in Boring RPS-3-17. In general, the SPT N-values recorded for this layer during drilling of the current borings generally ranged from 9 to 35; N-values in the historic borings were similar with N-values to 31 bpf. Approximate soil strength measured with pocket penetrometer testing indicated that the undrained shear strength ranges from 2,000 to 4,000 psf.

In the East Offsite Pipeway and South Offsite Pipeway areas, the available historic subsurface information shows that this clay deposit is present at thicknesses of approximately 10 to 30 feet, beginning from ground surface to several feet below ground surface (refer to Borings B-28-57 and

B-29-57 in Appendix B.1, Boring L-6 in Appendix B.3, Geologic Cross-Sections B-B' and D-D' in Appendix B.4, and Test Pit TP-1-16 and Figure 3 - Idealized Soil Profile – Unit 20 in Appendix B.6.)

Stratum 3: Brown to Gray Dense to Very Dense Silty Sand to Sand

This layer of dense to very dense silty fine to medium sand to poorly-graded fine to medium sand with silt, occasionally with thin layers of very stiff to hard silt, was encountered below the stiff to hard silty clay layers in all of the current and previous borings at the Site. The top of the deposit was encountered at depth about 10 to 20 feet bgs in the current borings with thickness ranging from about 12 to greater than 22 feet. Borings RPS-5-17, RPS-7-17, and RPS-8-17 did not fully penetrate this layer. The SPT N-values varied from 31 to greater than 50 bpf in the previous and current borings, but two instances of N-values of 22 and 28 corresponding to medium dense soil were also encountered in Boring RPS-4-17.

Stratum 4: Gray Very Stiff to Hard Silty Clay to Silt

This layer of very stiff to hard silty clay to silt was encountered below the dense to very dense sand layers in all of the current and previous borings at the Site except in Borings RPS-5-17, RPS-7-17, and RPS-8-17, which did not extend deep enough to encounter it. The top of the deposit was encountered at depths ranging about 25 to 35 feet bgs. The SPT N-values were mostly greater than 50 bpf, though one instance of 44 bpf was encountered in Boring RPS-4-17. Approximate soil strength measured with pocket penetrometer testing indicated that the undrained shear strength is typically greater than 3,000 to 4,000 psf.

5.4 GROUNDWATER

During the current field investigation, groundwater was encountered at depths ranging from 18 to 35 feet bgs near the bottom of the Stratum 3 sand layer in Borings RPS-1-17 through RPS-4-17 and RPS-6-17. In the monitoring well installed in Boring RPS-3-17 (PZ), groundwater was observed at 12.5 feet bgs after two days stabilization time. Groundwater measurements are summarized in Table A.1 in Appendix A.

In Appendix B.4, Figure 6 from the 1989 Hydrogeologic Investigation Report for Texaco Puget Sound Plant by Landau Associates presents groundwater surface contours across the Site for Hydrogeologic Zone W-3, which is the "Upper Water-Bearing Zone." The contours show groundwater levels ranging from Elevations 150 to 166 feet across the footprint of the proposed Crude Tank, to Elevations 100 to 130 feet in the vicinity of the proposed Product Tanks. The groundwater levels measured in the borings and monitoring well are generally consistent with the groundwater contours.

It should be noted that current groundwater elevations could be different from historic levels due to fill placement and other site activities since the 1988/1989 hydrogeologic studies. Groundwater elevations can also be affected by local perching conditions, and are expected to vary seasonally due to precipitation and temperature changes.

6.0 FIELD AND LABORATORY TESTING

During previous projects, tests have been performed in the field and laboratory to measure the consolidation properties, shear strength, unit weight, and moisture content of the fill and of the native soils. The shear strength, unit weight, and moisture content results are shown on the boring logs in Appendix B, and the laboratory test results are also included in Appendix B. The previous testing was supplemented by site-specific testing at the RP&S Tanks Site and the Clean Soils Pile as described below.

6.1 RP&S Crude Tank and Product Storage Tanks Site

Tests performed in the field included the aforementioned pocket penetrometer test to measure the unconfined compressive strength of fine-grained soils (silt and clay), and petroleum hydrocarbon screening using an organic vapor meter with a photoionization detector (OVM/PID). The results of these tests are reported on the boring logs (Appendix A) at the depth of the measurement.

The pocket penetrometer tests indicated that the undrained shear strength of the native clay layers ranges from 2,000 to 4,000 psf in Stratum 2 to greater than 3,000 to 4,000 psf in Stratum 4 as described above.

The PID measurements ranged from 0 to 75 parts per million (ppm) for samples within depths of 30 feet bgs but were generally below 14 ppm in most borings and test pits. The highest measurement of 149 ppm was encountered in Boring RPS-3-17, but this and the rest of the readings in this boring plus readings in the top nine feet of Boring RPS-4-17 are considered unreliable due to PID calibration issues at the time of those readings. Some fill soil samples did exhibit obvious soil staining or odors that would indicate potential petroleum contamination.

AECOM performed laboratory testing including 23 water content determinations, five grain size distribution analyses, and four Atterberg Limits tests on selected soil samples from the borings. The results are included in Appendix C and summarized in Table C.1. In addition, AECOM submitted a total of two selected samples of fill soils from depths of 5.5 feet and 1.5 feet in Boring RPS-2-17 and Test Pit TP-4-17, respectively, to Fremont Analytical, Inc. of Seattle, Washington for assessing the corrosion potential of the soils. The samples were analyzed for water content, pH, specific conductance (for resistivity), chloride content, and sulfate content. The results of these tests are summarized in Table 4 and the full laboratory report is included in Appendix D.

6.2 Clean Soils Pile (CSP)

During the geotechnical investigation for the Crude Rail Unloading Facility Project in 2014 (URS 2014), the moisture content of 23 soil samples selected from five borings (U-22-14 through U-26-14) drilled at the CSP was determined as part of analytical testing for the presence of environmental contamination. The results of those tests are included in Table C.2 of Appendix C. In addition, during the current RP&S Tanks investigation, three gradation analyses and two Atterberg Limits tests were performed on five soil samples collected in 2013 from Borings U-16-13, U-17-13, and U-18-13. Figure B.5.1 in Appendix B.5 shows the locations of the borings in the CSP from which the samples tested were obtained.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the subsurface conditions encountered at the Site, the proposed Crude and Product Storage Tanks, including the tank shell, may be supported on a shallow foundation system, with some overexcavation and replacement of the Stratum 1a cohesive soils at certain ringwall locations. Structures including vapor recovery equipment, electrical equipment, access platforms, stair stiles, and underground pipe vaults at roadway crossings may also be supported on shallow foundations. Above-ground pipeways and cable trays may be supported on shallow foundations, or on intermediate depth drilled piers (shafts) if overturning loads make shallow foundations impractical. The proposed containment berms may be constructed with compacted clay soils with the sideslopes having inclinations as steep as 1.5 Horizontal to 1 Vertical (1.5H:1V). The gravel access roads may be constructed with aggregate base and surfacing courses placed on the existing cohesive or granular fill soils, or on the underlying native clay; a separation geotextile should be placed between the subgrade and aggregate base. Apart from site grading to meet design elevations and the aforementioned ringwall area overexcavation and replacement, extensive subgrade preparation is not expected to be required, and may only need to consist of localized excavation of soft and wet soils, which will be more prevalent if construction occurs during the fall through spring rainy season. The greatest amount of earthwork is expected to be associated with construction of the containment berms given the large volumes and the relatively high moisture content of the soils that must be handled. Drying of these soils is expected to be required in order to place and compact them to the required density; this is likely to be problematic if done during the rainy season.

Specific recommendations for design and construction of the foundations and facilities described above are present below. Table 1 at the end of the text of this report presents recommended soil parameters for design.

7.1 SEISMIC CONSIDERATIONS

7.1.1 Regional Seismic Setting

The Puget Sound area is located in a high seismicity region in the western U.S. The regional ground-motion hazard is governed by the following:

- Great magnitude ($M > 8$) earthquakes on the interplate portion of the Cascadia Subduction Zone (CSZ);
- Large magnitude ($6 < M < 7.5$) earthquakes on the intraplate portion of the CSZ, at depths ranging between approximately 40 km and 90 km; and
- Moderate to large magnitude shallow crustal earthquakes, including those events capable of occurring in known active faults, such as the Seattle and South Whidbey Island faults.

The Holocene-active (last 10,000 years) fault closest to the Site is the Darrington-Devils Mountain (DDM) Fault Zone (Barnett et al. 2010; Dragovich 2007; USGS 2006) located south of the March’s Point peninsula. Geologic evidence suggests this fault extends from Vancouver, British Columbia east through the northern end of Whidbey Island to the Darrington, Washington area. Trench studies of scarps located along the DDM Fault indicate that Holocene faulting generated these scarps (Personius et al. 2009). The closest lineament or projected fault trace is located approximately 10 miles south of the Project Site. Thus, based on the available information, there is not a potential for ground-surface rupture at the proposed Site due to a major earthquake on the DDM fault zone.

Aside from the proximity of the DDM fault zone, the potential for other geologic hazards impacting the Site, such as landslides, liquefaction and lateral spreading, and subsidence, is considered negligible or non-existent due to the relatively flat topography and the combination of stiff/dense and/or cohesive soils. The planned grading for the Project will not result in slopes that are significantly different from the relatively flat grades that currently exist at the Site.

7.1.2 IBC- ASCE/SEI Seismic Design Parameters

The seismic design parameters, in accordance with the general procedure in the 2015 International Building Code (IBC)(ICC 2015), were evaluated as described in Section 1613.3 of the IBC. (Note: See paragraph at the end of this section regarding code update and impact to ground motions.) The spectral response accelerations, S_S and S_1, for the "risk-targeted Maximum Considered Earthquake – (MCE_R)" were obtained from the U.S. Geological Survey earthquake hazards website (USGS 2017). The MCE_R values for the Site (Latitude 48.47624 degrees north and Longitude 122.56395 degrees west) for Site Class D – Stiff Soil and a 2,475-yr return period are:

$S_S = 1.106$ g (short period, or 0.2 second spectral response)

$S_1 = 0.435$ g (long period, or 1.0 second spectral response)

(where "g" is the acceleration due to gravity)

The Site Class is selected using the definitions in Chapter 20 of American Society of Civil Engineers Standard ASCE/SEI 7-10 (ASCE 2010) considering the average properties of soils (SPT N-Values) in the upper 100 feet of the soil profile at the Site, which corresponds to Site Class D ("Stiff Soil") in Table 20.3-1 of ASCE/SEI 7-10.

The site coefficient values, obtained from Section 1613.3.3 of the 2015 IBC, are used to adjust the mapped spectral response acceleration values to get the adjusted spectral response acceleration values for the Site. The recommended Site Coefficient values for Site Class D are:

$F_a = 1.058$ (short period, or 0.2 second spectral response)

$F_v = 1.565$ (1.0 second spectral response)

The MCE_R spectral response acceleration parameters adjusted for Site Class effects are:

$S_{MS} = F_a \times S_S = 1.058 \times 1.106 = 1.170$ g

$S_{M1} = F_v \times S_1 = 1.565 \times 0.435 = 0.681$ g

The design earthquake ground motions are 2/3 of the maximum considered ground motions:

$S_{DS} = 2/3 \times S_{MS} = 2/3 \times 1.170$ g $= 0.780$ g

$S_{D1} = 2/3 \times S_{M1} = 2/3 \times 0.681$ g $= 0.454$ g

The horizontal peak ground acceleration (PGA) for Site Class D, in accordance with ASCE 7-10 Section 11.8.3, is $PGA_M = F_{PGA} \times PGA$ (2,475-year):

PGA = 0.4632 (Site Class B Rock)

$PGA_M = 1.0368 \times 0.4632 = 0.480$ g (Site Class D Stiff Soil)

Shell and the structural engineer should be aware that ASCE/SEI Standard 7-16 (ASCE 2017) is available. The updated standard made some revisions to the ground-motion provisions (Chapter 11) in ASCE 7-10, but typically these revisions do not result in ground motions that differ from the ground motion derived from ASCE 7-10/ IBC 2015 by more than 10 percent. Although IBC 2018, which will be based on the updated guidance in ASCE 7-16, will not be published until fall of 2017, Shell should consider whether to use ASCE 7-16 in advance of the IBC 2018 in order to further reduce potential risks to proposed structures and site personnel resulting from earthquake events.

7.2 CRUDE AND PRODUCT STORAGE TANKS

Shallow foundations, consisting of at-grade support for the tanks and concrete perimeter ringwalls are recommended for supporting Crude Tank 503 and the two Product Tanks 504 and 505. As described below, overexcavation and replacement of a portion of the stiff but still compressible Stratum 1a cohesive fill below the two Product Tank ringwalls is recommended to help control settlements that could lead to excessive tank and ringwall stresses. The dimensions and ground loading details of the tanks are described in Section 2.0. Tank 503 will apply a maximum gross load of about 4,300 psf across the tank bottom under hydrostatic testing conditions, and a load of about 3,500 psf under the ringwall. Tanks 504 and 505 will apply a maximum gross load of about 2,500 psf across the tank bottom during hydrostatic testing, and loads of about 2,700 psf and 2,800 psf under the diesel tank and gasoline tank ringwalls, respectively. The ringwalls are expected to measure approximately 4 feet wide by 4 feet thick and extend about 3 feet below finish grade.

Given the competent nature and shear strengths of most of the foundation soils below the proposed subgrade levels, including the stiff Stratum 1a cohesive fill (silty clay), the stiff to hard Stratum 2 silty clay, and the dense to very dense Stratum 3, AECOM recommends that a static Allowable Stress Design (ASD) net allowable bearing pressures of up to 4,300 psf be permitted for the Crude Tank and its ringwall, and an allowable bearing pressure of 3,000 psf be permitted for the two Product Tanks and their ringwalls. The 4,300 psf bearing pressure may also be adopted for the medium dense Stratum 1b silty sand (granular fill) in the northern portion of the Crude Tank provided additional densification is provided during subgrade preparation as described in Section 7.10. The bearing pressures for the respective tanks may also be used for Stratum 2, where it is expected to be present at the tank and ringwall bearing elevations in portions of the three tanks (refer to Figure 4 of this report and Cross Section D-D' in Appendix B.4). The allowable bearing pressure may be increased by one-third for transient loads from wind or seismic sources.

A minimum foundation embedment depth of 1.5 feet should be used for frost protection. The prepared tank base subgrade should be covered with a minimum 10-inch-thick blanket of compacted 3/4-inch minus crushed rock. This material will help reduce settlements, act as a protective blanket for the subgrade during construction, and form a capillary break to provide drainage for condensation which might form at the bottom of the tanks. The blanket should be provided with a small crown of approximately 2 inches to compensate for the expected greater settlement of the center of the tank in relation to the perimeter. This crown will also help shed water during construction. The blanket should be topped with 2 inches of sand bitumen mix for corrosion control to complete the tank pad. See Section 7.10 for additional earthwork recommendations for tank foundation.

The most recent borings and test pits by AECOM (RPS-1-17 to RPS-8-17 and TP-1-17 to TP-4-17) indicate the soil profile beneath the Product Storage Tanks are similar, with settlement likely controlled by the Stratum 1a cohesive fill and Stratum 2 silty clay. The profile for the Crude Tank includes a thinner and less variable thickness of Stratum 1a cohesive fill and only limited amounts of Stratum 2 silty clay, but does include a substantial thickness of Stratum 1b loose to medium dense granular fill that will need additional densification as described in Section 7.10. The estimated long-term settlement of the tanks, assuming the existing soils below the bottom of the tanks remain in place, are summarized in Table 2:

Table 2 – Estimated Tank Settlements

Tank No.	Tank Diameter (feet)	Tank Base Elev. (feet) & Thickness of Stratum 1a/1b Below Base	Estimated Settlement (inch)[1]		
			Center	Perimeter/Edge	Differential[2] Absolute δ (in.) and δ/D (%)
TK-503	190	174 1a: 2 to 4 ft 1b: 11 ft	3.5 to 4.8	1.4 to 3.5 (W: 2.5-3.5 NE: 1.5 SE: 1.4-2.2)	1.0 to 3.3 0.04-0.14%
TK-504	134	158 1a: 0 to 9 ft	Approx. 75% of TK-505 settlements		
TK-505	134	153 1a: 0 to 12 ft	3.1 to 4.6	1.1 to 5.7 (N: 1.8-2.7 E: 1.1-1.6 S: 3.0-4.5 W: 3.7-5.7)	0.1 to 3 0 to 0.19%

Notes:
1. Settlement ranges reflect variations in soil stratum thicknesses across the footprint of the tanks, variable preloading as a result of potential unloading by the proposed cuts, and uncertainty in soil engineering parameters, including but not limited to variations in the consistency or density of the existing Stratums 1a/1b non-engineered fill.
2. For Tanks 504 and 505, settlements greater than indicated in this table are anticipated between the center of the tank and the tank perimeter in the southwestern portions of the tanks, assuming no settlement mitigation is implemented (see discussion in text below table).
3. Differential settlements span the low- to high-end estimates of settlements between tank center and various locations around the perimeter of the tank. δ/D = angular distortion.
4. N, E, S, and W = North, East, South, West

The settlements in Table 2, which are based on calculations at a limited number of discrete points at the tank center and perimeter, show that the greatest settlement at the Crude Tank will be at the center of the tank, with the greater of the perimeter settlements expected on the west side of the tank, i.e., indicating a slight westward tilt. At Product Tank 505, the settlement at the center is expected to be slightly less than at the west side of the tank, and similar to the settlement at the south side of the tank. The settlement is expected to be least at the east side of the tank. The trend of the settlements values is consistent with the approximately northeast to southwest 10 percent downward slope of the top of Stratum 2, meaning that the thickness of Stratum 1a cohesive fill below the tank base also increases in that direction. At Product Tank 504, which will be located 200 feet north of Tank 505, the thickness of cohesive fill below the tank is about 2 to 3 feet thinner than at Tank 505; accordingly, the settlement at Tank 504 is estimated at approximately 75 percent of the settlement at Tank 505. Settlements approximately two times greater than those estimated at the center of Tanks 504 and 505, i.e., on the order of 6 to 9 inches at Tank 505 and 5 to 7 inches at Tank 504, are expected between the center of the tank and the tank perimeter in the southwestern portions of the tanks (these values are not reflected in the table above as the precise locations have not been determined). This is because the tank vertical stress zone influence factor, which is greatest at the center of the tank, reduces only a small amount toward the perimeter of the tank due to the large diameter of these tanks; this in combination with the greater thickness of Stratum 1a toward the west/southwest will likely result in the greatest settlement occurring closer to the perimeter than at the center. As a result, the magnitude of differential settlements and angular distortions will likely be greater than those in Table 2, and may approach and even exceed the relevant acceptable criteria, which are discussed further below. To address potential excessive settlements, we recommend overexcavating and replacing a portion of the Stratum 1a cohesive fill below the ringwall area for Tanks 504 and 505 with compacted granular structural fill. More detail regarding this recommendation is provided below after further discussion of subgrade conditions under the tanks and ringwalls.

The current and historic subsurface profiles in the tank areas show that the proposed Product Tank bases will likely bear in the medium stiff to very stiff Stratum 1a cohesive fill over the majority of the base area, but will bear in the stiff to hard Stratum 2 silty clay in the eastern portions of the tanks due to the sloping surface of Stratum 2. Similarly, concrete ringwall foundations extending approximately 4 feet below the tank bases are also expected to bear in Stratum 2 in these areas, but over a greater areal extent than the tank bases. These Stratum 2 bearing areas will comprise "hard spots" that could result in excessive differential settlement across the diameter of the tank leading to potential structural distress of the ringwall and tank. Therefore, we also recommend overexcavation and replacement of part of the cohesive fill thickness as mentioned above to help mitigate the effects of the "hard spots."

We recommend implementing the overexcavation and replacement mitigation measure at the Tank 504 and Tank 505 ringwalls as follows:

- Where the thickness of Stratum 1a cohesive fill below the bottom of the ringwall is no greater than 2 feet, the soil can be left in place and the surface compacted and proof rolled (and repaired if necessary) as described in Section 7.10. To establish the horizontal limits of the overexcavation and replacement, the thickness of the existing Stratum 1a will need to be confirmed and this can be accomplished by excavating small test pits at regularly spaced intervals along the tank perimeter. The test pits should be backfilled with compacted granular fill or controlled low-strength material (CLSM); more information regarding backfilling and CLSCM is provided in Section 7.10

- Where the thickness of Stratum 1a below the ringwall exceeds 2 feet, over-excavate up to 3 feet of Stratum 1a below the bottom of the ringwall, and replace it with compacted granular structural fill to the limits shown in Figure E.1 of Appendix E. The recommended gradation for the structural fill is provided in Section 7.10. Before placement of the fill, re-compact and proof roll the subgrade, repairing soft areas as necessary.

- As shown in Figure E.1, the overexcavation zone should have a minimum width of 12 feet at the bottom of the excavation, with the sideslope at the interior side of the tank shell inclined at 4H:1V up from the bottom of the excavation to the tank subgrade elevation. The 4H:1V slope of the excavated area is designed to reduce differential settlement of the tank floor. A flatter slope toward the center of the tank would decrease both the total potential settlement and differential settlement of the tank floor.

- The fill material in the over-excavated area should consist of granular structural fill and be placed and compacted to 95 percent of the maximum dry density per ASTM D 1557 as specified in Section 7.10. In the 12-foot-wide area below the edge of the tank in Figure E.1, any areas exhibiting excessive weaving, rutting, or other signs of softness should be overexcavated locally by an additional 2 feet and repaired with compacted granular fill. From the perimeter of the overexcavation zone toward the center of the tank to the limit of the 4H:1V slope at the ground surface/tank subgrade elevation, a minimum 12 to 18 inches of structural fill should be placed immediately following overexcavation to protect the subgrade from construction traffic and deterioration/softening caused by inclement weather.

Assuming the overexcavation and replacement is performed as recommended, the reduction in settlements at and in the vicinity of the ringwall is estimated to range from up to about 2 to 4 inches from the magnitudes presented in Table 2 and in the report text above, depending on location. Since, settlement will still occur at all three tanks, piping connections to the tanks should be designed to be flexible so they can accommodate the differential movements.

The effect of differential settlements on steel tanks has been described in several landmark publications including Marr et al. (1982) and D'Orazio and Duncan (1987). These and other publications indicate that while steel tanks are capable of sustaining total and differential settlements in excess of 1 foot, the deformed shape and magnitude of distortion are the determining factors in whether damage will occur. The consensus is that where the tank settlement profile is dish-shaped, with the maximum movement occurring at the center, a center-to-edge differential settlement of up to 0.01 to 0.025 times the tank diameter (i.e., 1 to 2.5 percent of the diameter, or "distortion" value of 1/100 to 1/40) is acceptable. Where settlement of the tank edge, or somewhere between the center and the edge, exceeds that of the center (including non-planar tilting), a center-to-edge differential settlement of 0.005 to 0.015 times the tank diameter is acceptable. Although settlements have only been estimated at a limited number of discrete points, the settlement shape for Crude Tank 503 generally conforms to that of a roughly flat dish for which the criterion of 0.015 (1.5 percent) times the tank diameter applies. The settlement shape for Product Tank Tanks 504 and 505 is estimated to range from that similar to the roughly flat dish for part of the tank, to a shape where the greatest settlements are closer to the edge than at the center for the remainder of the tank. For both the most conservative criterion of 0.005 (0.5%) is judged applicable to the southwest areas of these tanks. Accordingly, the settlement magnitudes estimated here are below published limiting values for the Crude Tank, but approach and/or possibly exceed the limiting values in the approximately west to south portions of the Product Tanks assuming no settlement mitigation is implemented. If the partial overexcavation and replacement of the Stratum 1a is performed, then the settlements should not exceed the above criteria.

Further guidance on limiting values of tank differential settlement is presented in the American Petroleum Institute (API) Standard 653 and to a lesser extent also in API Standard 650. Standard API 650 contains the circumferential settlement criterion which specifies that differential settlements measured between adjacent monitoring points during the hydrostatic test should not exceed 1/2 inch in 32 feet, which equals an angular distortion of approximately 1/750. Using this criterion, the settlements estimated for the Crude Tank meet the criterion. The settlements estimated for the Product Tanks exceed the criterion in the west to south areas of the tanks without mitigation, but are expected to meet the criterion assuming the recommended partial overexcavation and replacement is performed. The tank manufacturer should be consulted regarding the possible adverse effects of settlements of the magnitude estimated above.

Settlement rates were estimated based on the soil profile, soil stratum drainage assumptions, and consolidation rate parameters based on empirical correlations with results of laboratory index tests. Due to the granular or stiff to very stiff cohesive nature of the foundation soils for the tanks, approximately 50 percent of the total settlements are expected to occur shortly after loads are applied. Ninety percent of the settlements are estimated to occur 2 to 3 months after application of the load, with the remainder occurring over the ensuing 2 years or more. During a hydrotest, assuming a filling and monitoring duration of approximately 1 month, about 60 percent of the total settlements are estimated to occur. Following emptying of the tank after the hydrotest, heave due to elastic rebound is expected to equal about 50 percent of the settlement observed at the end of the hydrotest. Depending on how quickly the tank is refilled with the intended crude oil and product(s), subsequent settlement is anticipated at a rate similar to but slightly faster than that described above for hydrostatic loading.

Resistance to lateral loading of the ringwall foundations may be achieved using concrete-to-soil friction along the base of the foundation, steel-to-soil friction along the base of the tank, and passive earth pressure against the side of the foundation. Per Table 1, an ultimate value of soil-to-concrete friction coefficient of 0.33 to 0.45 may be used for the base friction, depending on the soil type that occurs at the foundation subgrade level, and assuming the Stratum 1b silty sand fill is compacted prior to placement of the foundation. For the steel tanks constructed on clean sand pads, an ultimate value of soil-to steel friction of 0.30 may be used for base friction. An ultimate equivalent fluid density of 450 pounds per cubic foot (pcf) may be used for estimating the passive earth pressure, assuming that the backfill consists of recompacted sand fill or imported granular structural fill. Where the foundation is embedded in cohesive Stratum 1a or Stratum 2 soils with only a narrow (1 to 2 feet) zone of backfill, an ultimate passive earth pressure of 3,000 psf may be used. Safety factors of at least 1.5 for sliding friction and 1.5 for passive earth pressures should be applied to each of these values during design. Typical “resistance factors” being recommended by government agencies for the LRFD approach are 0.9 for the friction coefficient and 0.50 for the passive earth pressure. The passive pressure should be ignored at locations where the soil providing the lateral resistance is already occupied by other structures that are within a lateral distance of two times the depth to the bottom of the new mat. The upper 1 foot of soil below the ground surface should also be excluded when calculating the passive resistance.

Recommended values of vertical modulus of subgrade reaction values for concrete ringwall design are provided in Table 1.

Shell and the tank designer may conclude that the tanks including the ringwalls will need to be underlain by a geomembrane with a leak detection system. If so, when lateral load, such as from seismic sources, is applied to the tank, the tank's resistance to the load will be derived from friction on the base of the ringwall and tank system, and passive resistance on the side of the ringwall foundation. The geomembrane-to-soil interface or a geomembrane-to-geotextile interface will provide lower unit frictional resistance than a concrete-to-soil interface. Considering this, it is likely that a frictional failure surface would not be planar between the bottoms of the ringwall on opposing sides of the tank, but instead would rise up from the bottom of the ringwall to the geomembrane. The angle of this rise can be estimated to be 1H:1V. This should be considered when evaluating the potential for lateral movement under seismic loading.

Hydrotesting of the tanks is recommended per guidance in API Standard 650. The hydrotesting is performed in such a way as to incrementally load the foundation and control the rate and magnitude of settlement while measurements of tank structure and foundation are performed. Measurements of tank shell and tank bottom settlements during the hydrotesting should be performed in the manner recommended by API in Standards 650 and 653, except the filling rate shall be as noted below, or the more conservative filling rate prescribed in Shell DEPs 34.11.00.11 or 34.51.01.31. AECOM recommends that hydrotesting be performed by filling the tank to not more than one-third of the design level in each of three increments. Each of the increments should be applied over a period of not less than seven days, followed by a minimum three-day pause to observe settlements. Settlement measurements should be reviewed by the Geotechnical Engineer prior to resumption of the hydrotesting. At the end of the last increment, the tank should be left fully filled and monitored for at least three days.

7.3 TANK CONTAINMENT AREA AND BERMS

Secondary containment of spills will be required in the form of low permeability berms/dikes (or retaining walls) as well as low permeability materials forming the floor of the storage area between the dike and the tank. Per Shell DEP Specification 34.11.00.11, the materials forming the dike and floor of the containment area are required to be “sufficiently impervious” to prevent the released product from migrating out of the system to surrounding soil, surface water or groundwater before spill cleanup occurs. A specific soil permeability requirement is not provided in federal and state guidelines for spill control.

The Stratum 1a cohesive fill and the Stratum 2 native silty clay soil at this site appear to meet the "sufficiently impervious" requirement when used as the floor of the secondary containment area because:

- The Stratum 2 soil is a fine grained typically moderately plastic silt or clay that has not been observed to contain substantial or continuous granular zones or interbeds that would allow the potential for rapid vertical or lateral migration of fluid.
- The properties of this silt/clay suggest that a permeability value of 10^{-5} centimeters per second (cm/sec) or lower can be expected, according to published data on soils of this type.
- With some exceptions, as described below, the minimum 4-foot thickness of Stratum 2 silt/clay soil over the granular Stratum 3 groundwater-bearing soil in the vicinity of Tank 503 indicates that the spilled liquid would take at least 140 days under the relatively small head of perhaps 4 feet that would be generated to fully penetrate Stratum 2 and reach groundwater in Stratum 3. Similarly, the minimum 12-foot thickness of Stratums 1a and 2 silt/clay soils over the granular Stratum 3 groundwater-bearing soil in the vicinity of Tanks 504 and 505 indicates that the spilled liquid would take at least 1000 days to fully penetrate Stratum 1 and reach groundwater in Stratum 3.

  Exceptions: In the vicinity of Boring RPS-3-17 (refer to Figure 4), Stratum 1b granular fill is expected to daylight once cutting to design grades for the facility is performed, with no Stratum 2 silt/clay below to provide low-permeability separation from groundwater-bearing Stratum 3. In this area, the granular soils should be over-excavated and replaced with a minimum 12-inch-thick layer of compacted Stratum 1a clay/silt soils from cut areas of the Site, and/or with clay/silt soils from the Clean Soils Pile, which are described below. This layer should be placed in two lifts and compacted to a minimum of 95 percent of the maximum dry density as measured using ASTM D 1557 (Modified Proctor test), and it should be keyed into adjacent Stratum 1a or 2 clay/silt soils so that a continuous low permeability containment basin floor can be established. Assuming the aforementioned permeability of 1×10^{-5} cm/sec for silt/clay, and a 4-foot head, water and other fluids with a viscosity similar to that of water would take about nine days to percolate through the 12-inch-thick floor.

  It should be noted that the available boring and test pit data are insufficient to establish the precise limits of where the containment basin floor in the vicinity RPS-3-17 should be constructed. Therefore, visual observations of the subgrade combined with shallow test pits during construction will be necessary to confirm the limits of Stratum 1b soils once site grades approach design grades. The observations and test pits will need to be performed in a systematic pattern to ensure a continuous basin floor is constructed.

It should also be noted that a similar soil profile situation to that described above near Boring RPS-3-17 also exists in the vicinity of Boring RPS-5-17. However, a containment berm is planned to be constructed over this location and the berm and adjacent basin floor will be constructed with low-permeability soils. The berm and basin floor should be keyed into the Stratum 1a cohesive fill to provide effective containment per recommendations in Section 7.10. The soils found in the Clean Soils Pile that were described in the 2014 AECOM Report of Geotechnical Investigation for the Crude Rail Unloading Facility East are still available for use in construction of the containment area floor and dikes for this Project. Those soils were described as medium stiff to stiff clay with occasional pockets of silty sand. They also appear to meet the "sufficiently impervious" requirement, provided that any silty sand pockets are spread and mixed into the clay matrix during fill placement so that potential “short circuiting” of spilled crude or product through continuous zones of permeable material is avoided.

The final slopes of berms constructed with the low permeability cohesive soils described above may be constructed to inclinations not steeper than 1.5H:1V. The berms should not be constructed with granular soils including Stratum 1b granular fill as they will not provide the required low-permeability containment and will have insufficient stability. However, if modest amounts of the Stratum 1b granular soils from the Site need to be disposed, they can be incorporated in the berms provided they are well mixed into the cohesive soils so that the low permeability of these soils is not impacted., The surface of the berms should be covered with erosion control material similar to what has been found effective at similar berm slopes at the Refinery. Subgrade preparation and fill placement recommendations for the berms are provided in Section 7.10.

We evaluated the stability of the containment berms with sideslope inclinations of 1.5H:1V for static (non-seismic) conditions assuming they are constructed with the compacted Stratum 1a cohesive fill from the Site or with the silt/clay soils from the Clean Soils Pile. The stability analyses were performed using the commercially available software SLOPE/W (GEO-SLOPE International 2007). For the maximum proposed berm height of 28 feet, which is at the southwest corner of the Crude Tank containment basin, the factor of safety (FOS) for the end-of-construction undrained case is approximately 2.9, which compares favorably with the FOS=1.3 criterion that is typically applicable to this analysis case. The FOS for the long-term drained case ranges from about 1.2 to 1.3, which is generally in agreement with the FOS=1.3 criterion for this analysis case as given in Shell DEP 34.11.00.11, but slightly less than the more typically accepted FOS=1.5 criterion. With the berm subjected to the hydrostatic load from a tank spill and assuming the spill fluid reaches the top of the berm, the long-term FOS also ranges from about 1.2 to 1.3.

To evaluate the effect of berm height on stability, we also evaluated the long-term stability for a berm with a height of 20 feet. The analysis showed a FOS of approximately 1.5, which is greater than the Shell DEP FOS=1.3 criterion and equals the typically accepted criterion.

Although the calculated long-term stability FOS of the berm with a height of 28 feet appears to be somewhat marginal, the FOS is expected to be slightly higher due to three-dimensional effects present at this corner location. The three-dimensional effects cannot be readily modeled in the SLOPE/W software since the analysis method is inherently based on infinitely long slopes. Berms with a proposed height of greater than 20 feet are limited to a relatively small portion of the containment basin. In addition, the stability analyses for 20-foot and 28-foot berms show that the failure surfaces for the long-term case are limited to the upper 5 to 10 feet thickness of the berm slope and don’t extent into the berm foundation soils. Therefore, potential instability would likely occur as sloughing-type movements, and should these occur under adverse conditions such as severe weather or earthquake activity, they could be repaired with modest effort.

The settlement of the berms was evaluated using software Settle3D. Long-term settlements at the middle of the berms are estimated to range from essentially no settlement where berms are less than about 10 feet high, i.e., along the northern east-west berms and along the easternmost north-south berm, to 3 to 6 inches at the south, depending on the berm height and thicknesses of underlying compressible soils. Based on the available subsurface information and proposed grades the greatest settlement is expected in the southwestern berms of both containment basins. Approximately 90 percent of the settlements are expected to occur within 3 to 9 months following construction of the berms to their full height, with the remainder occurring during the following year or more. Depending on the time between constructing the berms to their full height and shaping them to their design profile, we suggest that that the crown elevation of the berms be overbuilt, tapering from no overbuild for berms heights up to 10 feet, to 3 inches for berm heights of 25 to 28 feet.

7.4 SHALLOW FOUNDATIONS – MATS AND FOOTINGS

Shallow foundations are recommended for miscellaneous equipment or pipe supports for this Project and may be supported in the Stratum 1 typically stiff silty clay/dense silty sand fill that are underlain by the Stratum 2 stiff native silty clay. For the approximately 10 feet depth to the top of the silt fill, the bearing capacity will likely be controlled by a combination of the silty clay and silty sand fill strength properties, and will also depend on the depth and size of the foundation. The net ultimate soil bearing pressure for such foundations is conservatively estimated at 8,700 psf, based on an assumed undrained shear strength of approximately 1,700 psf for the Stratum 1a silty clay fill in a stiff condition, i.e., assuming the foundation bears directly on the silty clay fill rather than on some thickness of sand fill over the native clayey silt, which would result in a somewhat higher bearing capacity. A factor of safety of at least 2.5 is recommended for an ASD approach, along with an evaluation of the estimated settlement. Typical "resistance factors" being recommended by government agencies for the Load Resistance Factor Design (LRFD) approach are 0.5 to 0.6. In keeping with previous reports for projects at the Refinery and to control settlement magnitudes, a net allowable bearing pressure of 3,000 psf may be used for design of mat foundation or footings for equipment. This value may be increased by one-third for transient loads from wind or seismic sources.

A minimum foundation embedment depth of 1.5 feet should be used for frost protection. To help control settlement of foundations bearing in the compressible Stratum 1a cohesive fill, we recommend placing 12 inches of crushed aggregate below foundations with actual service load bearing pressures greater than 1,500 psf. For foundations with bearing pressures less than 1,500 psf, the crushed aggregate thickness can be reduced to 6 inches. Subgrade preparation and fill placement and compaction recommendations for shallow foundations are provided in Section 7.10.

An evaluation of potential shallow foundation settlements has been conducted for a range of square footing/mat foundations from 3 feet upward to 20 feet in width, the results of which are presented in Figure 5. Settlements were analyzed for an applied pressure of 1,000 psf, 2,000 psf and the maximum allowable 3,000 psf. Interpolation may be used where necessary. Footings less than about 12 to 15 feet in width and with a length less than two times the width are considered rigid, and are expected to settle uniformly. Larger or longer mat foundations will not settle uniformly if the mat is not thick enough to be considered rigid. For these flexible mats, the settlement estimate given in Figure 5 is for the center of the mat. Settlement of the corner of a flexible mat is expected to be approximately 50 percent of the magnitude given for the center.

Settlements of shallow foundations at several areas of the Site were considered separately. The proposed vapor recovery pad, which will be located between the two Product Tanks and will apply a ground pressure of less than 500 psf, is estimated to settle less than 1/2 inch. The proposed electrical equipment pad, for which loads and approximate dimensions were not available during this investigation, will be located near or at the north edge of 8th Street. A test pit could not be excavated at that location due to possible buried utilities. However, Boring RPS-5-17, located about 80 to 100 feet northwest of the equipment pad, encountered approximately 10 feet of medium dense Stratum 1b granular fill over dense Stratum 3. In addition, it is likely that several feet of compacted granular aggregate was used to construct 8th Street so that this material also underlies the equipment pad. Assuming medium dense to dense granular fill underlies the pad, the settlements are expected to be less than those given in Figure 5. For conservatism, the settlements in Figure 5 can be considered as upper bound values. The subsurface conditions in the East and South Offsite Pipeway areas are anticipated to consist of several feet of either medium to dense granular fill or medium stiff to stiff cohesive fill overlying very stiff Stratum 2-type silty clay. For these areas the settlements can also be conservatively estimated using Figure 5, but are more likely to be half of the values in the figure.

If the footings are rectangular with a length-to-width ratio of approximately three to five, the settlement magnitudes should be increased by a factor of 1.5 over those shown in Figure 5. The reason for the increase is that longer footings cause the stress bulb to extend deeper where soils are more compressible.

Approximately 90 percent of the settlements are expected to occur within 2 to 3 months following application of the full load, with the remainder occurring over a period of roughly 6 to 12 months or more.

Resistance to lateral loading of shallow foundations may be achieved using concrete-to-soil friction along the base of the foundation, and using passive earth pressure against the side of the foundation. Per Table 1, an ultimate value of soil-to-concrete friction coefficient of 0.33 to 0.45 may be used for the base friction, depending on the soil type that occurs at the foundation subgrade level, and assuming the Stratum 1b silty sand fill is compacted prior to placement of the footing. An ultimate equivalent fluid density of 450 pounds per cubic foot (pcf) may be used for estimating the passive earth pressure, assuming that the backfill consists of recompacted sand fill or imported granular structural fill. Where the foundation is embedded in cohesive Stratum 1a or Stratum 2 soils with only a narrow (1 to 2 feet) zone of backfill, an ultimate passive earth pressure of 3,000 psf may be used. Safety factors of at least 1.5 for sliding friction and 1.5 for passive earth pressures should be applied to each of these values during design. Typical “resistance factors” being recommended by government agencies for the LRFD approach are 0.9 for the friction coefficient and 0.50 for the passive earth pressure. The passive pressure should be ignored at locations where the soil providing the lateral resistance is already occupied by other structures that are within a lateral distance of two times the depth to the bottom of the new mat. The upper 1 foot of soil below the ground surface should also be excluded when calculating the passive resistance.

Recommended values of vertical modulus of subgrade reaction values for mat or slab design are provided in Table 1.

7.5 DEEP FOUNDATIONS – AUGERCAST CONCRETE PILES

In the event that construction of shallow foundations creates an unacceptable effect on nearby existing foundations, that minimal settlements are preferred, or that sufficient uplift or lateral resistance cannot be provided by the shallow foundations, a drilled augercast concrete pile (or “pier”) foundation may be used instead. This approach may especially be required for the elevated pipelines that will need sufficient overturning protection.

7.5.1 Downward and Uplift Loads

The augercast concrete piles will derive their downward capacity primarily from side friction in the Stratum 1a/1b fill and the Stratum 2 stiff to hard silty clay that extend typically 15 to 20 feet below the existing ground surface elevations in the vicinity of Tanks 504 and 505. That profile extends only to about 15 feet near Tank 503. But for both cases Stratum 2 is underlain the by the Stratum 3 dense to very dense silty sand if additional vertical capacity is required. Ultimate axial compressive and uplift loads of an 18-inch-diameter augercast pile were calculated based on subsurface conditions represented in the upper 20 feet of Figure 4. The assumed profile and the recommended ultimate friction and end bearing loads to be used for design of an 18-inch-diameter augercast pile are shown in Figure 6. These are based on the following unit skin friction and end bearing capacities:

- Stratum 1a cohesive fill: 0.87 ksf skin friction. 15.3 ksf end bearing (ultimate)
- Stratum 2 native silty clay: 1.1 ksf skin friction, 27.0 end bearing (ultimate)

The pile capacities shown in Figure 6 are expected to be conservative for the South and East Offsite Pipeways areas, where the top of the higher strength Stratum 2 is estimated to be shallower by approximately 5 feet.

The downward and uplift loads may be increased by one-third for transient components from wind or seismic sources. For allowable stress design (ASD), minimum factors of safety of 1.75 and 3.0, respectively, should be used for downward and upward friction. A factor of safety of at least 2.5 should be used for end bearing. The pile self-weight can be included in the uplift load resistance, with the buoyant weight used below the groundwater surface and a factor of safety of 3.0 applied. For load and resistance factor design (LRFD), typical geotechnical strength limit resistance factors are provided in AASHTO (2014) Table 10.5.5.2.4.1 – Resistance Factors for Geotechnical Resistance of Drilled Shafts. The relevant resistance factors for this Project, applicable to small groups of piles spaced at a minimum of three times the shaft diameter, are as follows:

- Side, tip, and uplift resistance in clay: 0.45/ 0.40/ 0.35
- Side, tip, and uplift resistance in sand: 0.55/ 0.50/ 0.45
- Horizontal resistance, all materials: 1.0

The structural load capacity of the augercast piles should be verified by the structural engineer.

Settlement of a single 18-inch pile supporting a service load of 60 kips is estimated to be approximately 0.35 inches or less when the pile is appropriately embedded to approximately 15 to 20 feet, and terminated in the Stratum 2 silty clay. The settlement of piles in groups of three or fewer piles will be approximately the same as for the single pile case. The magnitude of settlement of larger pile groups will depend on the size and shape of the group and the spacing of the piles. The pile settlements will be essentially elastic in nature, occurring coincidental with the application of load. No appreciable settlements are expected over time.

If needed, AECOM can provide additional estimates of ultimate load versus depth for piles that are embedded at least 3 feet into the Stratum 3 dense to very dense sand. Significant increases in vertical capacity are anticipated for pile embedment depths of at least 3 feet into Stratum 3, but pile settlements are not expected to increase beyond the 0.35 inches referenced above. Another option is to enlarge the diameter of the pile, and multiply the ultimate friction and end bearing loads shown in Figure 6 by ratios of the surface area (for friction increases) and end area (for end bearing increases) of the enlarged compared to the original 18-inch pile.

7.5.2 Lateral Loads

The concrete augercast piles were evaluated for lateral loads that would generate certain deflections at the pile top for both the free head and fixed head cases. A magnitude of 0.25 to 0.5 inches of pile top deflection is considered acceptable for typical refinery equipment. The lateral pile analyses were performed using the commercially available software package LPILE-Plus from Ensoft, Inc. (2012). The lateral pile analysis took into account the linear modulus of elasticity of the pile using a rebar cage with six No. 8 bars distributed evenly with a 3-inch cover.

The fixed head condition is likely to be appropriate for piles that are properly connected to a rigid mat or large pile cap. A lateral design load of approximately 40 kips for a 12-foot-long by 18-inch diameter pile is sufficient to cause 0.25 inches of deflection for the fixed head case. A lateral design load of approximately 20 kips for the 18-inch pile is estimated for a free head case of 0.25 inches of deflection. Graphical representations of the fixed head pile deflections, bending moments, and shear forces as a function of depth are shown in Figures 7, 8, and 9; these assume the pile is embedded in Stratum 1a cohesive full for its full depth. Graphical representations of the free head pile deflections, bending moments, and shear forces as a function of depth are shown in Figures 10, 11, and 12. Note that lateral load analyses are for service loads. The analyses do not include a factor of safety and the designer can estimate the allowable load by choosing the allowable deflection. Although a factor of safety is not explicitly included, the analyses used conservative values of soil stiffness (k) and neglected the presence of the pile cap, which is expected to provide additional resistance to lateral load and tend to reduce deformation. If the pile location is sensitive to lateral deformation, and the effect of slightly higher deformations could be undesirable, then the designer can consider reducing the allowable lateral load per pile by approximately 15 percent. The lateral capacities of piles in the South and East Offsite Pipeway areas are estimated to be somewhat greater since the approximately bottom half of the pile is expected to be embedded in the stiff Stratum 2 native silty clay.

The soil parameters used for the LPILE analysis are listed in Table 3 below:

Table 3 – Soil Parameters Used in LPILE Analysis

Soil Layer No.	Description of Soil Layer	Total Unit Wt (pcf)	Friction Angle (degrees)	Cohesion (psf)	Modulus Parameter k (pci)	Strain Parameter e_{50}
1a	Fill: Stiff – V. Stiff Clay/ Silt	126	0	1,700	500	0.007
2	V. Stiff - Stiff Clay	128	0	3,000	1,000	0.005

7.5.3 Group Effects

The recommended minimum spacing for piles in a group is three pile diameters. No adjustment for group effects is recommended for pile groups having three piles or less at this minimum spacing.

With respect to axial loads, for pile groups of six to 16 piles with a spacing of three pile diameters, a 20 percent reduction in allowable uplift loads and no reduction in allowable downward loads are recommended. For pile groups of any size greater than 16 piles, a 35 percent reduction in allowable uplift loads but no reduction for downward loads is recommended. Where the pile spacing exceeds six pile diameters, the group effect can be ignored regardless of the number of piles in the group, and no adjustment of allowable loads is recommended. The designer may interpolate uplift reduction factors for pile spacing between three and six pile diameters.

The settlement of piles in groups of three or fewer piles will be approximately the same as for the single pile case. The magnitude of settlement of pile/pier groups will depend on the size of the group and the spacing of the piles. Piles in a group that are spaced at six pile diameters or more can be considered a single pile. AECOM anticipates that pile settlements will be essentially elastic in nature, occurring coincidental with the application of load. No long-term settlements are expected for the piles bearing in the dense sands.

When considering lateral loads, a minimum pile spacing of three pile diameters is again recommended. For pile groups of six to 16 piles or more spaced at three pile diameters, the resulting behavior is higher deflections and moments compared to single piles at the same lateral load level. The recommended "p – multiplier" (P_m) for modifying p-y curves used in the LPILE software ranges from 0.7 to 0.4, and would average approximately 0.5 for medium to large pile groups at three-pile-diameter spacing, based on results of research in stiff clay (FHWA 2006 and Rollins et al. 2006). A lateral load reduction of only 30 percent (p-multiplier of 0.7) is considered appropriate for a small pile group, i.e., four to five piles total at the three-pile-diameter spacing. Where the pile spacing is eight pile diameters or more, the group effect can be ignored regardless of the number of piles in the group. These lateral criteria are for pile spacing parallel to the direction of the load, and assume that the pile spacing in the direction perpendicular to the load is at least three pile diameters. For circular pile arrangements, p-multipliers can be based on a weighted average pile spacing.

7.5.4 Installation

Augercast piles should be installed using a continuous flight auger advanced to the required depth. The equipment used to advance the auger should be of sufficient capacity to advance the auger in the strata indicated in the subsurface explorations shown on the logs attached. When the desired depth is reached, a high-strength sand-cement grout is continuously pumped under controlled pressure through the center of the shaft of the hollow-stem auger as the auger is slowly withdrawn. The concrete grout should be pumped continuously during withdrawal of the auger at a rate greater than that required to fill the volume of augered hole, and at a pressure greater than that required to maintain lateral support of the hole. This withdrawal rate should not exceed that required keep the augered hole completely filled with grout below the tip of the auger. The pressure at the grout pump should be in the range of 150 to 350 psi, depending on the length of the feeder hose. A grout head of at least 5 feet above the injection point should be maintained during raising of the auger. The total volume of grout injected should be at least 115 percent of the theoretical volume of the pile. The steel reinforcement is then installed within the column of fluid grout.

Drilled piles less than about 12 to 20 feet in length can likely be installed using open-hole drilling with a solid auger with little risk of caving due to the generally stiff cohesive nature of most shallow soils at the Site. If caving is observed during drilling, the hole should be temporarily cased. Evidence of caving should be checked before reinforcing cages are installed. If caving occurs after the reinforcing cage has been placed in the hole, the cage should be removed and the hole cleaned before replacement of the cage and placement of the concrete occurs. If necessary, the casing can be left in place while the cage is installed, then pulled as the concrete is being poured.

Adjacent piles within three pile diameters, center-to-center, should not be installed within 12 hours of each other, or should not be installed until grout in the previously installed pile has achieved an initial set. Installation timing restrictions are not necessary for piles spaced at five pile diameters or more.

If the pile will experience uplift loads, a full-length center reinforcing bar will need to be included in the pile.

During construction of pile caps, overexcavation below the bottom of the pile caps is not required. If an unusual zone of wet Stratum 1 silty sand fill in soft condition is encountered at the pile cap subgrade that makes construction of the pile cap difficult, then this material should be over-excavated locally by 1.5 to 2 feet and replaced with compacted gravel fill from an on-site structural fill or an off-site structural fill source.

7.5.5 Pile Load Testing

Pile testing of the proposed 18-inch augercast piles should not be necessary given that installation of such piles at the Shell and other refineries in the Anacortes area has generally been successful to date. As a minimum, conformance monitoring of the piles should be performed, including automatic recording of grout/concrete volume, maximum and minimum grout/concrete pressure, auger rotation, and depth of grout/concrete injection point. Pile installation should also be monitored by the geotechnical engineer and materials testing of grout/concrete should be performed as per the specifications.

If evidence of problems with pile installation arises and/or grout volumes are lower than expected, pile testing should be performed. AECOM recommends this testing consist of low-strain pile integrity testing (PIT, also known as pulse echo testing), initially beginning with four to six tests on both suspect piles as well as on piles that are believed to conform to the installation specifications. The testing program can then be adjusted based on the results of the initial testing. The pile integrity testing should be performed in accordance with ASTM D5882, Standard Test Method for Low Strain Impact Integrity Testing of Deep Foundations.

If PIT testing is found to be necessary, but results of testing by this method are inconclusive, then other testing methods can be considered including single-hole sonic logging or thermal integrity profiling; however, these require advance planning since they involve the attachment of metal tubes or cables to the pile reinforcement during pile fabrication/installation. Thermal integrity profiling (TIP) is a more recent technological development that uses thermal wires with uniformly spaced temperature sensors that are cast into the shaft (often tied to the reinforcement cage) over the total length of the shaft. Based on thermal data interpretation and total concrete volume information, the as-built shape is calculated. An examination of the graphical representations produced by the TIP system software is often sufficient to indicate a pile or shaft with no integrity issues or one with defects.

7.6 CORROSION

To evaluate the soils at the Site for potential corrosivity, AECOM sent two samples from the Stratum 1 fill at Boring RPS-2-17 and Test Pit TP-4-17 to Fremont Analytical laboratory for testing (refer to Appendix D for results). As summarized in Table 4, tests included moisture content, pH, resistivity (indirectly, by testing for conductivity), chloride content, and sulfate content. The results show that when compared to generally accepted criteria for assessing ground corrosion potential (FHWA 2003 and ACI 318-14 [2014]), corrosivity does not appear to be an issue at the Site for concrete and steel structures, given the approximately neutral pH levels, and low chloride and sulfate levels. The resistivity results shows mild corrosion potential; however, based on our experience with measuring resistivity in the field using a four-pin Wenner array at other locations in the Refinery, the resistivity is likely higher, indicating mild to no corrosion potential. If there is concern with potential corrosion of steel elements in the soil based on these results, then conducting field resistivity testing may be warranted for verification.

Sulfate was detected at 0.0006 and 0.008 percent in the samples. In accordance with the ACI (2014) criteria for sulfate exposure, this sulfate concentration corresponds to Exposure Class S0, i.e., severity classified as “not applicable.”

7.7 LATERAL EARTH PRESSURES

Lateral earth pressure estimates will be required to evaluate the pressures against the subsurface walls from retained soils and to assess the available resistance to lateral loads on footings, mats and pile caps.

Recommended values of lateral earth pressure coefficients for the active, at-rest and passive cases are presented in Table 1 following the text of this report; the coefficients assume horizontal ground behind the wall. The seismic earth pressure coefficients K_{ae} and K_{pe} include the static components due to gravity loads plus the seismic components. The combined earth pressure distribution increases linearly from the top of the wall to the base of the wall. The resultant of the total earth pressure should be located H/3 above the wall base, where H is the total wall height measured from the ground surface at the back of the wall, including any soil surcharge, to the bottom of the footing (AASHTO 2014).

The active case applies to walls that are permitted to rotate or translate inward (i.e., away from the retained soil) by approximately 0.002H, where H is the height of the wall. This case would be appropriate for a retaining wall or an abutment founded on soil. The at-rest case applies to unyielding walls, such as a rigidly connected basement or sump wall. The passive value should be used with a safety factor of at least 1.5. These values apply to the case of drained soil conditions where water pressures are not permitted to develop, and should be accompanied by adequate drainage measures. Alternatively, hydrostatic pressures should be considered in the design where appropriate.

Equivalent fluid unit weight values for each soil layer can be obtained by multiplying the total unit weight of the soil by the appropriate earth pressure coefficient. While buoyant unit weight of the soil should be used in estimating equivalent fluid unit weights and earth pressures for soils below the groundwater table, the significant depth to water at this location indicates that groundwater effects can be ignored.

The lateral earth pressure on subsurface walls will increase where loads applied to the soil from nearby structures, traffic, sloping ground behind the wall, or other sources (i.e., surcharge loads) are close enough to the new wall or to existing walls to exert an influence. The vertical surcharge pressure applied will result in increased lateral earth pressures on nearby vertical walls that extend below the applied load level. For large area loads, the additional imposed lateral earth pressures may be evaluated using the following:

Lateral Pressure (psf) = K × q

Where q = vertical surcharge load in psf
K = appropriate earth pressure coefficient (active K_a or at-rest K_o)

A typical surcharge (q) value for vehicle traffic loads is 250 psf. Other surcharge load magnitudes should be assessed individually, considering the source and magnitude of the load. The magnitude of these surcharge pressures can be estimated using the relationships shown in Figure 13.

Once the data of a retaining wall including type, shape, footing depth, surcharge, etc. at the Site are established, its safety against overturning and sliding can be evaluated by using the soil parameters in Table 1. The 2015 IBC recommends a minimum static safety factor of 1.5 for overturning and sliding of retaining walls. Similarly, Section 1807.2.3 of the 2015 IBC recommends a minimum seismic (where earthquake loads are included) safety factor of 1.1 for overturning and sliding of retaining walls.

Retaining walls should be provided with adequate drainage behind the wall to avoid lateral forces from hydrostatic pressures. This can be achieved by providing a minimum 24-inch-thick zone of relatively free-draining granular backfill behind the wall, or a prefabricated drainage mat against the back of the wall. The granular backfill should contain a maximum of five percent passing the No. 200 sieve, e.g., conforming to WSDOT Standard Specification (SS) Section 9-03.12(2) Gravel Backfill for Walls (WSDOT 2016). Where the granular drainage zone is adjacent to fine-grained silt/clay soils, the drainage zone should be separated from the fine-grained soils with a filtration geotextile meeting the specifications of WSDOT SS Section 9-33.2(1) Geotextile for Underground Drainage Filtration, Class C. The drainage mat should meet the specifications of WSDOT SS Section 9-33.2(3) Prefabricated Drainage Mat. Water percolated through the drainage zone or drainage mat should be collected via a perforated drainage pipe extending longitudinally for the full length of the wall, with the pipe exiting to a free-draining location or to a sump from which the drainage can be pumped. If providing positive drainage with a drainage pipe is impractical due to site constraints and grades, then alternatively, the wall could be constructed using weep holes through the wall instead of a drainage pipe behind the wall, or the wall could be designed for full hydrostatic pressure. If designing for full hydrostatic pressure, then the lateral earth pressures on the wall is computed using the buoyant unit weight of the soil, together with the active or at-rest lateral earth pressure coefficient, as applicable for the wall under consideration. Given the relatively impermeable soils across much of the Site, which can lead to perched groundwater conditions, the hydrostatic pressure should be added to the lateral earth pressure assuming groundwater rises to ground surface behind the wall.

Use of heavy rolling equipment to compact fill soil directly behind subsurface walls will cause an increase in horizontal earth pressures beyond those values given above. The magnitude of additional pressures will depend on the weight and characteristics of the roller. A similar increase will occur if backhoe-mounted compaction equipment (e.g., Hoe-pac) is used. The increase will be negligible if the heavy equipment is kept at least 6 feet from the wall. Compaction in this 6-foot zone directly behind the wall should be accomplished using hand operated or walk-behind equipment in conjunction with lift thicknesses not greater than 6 inches prior to compaction.

7.8 ACCESS ROADS

Access Roads shown on the Preliminary Site Plan for the Project are planned to consist of gravel (aggregate) surfacing. We developed roadway section recommendations using traffic loading information provided by Anvil and Shell, the Shell DEP Specification 34.13.20.31 “Roads, Paving, Surfacing, Cable Trenches, Slope Protection and Fencing,” the Federal Highway Administration (FHWA 2015) guidance document “Gravel Roads – Construction and Maintenance Guide,” and the AASHTO (1993) “Guide for Design of Pavement Structures.” The FHWA document provides guidance on the minimum thickness of the surface and the base course based on the number of heavy trucks using the road per day and the subgrade support condition. (Note: The precursor to the 2015 FHWA document was the 2000 SDLTAP-FHWA “Gravel Roads Maintenance and Design Manual.” This manual contains a low-volume road “design catalog” that recommends aggregate thickness based on more detailed design parameters including traffic level based on ESAL, and U.S. Climatic Region. The design catalog is the same as that contained in AASHTO [1993].)

Per Anvil and Shell, the operational traffic after completion of construction will include a “Light Duty Road Load” (two axles with 11.25 kips per axle) of 12 round trips per day for 7 days per week, though it could be as low as two round trips per day. In addition, the traffic will include a fire or vacuum truck H-25 load (one 10-kip axle plus one 40-kip axle) of one round trip per week. Using the appropriated load equivalency factors from AASHTO (1993) and a 20 year design life, the proposed traffic translates to an equivalent single axle loading (ESAL) ranging from approximately 73,000 to 140,000, i.e., a “high” traffic level as defined in the design catalog for low-volume roads in SDLTAP-FHWA (2000) and

AASHTO (1993). It should be noted that this is less than the 1.0 million ESAL traffic loadings specified for light-duty roads in the Shell DEP.

Subgrades for gravel roads at the facility will likely consist of Stratum 1a cohesive fill, although in some areas could consist of the Stratum 1b granular fill. Where the gravel roads extend over the berms surrounding the tanks, the subgrades would presumably consist of the low permeability silty clay soil required for those berms. During extremely wet periods of the year these low permeability subgrade soils could saturate and soften, hence causing deterioration of the roadway performance under heavy loads. The recommended approach in that situation is to place a suitable geotextile over the subgrade prior to placement of the base course and surface course layers. Subgrade and base course materials should be compacted to 95 percent of the maximum dry density as measured using ASTM D1557.

The recommended section for aggregate access roads from the top down consists of:

- 4 inches top course:
    - Crushed Surfacing Top Course (3/4-inch minus aggregate);
    - Per WSDOT SS 9-03.9(3);
- 5 inches base course:
    - Crushed Surfacing Base Course (1-1/4-inch minus aggregate);
    - Per WSDOT SS 9-03.9(3);
- One layer of Woven or Nonwoven Separation Geotextile:
    - Per WSDOT SS 9-33.2(1)(Table 3);
    - Example: TenCate Mirafi 160N or similar (nonwoven);
    - All seams should be overlapped a minimum of 2 feet;
- Prepared subgrade soils (CBR=10).

The access road section thickness provided above is based on a relatively conservative interpretation of the guidance provided in the most recent (2015) FHWA documents described above. However, the recommended section based on the previous 2000 SDLTAP-FHWA guidance document is approximately 5 inches thicker, i.e., a total section thickness of 14 inches. To balance construction cost against uncertain performance improvements as suggested by a thicker section, we recommend constructing the access road with a total thickness of 9 inches as presented above, but to be prepared to add additional Crushed Surfacing Top Course if actual road performance is found to be less than satisfactory.

Construction traffic may travel on the access road base course; however, prior to installation of the top course, all contaminated base course material should be removed and loosened, re-graded, and re-compacted in preparation of placement of the top course. Construction traffic should not operate on the top course.

Loads from heavy crane “lifts” should be transmitted to the ground surface using outriggers supported on timber mats and/or steel plates to help distribute the load.

7.9 EXCAVATIONS

The surficial Stratums 1a and 1b Fill soils are considered Type B and Type C Soils, respectively, from the standpoint of OSHA/WISHA regulations for excavations, trenching and shoring. This means that temporary cuts greater than 4 feet deep should be no steeper than 1 Horizontal to 1 Vertical (1H:1V) for Type B Soils, and no steeper than 1.5H:1V for Type C Soils; flatter slopes may be required if water or seepage is present. Shoring of cuts more than 4 feet deep should be designed assuming that the lateral earth pressure distribution will linearly increase with depth. The pressures can be calculated using the lateral earth pressure coefficients given in Table 1.

7.10 EARTHWORK AND CONSTRUCTION CONSIDERATIONS

To prepare for earthwork, the potential for encountering elevated levels of environmental contamination at the Site and at the Clean Soils Pile borrow area should first be reviewed with the contractor, including in the two locations where the results of PID screening during drilling of the borings were unreliable due to PID calibration issues at the time of those readings (Borings RPS-3-17 and RPS-4-17). Of the total of 12 borings and four test pits performed during this geotechnical investigation, elevated PID readings were encountered in nine of them. It is our understanding that additional borings were drilled at the Site by others to assess environmental conditions.

Prior to construction, earthwork areas should be stripped of any vegetation and debris, organic topsoil, and any deleterious materials that might be encountered.

In areas that will support tanks, ringwalls, other structures, slabs, and access roads, and in areas that will receive fill, including containment berms, the exposed soil at subgrade elevation should first be compacted with a minimum of four passes of a single-drum self-propelled compactor with a weight at the drum of at least 20,000 pounds. A smooth drum vibratory compactor should be used for granular soils, whereas a sheepsfoot/tamping foot roller is typically more effective for compacting cohesive soils. The soil should be compacted to 95 percent of its maximum dry density as per ASTM D 1557 (Modified Proctor). This initial compaction is particularly applicable to approximately the northern half of Tank 503, where loose to medium dense Stratum 1b granular fill is present as was observed in Boring RPS-3-17.

Following the general compaction described above, the ground surface in areas of proposed tanks, shallow foundations, and access roads should be proof rolled to help identify soft zones that may require repair; areas of fill placement for containment berms and general grading do not require proof rolling. Proof rolling should consist of one pass of a 20-ton tandem axle dual wheel dump truck loaded to the legal limit with tires inflated to at least 125 pounds per square inch (psi). If yielding areas are observed, as evidenced by elastic (rebound) movement or rutting in excess of 1 to 2 inches with substantial cracking or lateral movement, they should be cut to expose undisturbed firm bearing soil and filled to grade with well-graded sand and gravel compacted to at least 95 percent of the maximum dry density as measured using ASTM D 1557. Compacted fill layers should be placed in lifts not more than 9 inches in initial thickness. Another acceptable option is to replace the over-excavated material with controlled density fill (CDF), also known as controlled low-strength material (CLSM). These “flowable fill” materials should have a minimum 28-day compressive strength of 100 psi and a maximum 28-day strength not to exceed 200 psi, as specified in Shell DEP Specification 34.11.00.11 Site Preparation and Earthworks Including Tank Foundations and Tank Farms. The overexcavation described above can be limited to a zone within 1 foot beyond the edge of the foundation or access road at the subgrade elevation, and extending down and out at a 1H:1V slope to the bottom of the excavation. Based on conditions observed in the borings, and except for the overexcavation recommended to mitigate settlements at the Crude and Product Tanks, overexcavation should generally not be needed unless an unusual zone of wet Stratum 1 fill is encountered at structure foundation or access road subgrade elevations.

Soft and wet zones identified in containment berm and general grading areas during the initial compaction work should also be cut to firm bearing soils and backfilled as described above.

The Stratum 1 fill consisting of silty sand or silty clay can easily be disturbed to a soft consistency when exposed to groundwater or rain and subjected to foot and equipment traffic. The contractor should implement measures to protect excavated subgrades from ponded water and construction traffic disturbance. Subgrades soils that become loose, wet, or disturbed should be overexcavated and backfilled as described above prior to placing additional fill, placing concrete for foundations, or placing aggregate for roadways.

If it is necessary to import granular structural fill, we recommend that the imported material be well graded and meet the following grading requirements:

U.S. Standard Sieve Size	Percent Passing
3 inches	100%
No. 4 sieve	0 – 75%
No. 200 sieve	0 – 5%*

*Based on minus 3/4-inch fraction.

A geotechnical engineer should examine and test all materials that are proposed to be imported to the Site for use as structural fill.

Structural fill soil that will support ringwalls, structures, slabs and roadways should be compacted in lifts not less than 4 inches or more than 9 inches in initial thickness to 95 percent of the maximum dry density as measured using ASTM D 1557. The compaction moisture content should be within 2 percent of the optimum value per ASTM D 1557. Structural fill should be limited to 7 percent fines content during wet weather, but could contain up to 15 percent fines or more where moisture can be strictly controlled.

The excavated Stratum 1 soils can be re-used for backfill around the exterior of footings, trenches, and for general site grading. Except for certain areas below ringwalls and tanks as described in the recommendations in Section 7.2, they may also be used for support of footings, slabs-on-grade/mats, or access roads unless an unusual zone of wet soil in a soft condition is encountered. Such materials should be removed and replaced as described above.

Backfill in utility trenches should be in accordance with the pipe manufacturer's recommendations and Shell specifications. In the absence of manufacturer's guidelines, utility pipe zone bedding and pipe zone backfill should extend from the trench bottom, typically 6 inches below the pipe, up to at least 6 inches above the pipe. The pipe zone bedding and backfill should consist of select granular material free or organic matter or debris, and the gradation requirements should meet WSDOT SS Section 9-03.12(3) Gravel Backfill for Pipe Zone Bedding. Backfill above the pipe zone can consist of materials excavated from the trench, except that organic material, wood, or rocks greater than 6 inches in maximum dimension should not be used. Imported well-graded granular fill can also be used as backfill above the pipe zone. The backfill should be compacted to 90 percent of the maximum dry density measured using ASTM D 1557 where the utility trench is not directly beneath access roads. In access road areas, the top 3 feet of trench backfill should be compacted to at least 95 percent. Below 3 feet, it should be compacted to at least 90 percent.

Clay soils fill placed for the containment berms with 1.5H:1V sideslopes up to 10 feet high may be placed in lifts up to 12 inches thick prior to compaction and should be compacted to 93 percent of the maximum dry density measured ASTM D 1557. The moisture content of the soil should be within 2 percent of the optimum moisture content for compaction. Fill placed for containment berms greater than 10 feet high up to the maximum height of approximately 28 feet should be compacted to 95 percent of the maximum dry density. If a smooth drum compactor is used to construct the berms, the top of each lift of fill placed and compacted should be scarified prior to placement of the next lift of fill. To ensure fully compacted berms, they should be overbuilt by 1 foot beyond the design profile, and on completion trimmed back to the design profile, We recommend delaying final trimming as long as possible following construction to the full berm height; this is to allow for the settlements of the berms described in Section 7.3 to occur. Where the berms are constructed on existing ground or embankment slopes inclined 4H:1V or steeper, the ground or embankment should be terraced to avoid forming planes of weakness that could lead to unstable berm slopes. The face of each terrace cut into the existing slope should be a minimum of 1 foot and a maximum of 5 feet in height and should be vertical or near vertical as required to remain stable during fill placement and compaction. The bench of the terrace should slope outward to drain and should not be inclined steeper than 5 percent.

Fill for general grading purposes may be compacted to 88 percent of the maximum dry density, except on slopes steeper than 3H:1V where 93 percent should be achieved. Loose lift thicknesses should be limited to 9 inches.

Perched water may be encountered at the Site during excavation. The quantity of perched water is expected to be limited, and dewatering using local sumps and pumping is considered an appropriate method of water control.

Erosion control efforts during construction should be adopted, and Best Management Practices applied as necessary including stabilization of construction entrances with crushed rock or quarry spalls, mulching of exposed surfaces, protecting catch basins by wrapping grates in geotextile or by surrounding the basin with straw bales or similar sediment trapping materials, erecting check dams or silt fencing that is properly keyed into the base, and applying final seeding upon completion of construction.

AECOM recommends that a geotechnical engineer be present on site to observe subgrade proof rolling, overexcavation and repair, and structural fill placement and compaction in structure, slab, access road, and fill areas. The engineer should review the final foundation subgrade before concrete is placed. The geotechnical engineer should also monitor installation of piles to assure that conditions encountered are not different from those assumed for design, and to assure that proper installation procedures are followed. Our observations will be used to assess the capability of each pile to support the design load. Our field representative will evaluate the contractor’s compliance with the contract specifications and the intent of the recommendations of this report.

8.0 LIMITATIONS

The recommendations and descriptions presented in this report are based on soil conditions disclosed by the borings drilled and test pits excavated during this and previous investigations at the Site. The existing subsurface information referred to herein does not constitute a direct or implied warranty that the soil conditions between exploration locations can be directly interpolated or extrapolated, or that subsurface conditions and soil variations different from those disclosed by the borings and test pits will not be revealed. If, during construction, subsurface conditions different from those described herein are observed, AECOM should be notified so that such conditions can be reviewed and the recommendations given herein revised as necessary. Similarly, changes to the structure including modified locations, load magnitudes and footing sizes should be brought to the attention of AECOM so that the potential effect of these changes can be assessed.

9.0 REFERENCES

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TABLES

(Note: Tables 2 and 3 are embedded in text of report)

Table 1 - Summary of Soil Conditions and Design Parameters
RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery - Anacortes, Washington

Parameter	Granular Compacted Fill	Stratum 1a Fill: Clay/Silt M. Stiff -V. Stiff	Stratum 1b Fill: Silty Sand Loose-M. Dense	Stratum 2 Clay V. Stiff-Stiff	Stratum 3 Silty Sand/Sand Dense-V. Dense	Stratum 4 Clay/Silt V. Stiff-Hard
Typical Uncorrected N-values (bpf)	n/a	6 - 18	6 - 24	9 - 23	22 - 50/2"	43 - 50/4"
Total Unit Weight, γ (pcf)	130	126	125	128	130	130
Shear Strength - Drained						
ϕ' (deg)	36	30	35	28 - 32	40	-----
c' (psf)	0	50	0	500 - 1,500[3]	0	-----
Shear Strength - Undrained						
ϕ (deg)	36	0	35	0	40	0
$S_{u\ (psf)}$	0	1,700	0	3,000	0	4,000
Elastic Modulus, E_s (ksf)	1,200	1,000	600	1,100	1,500	1,300
Poisson's Ratio, ν	0.30	0.40	0.25	0.45	0.30	0.50
Active Earth Pressure Coef., K_a	0.26	0.33	0.27	0.28	0.22	0.31
At-Rest Earth Pressure Coef., K_o	0.41	0.50	0.63	0.44	0.36	0.68
Passive Earth Pressure Coef., K_p	3.85	3.00	3.69	3.5	4.6	3.25
Seismic Earth Pressure Coef. per IBC (2015) - PGA_M = 0.48 g for Site Class D, 2,475-yr return period, 2008 USGS Hazard Data						
For Seismic Horizontal and Vertical Acceleration Coefficients: $k_h = PGA_M/2 = 0.24$; $k_v = 0$:						
Seismic Active Earth Pressure Coef., K_{ae}	0.41	0.51	0.43	0.44	0.36	0.47
Seismic Passive Earth Pressure Coef, K_{pe}	3.35	2.55	3.20	3.05	4.06	2.79
Soil-Concrete Friction Coef., f (=tan δ)	0.45	0.33	0.35	0.40	0.45	0.47
Modulus Subgrade Reaction, k_s (pci)	250	200	220	230	350	230
CBR	20	10	15	n/a	n/a	n/a

Notes:
1. The static E_s values apply to moderately large shear strain levels of approx 10^{-1} percent, i.e. for footing loads.
2. The k_s values are typical for results of tests on 30-inch-diameter plates, and need not be corrected for size or shape of the loaded area.
3. The drained cohesion for Stratum 2 varies with depth and was estimated assuming OCR=3 and an m-value of 0.5 (Terzaghi et al. 1996, p. 153).
4. Values listed above generally represent average to the slightly conservative side of average values based on interpretation of available data. Natural variability of soil conditions and parameters are expected to occur throughout the site. An exception is that the values of K_p and Soil-Concrete Friction Coefficient are considered "Ultimate" values, and should be used with a factor of safety of at least 1.5.

Table 4 - Summary of Corrosivity Testing Results

RP&S New Crude Tank and Product Tanks Project

Shell Puget Sound Refinery - Anacortes, Washington

Sample No.[1]	Depth[2] bgs (ft)	Soil Type	Moisture (%)	pH	Conductivity (μS/cm)	Resistivity[4] (ohm/cm)	Chloride (mg/kg)	Sulfate (mg/kg)	Sulfate Mass %
RPS-2_6	5.5 - 6.0	Fill - Lean Clay (CL)	20.2	6.30	201	4,975	51.9	5.81	0.000581
TP-4_2	1.5 - 2.0	Fill - Lean Clay (CL)	18.2	7.45	275	3,636	6.90	77.2	0.00772

Notes:

1. Samples collected from a boring and a test pit by AECOM on June 7 and 9, 2017.
2. bgs = below ground surfce.
3. Chemical analyses (excluding resistivity) conducted by Fremont Analytical. Refer to Appendix D for analytical report.
4. Resistivity = 1/Conductivity; computed by AECOM.

Criteria for Assessing Ground Corrosion Potential (after FHWA, 2003)

Test	Units	Strong Corrosion Potential/Aggressive	Mild to No Corrosion Potential/Non-Aggressive	ASTM Standard	AASHTO Test Method
pH (of soil)	---	< 4.5, > 10	5.5 < pH < 10	G51	T 289-91
Resistivity	ohm-cm	< 2,000	Greater than 5,000	G57	T 288-91
Sulfates	ppm	> 200	Less than 200	D516	T 290-91
Chlorides	ppm	> 100	Less than 100	D512	T 291-91
Stray Current	---	Present	---	---	

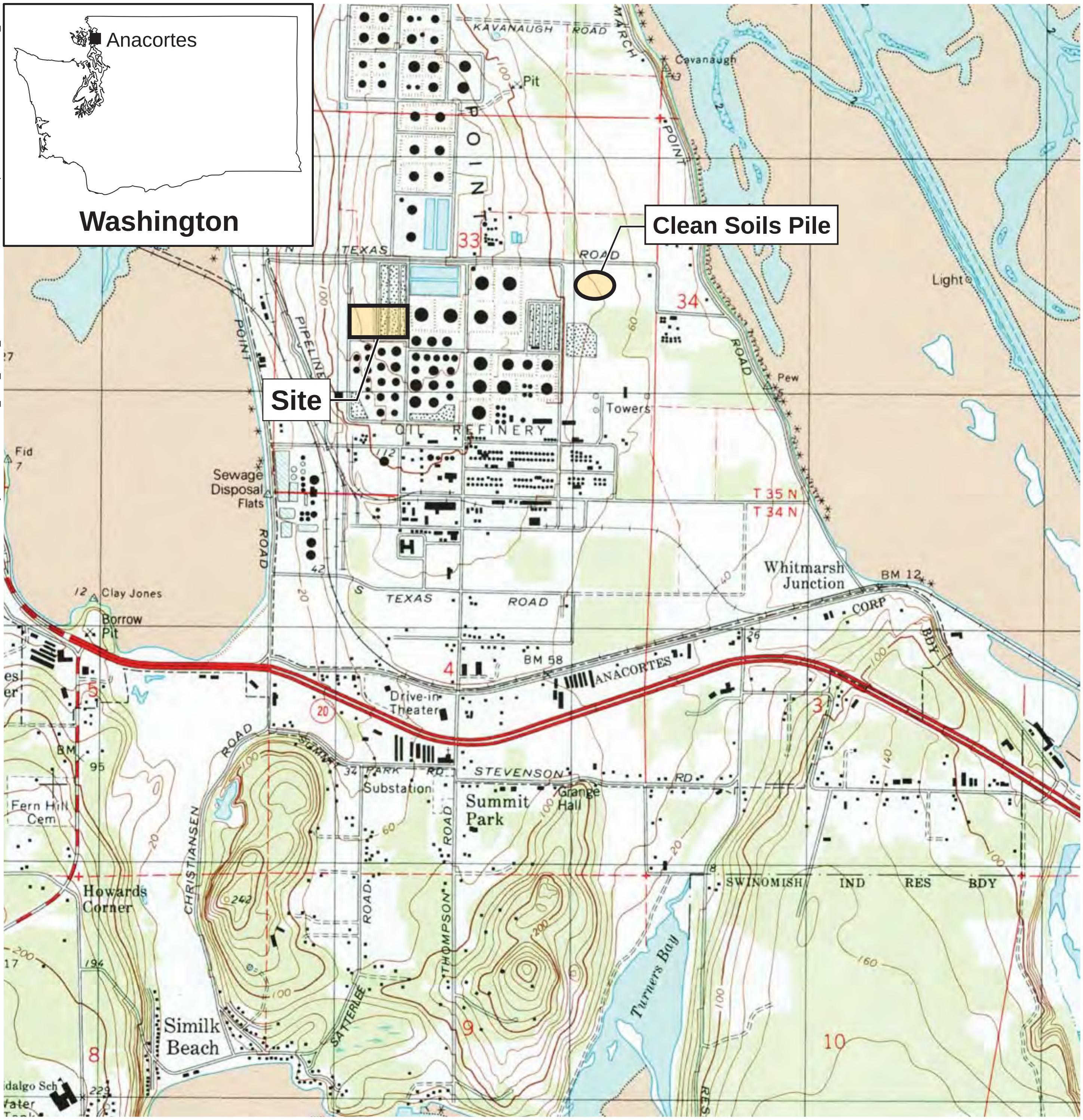
Note: (1) ppm = parts per million

Reference: FHWA (2003). **Soil Nail Walls**, Geotechnical Engineering Circular No. 7, Report No. FHWA-IF-03-017 (Authors: Lazarte, C.A., Elias, V., Espinoza, D.R., and Sabatini, P.J.)

Criteria for Sulfate Exposure (ACI 318-14)

Class	Severity	Sulfate in Soil (percent by mass)
S0	Not applicable	$SO_4^{2-} < 0.10$
S1	Moderate (Seawater)	$0.10 \leq SO_4^{2-} < 0.20$
S2	Severe	$0.20 \leq SO_4^{2-} \leq 2.00$
S3	Very severe	$SO_4^{2-} > 2.00$

FIGURES



Source: USGS 7.5-minute topographic quadrangle, Anacortes South, Washington, 1998

0 2,000 4,000

Scale in Feet

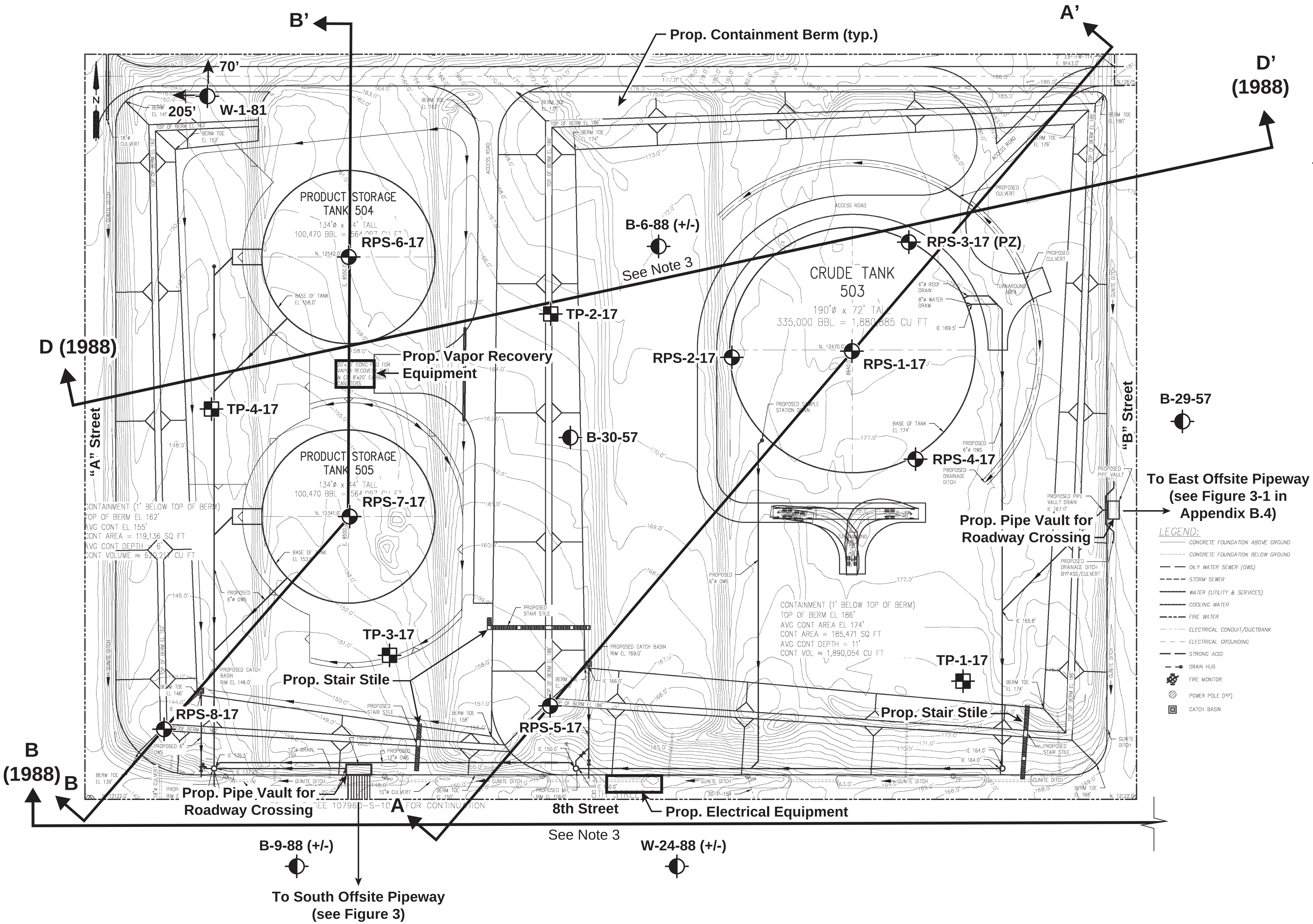
Job No. 60544813

Figure 1

Site Location Map

AECOM

RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery – Anacortes, Washington



Legend

Test pit location

Current/historical boring location

A A' Subsurface profile location

Notes

1. The locations of the current borings and test pits were obtained with a global positioning system unit. The ground elevations of the current borings and test pits were estimated from topographic contours on the basemap source drawing provided by Anvil.
2. The locations and elevations of previous subsurface explorations were obtained from figures and borings logs contained in reports from previous geotechnical or hydrogeologic investigations. See Appendix B.
3. See Appendix B.4 for Geologic Cross Sections B-B' and D-D' contained in the Landau (1988) "Final Report, Hydrogeologic Investigation, Texaco Puget Sound Plant."
4. Existing topography based on laser scan performed by Anvil in January 2017.
5. Area shown comprises south half of existing West Land Treatment Farm.

0 80 160
Scale in Feet

Basemap Source: Anvil Drawing No. 107960-S-1008 (Rev. A) "RP&S New Crude Tank & Product Storage Tanks, Preliminary Site Plan," dated 04/2017.

Job No. 60544813

Figure 2
Site Plan

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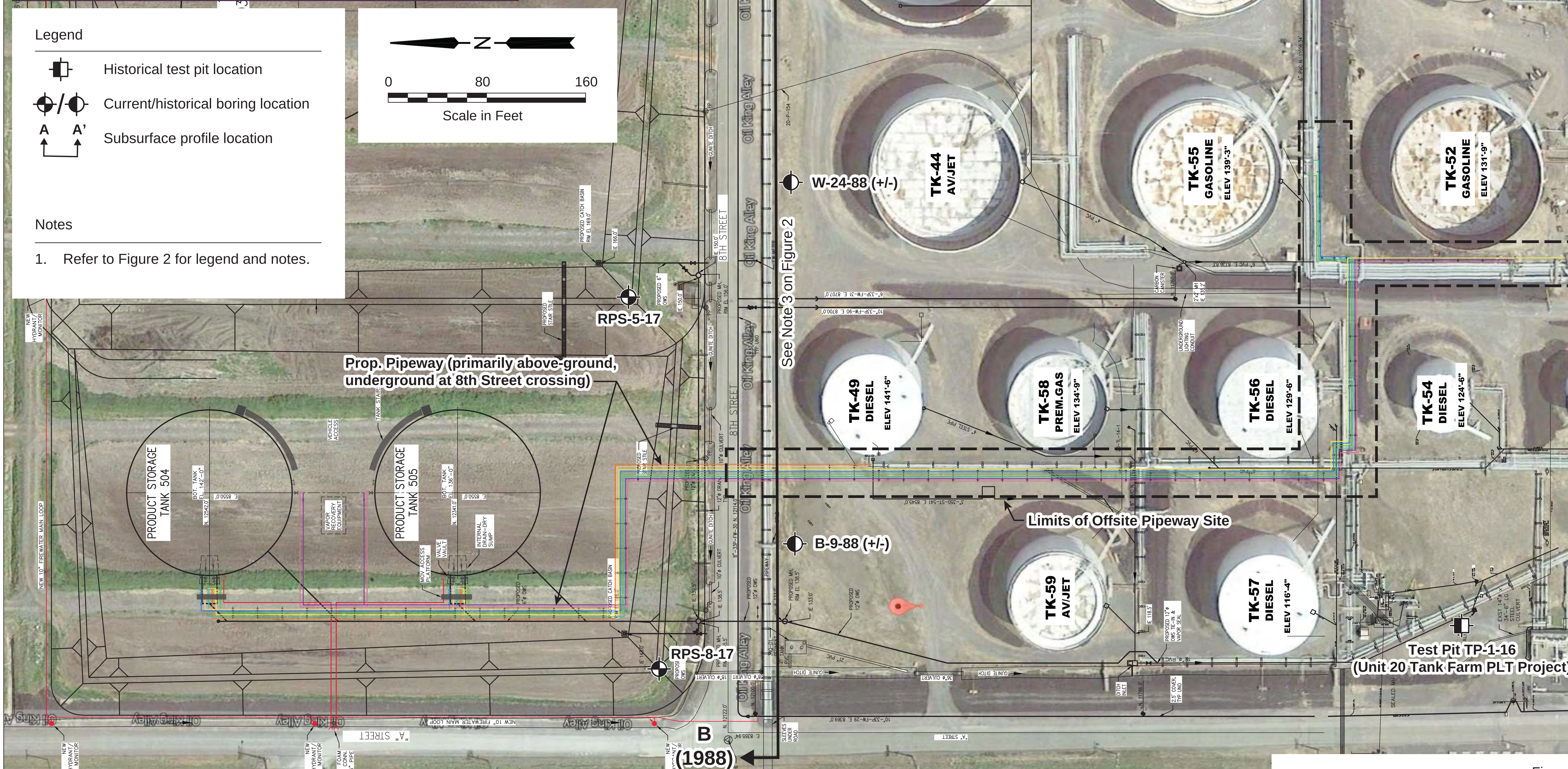
RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery – Anacortes, Washington

PIPING INFORMATION

LINE NUMBER	LENGTH	SERVICE	TIE–IN
8"–21–P–XXX5–1CB1S01	652'–1"	DIESEL TO TANK 504/505, FROM ULSD BLENDING	1
20"–21–P–XXX6–1CB1S01	658'–2"	DIESEL FROM TANK 504/505 TO OPL/SHIPPING	2
16"–21–P–XXX1–1CB1S01	1342'–10"	PREM. AND REG. GASOLINE TO TANK 504/505, FROM GAS BLENDING	3
20"–21–P–XXX2–1CB1S01	1330'–8"	REGULAR GASOLINE FROM TANK 504/505 TO OPL	4
10"–21–P–XXX7–1CB1S01	1350'–0"	REG. GASOLINE RECIRC. TO MOGAS PUMPS	5
20"–21–P–XXX4–1CB1S01	1381'–0"	PREMIUM GASOLINE FROM TK504/505 TO SHIPPING	6
20"–21–P–XXX3–1CB1S01	1305'–0"	REGULAR GASOLINE FROM TK504/505 TO SHIPPING	7
10"–21–P–XXX8–1CB1S01	1350'–8"	PREMIUM GASOLINE RECIRC. TO MOGAS PUMPS	8

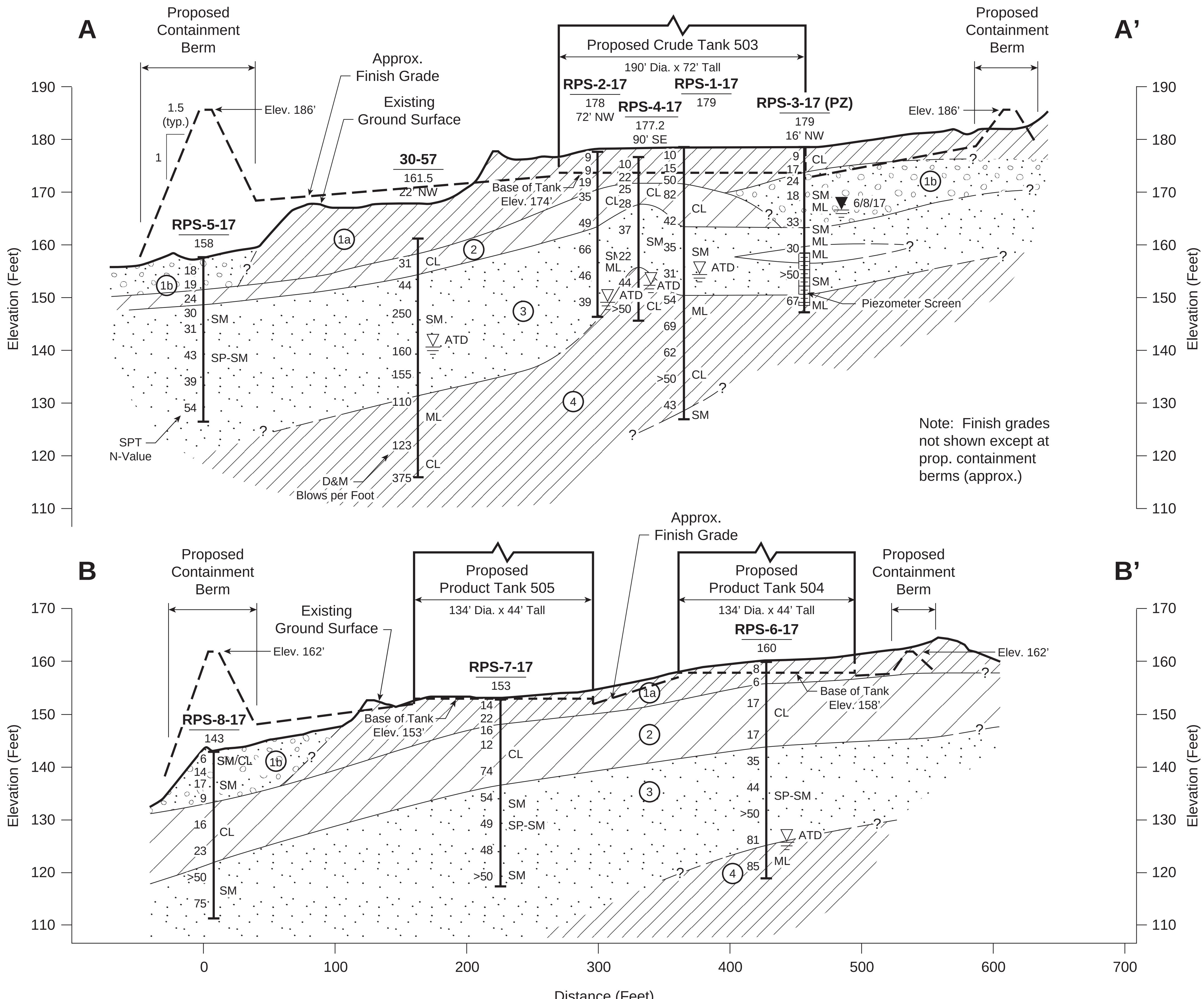


Basemap Source: Anvil Drawing No. 107986-P-1002 (Rev. A) "Product Tanks TK-504/TK-505, Overall Site Transposition," dated 4/17.
Job No. 60544813

Figure 3
South Offsite Pipeway Site Plan

AECOM

RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery – Anacortes, Washington



Soil Strata

1a Cohesive fill, brown to dark gray silty clay (CL) (medim stiff to very stiff)

1b Granular fill, brown silty SAND (SM) (loose to medium dense)

2 Brown silty CLAY (CL) (stiff to hard)

3 Brown to gray silty SAND to SAND (SM/SP-SM) (dense to very dense)

4 Gray silty CLAY (CL) (very stiff to hard)

Legend

RPS-2-17 Boring number
178 Surface elevation (feet)
72' NW Offset from profile line

6/8/17 Water level and date measured in piezometer well

ATD Water level at time of drilling

Notes

1. The soil conditions are known only at the boring and test pit locations and are therefore accurate only at these points. The profile is based on interpolation or extrapolation between conditions observed at the boring locations and should be considered approximate.
2. Only selected proposed structures are shown.

0 80 160
Horizontal Scale in Feet
Vertical Exaggeration = 4x

Job No. 60544813

Figure 4
Estimated Subsurface Profiles A-A' and B-B'

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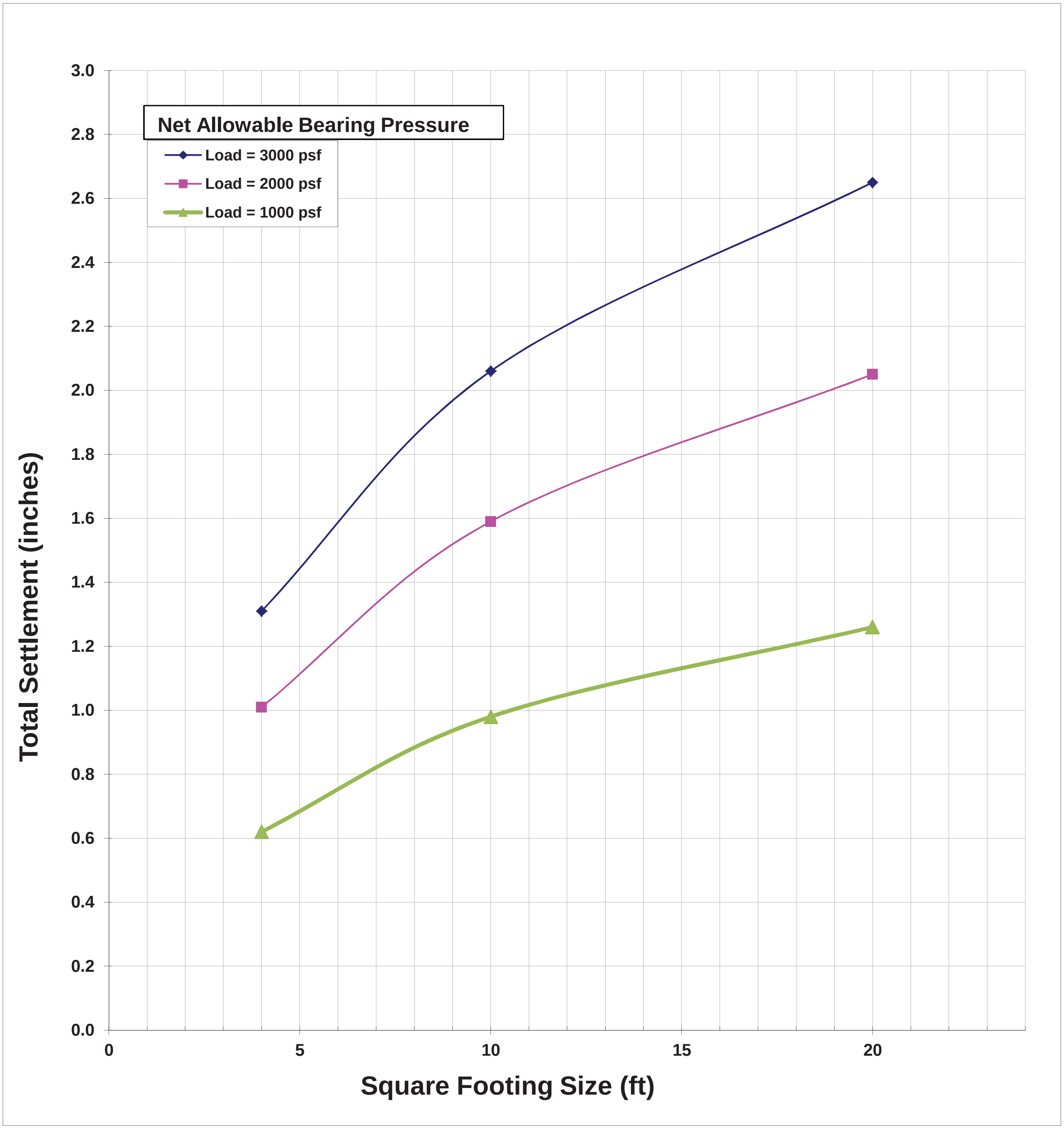
Shell Puget Sound Refinery – Anacortes, Washington



Notes:

1. Settlements conservatively assume soil profile consisting of 18 ft of Stratum 1a Fill over 25 ft Stratum 3 dense to very dense silty sand over 35 ft Stratum 4 very stiff to hard clay/silt.
2. Settlements assumes rigid footing and static loading of footing.
3. Groundwater surface assumed at 30 ft below ground surface.
4. Footing depth of 2 ft assumed. Footings bear at varying elevations.

Figure 5

Job No.: 60544813

Estimated Settlement of Shallow Foundations

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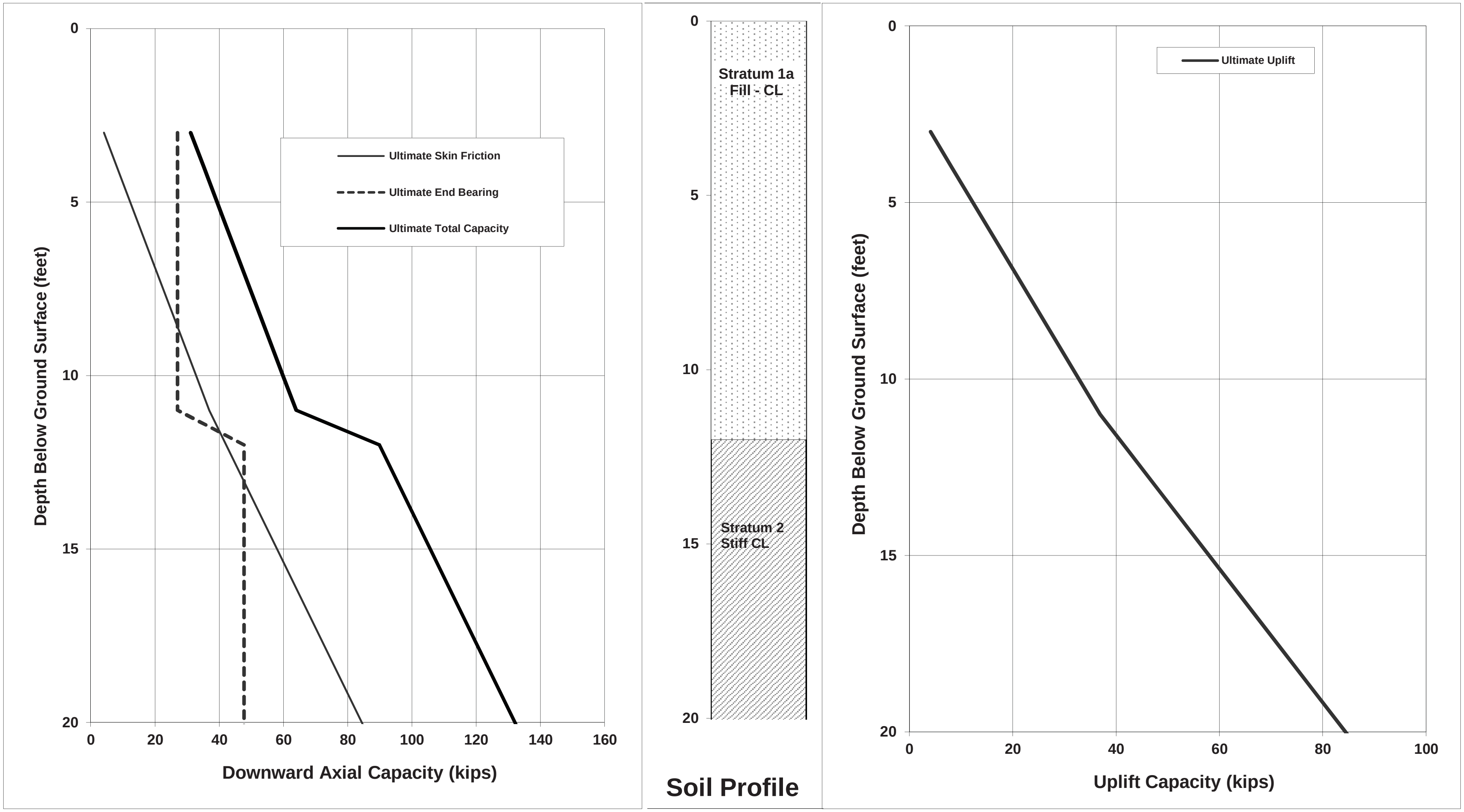
Shell Puget Sound Refinery - Anacortes, Washington



Notes:

1. Soil information mainly based on Borings RPS-1-17 to RPS-8-17.
2. Assumed groundwater level 32 ft bgs.
3. Top of pile elevation varies depending on location at the site.
4. Pile uplift capacity does not include weight of pile.
5. Friction contribution from top 2 feet of soil profile excluded.

FIGURE 6

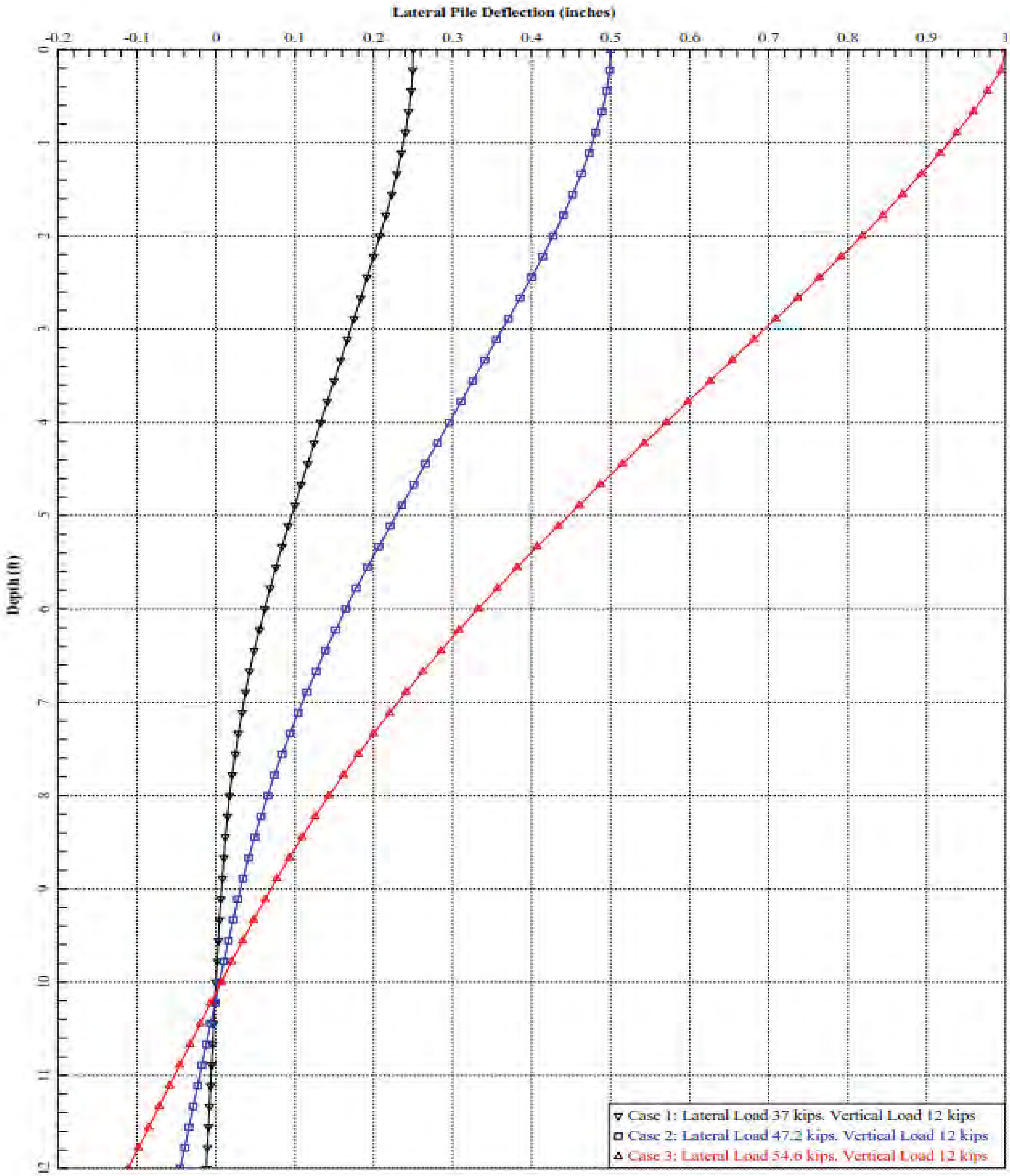
Job No.: 60544813

Ultimate Axial Loads, 18-in-Dia. Augercast Concrete Pile

AECOM

RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery - Anacortes, Washington

J:\DCS\Projects\WTR\60544813_Shell_RP&S_Tanks\400-Technical\433-Calcs\433.6a_Axial_Pile\Axial Capacity 18-in Augercast Pile R2.xls



Notes:

1. Assumed soil profile: 12 ft Stratum 1a Cohesive Fill. Refer to Figure 4.
2. Assume groundwater level depth 32 feet bgs.
3. Assume a generic rebar cage for augercast pile (6 - #8 bars, 1.86% steel ratio).
4. Assume top of the pile 2 ft below ground surface.

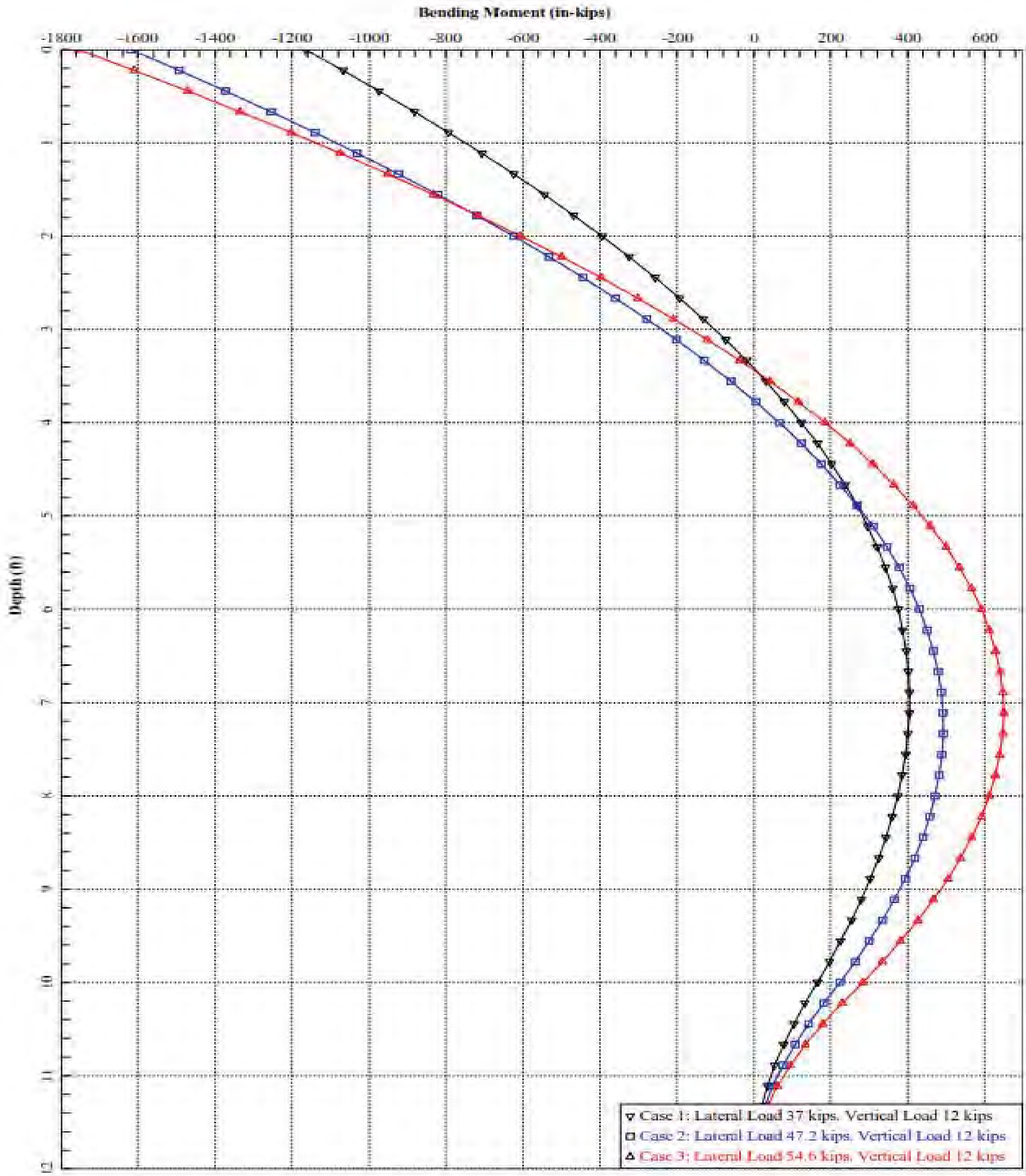
FIGURE 7

Job No.: 60544813

Lateral Deflection vs. Depth, 18-inch-Dia. Fixed Head Augercast Concrete Pile

AECOM

RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery - Anacortes, Washington



Notes:

1. Assumed soil profile: 12 ft Stratum 1a Cohesive Fill. Refer to Figure 4.
2. Assume groundwater level depth 32 feet bgs.
3. Assume a generic rebar cage for augercast pile (6 - #8 bars, 1.86% steel ratio).
4. Assume top of the pile 2 ft below ground surface.

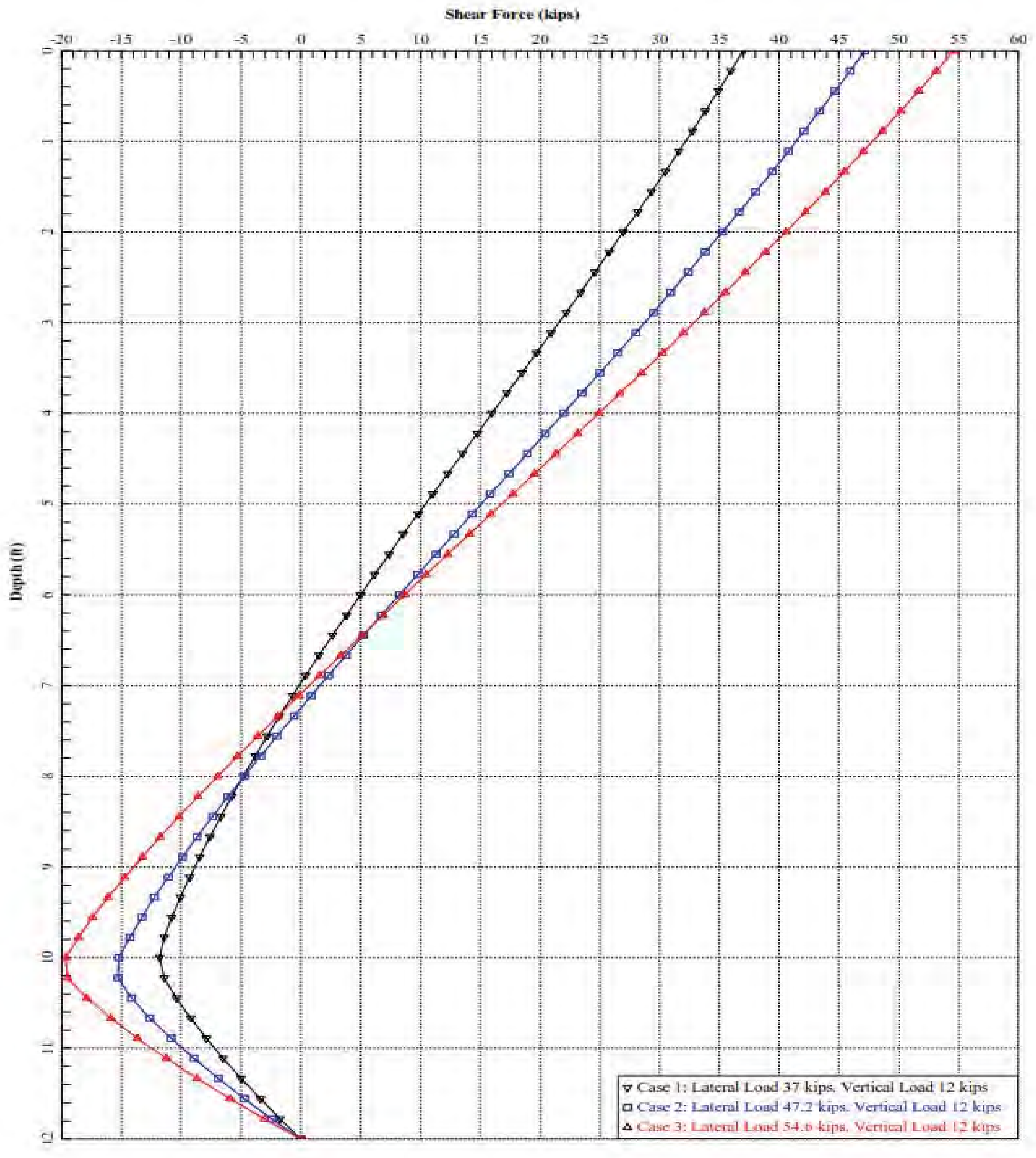
FIGURE 8

Job No.: 60544813

Bending Moment vs. Depth, 18-inch-Dia. Fixed Head Augercast Concrete Pile

AECOM

RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery - Anacortes, Washington



Notes:

1. Assumed soil profile: 12 ft Stratum 1a Cohesive Fill. Refer to Figure 4.
2. Assume groundwater level depth 32 feet bgs.
3. Assume a generic rebar cage for augercast pile (6 - #8 bars, 1.86% steel ratio).
4. Assume top of the pile 2 ft below ground surface.

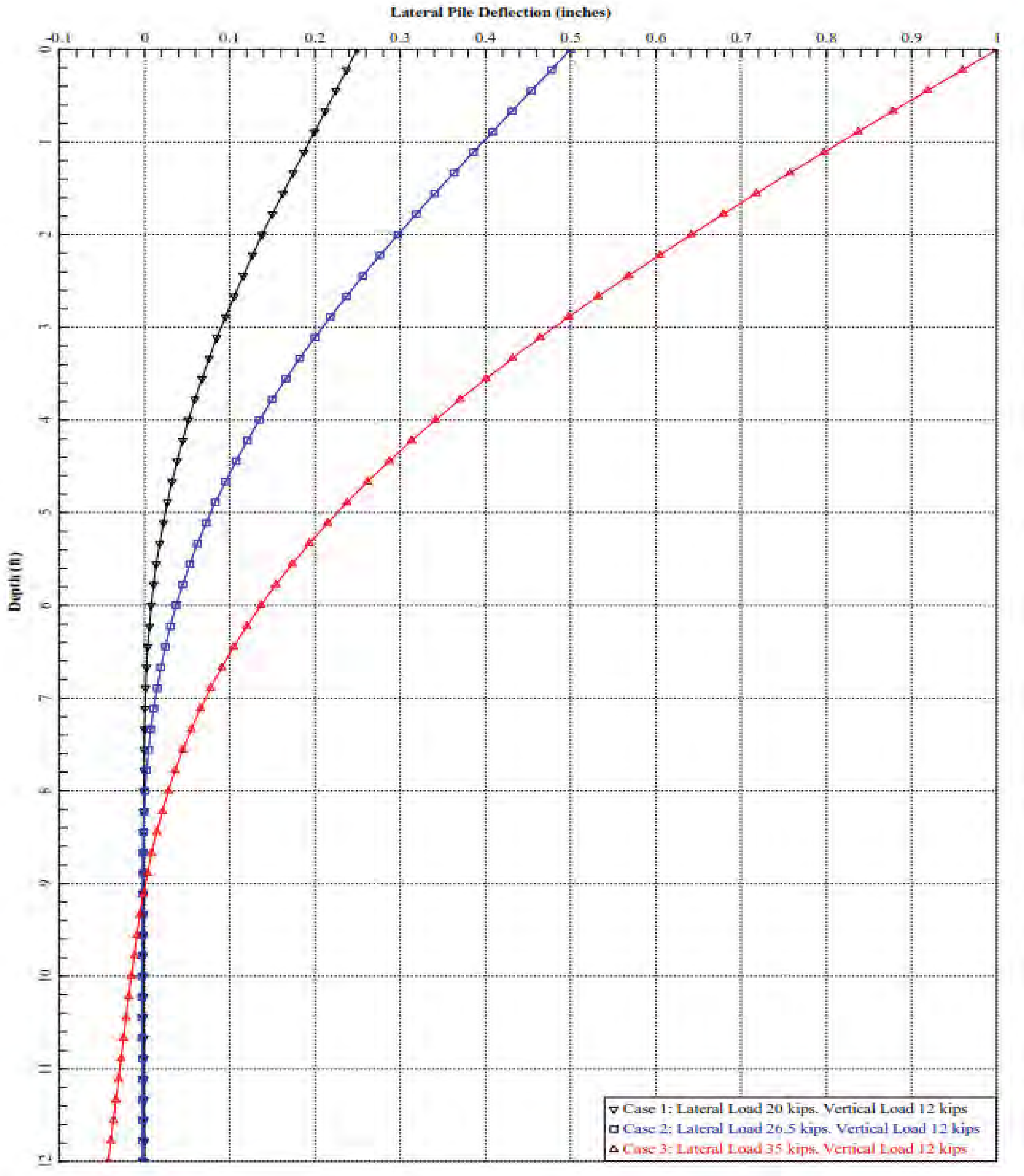
FIGURE 9

Job No.: 60544813

Shear Force vs. Depth, 18-inch-Dia. Fixed Head Augercast Concrete Pile

AECOM

RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery - Anacortes, Washington



Notes:

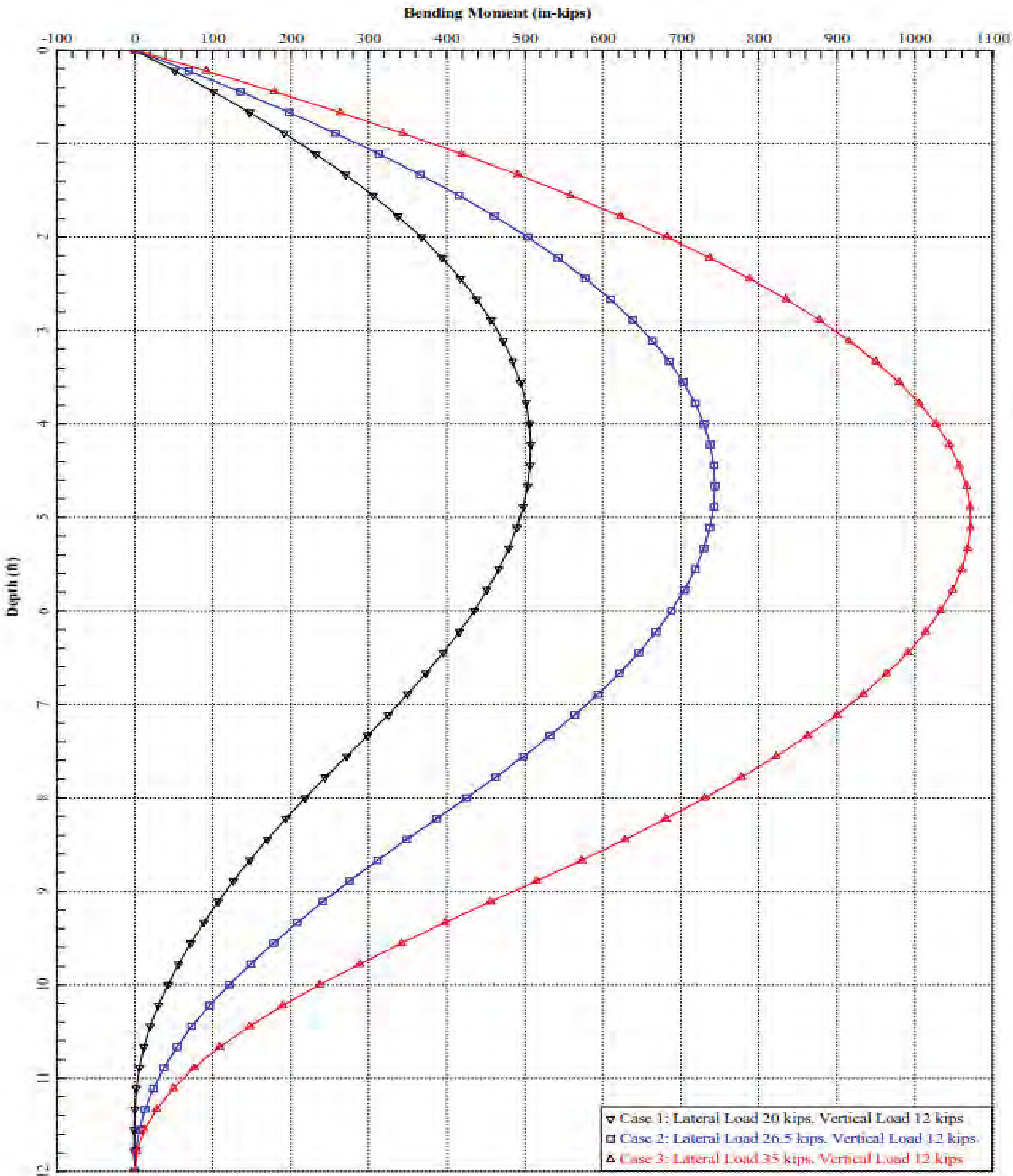
1. Assumed soil profile: 12 ft Stratum 1a Cohesive Fill. Refer to Figure 4.
2. Assume groundwater level depth 32 feet bgs.
3. Assume a generic rebar cage for augercast pile (6 - #8 bars, 1.86% steel ratio).
4. Assume top of the pile 2 ft below ground surface.

FIGURE 10

Job No.: 60544813 **Lateral Deflection vs. Depth, 18-inch-Dia. Free Head Augercast Concrete Pile**

AECOM

RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery - Anacortes, Washington



Notes:

1. Assumed soil profile: 12 ft Stratum 1a Cohesive Fill. Refer to Figure 4.
2. Assume groundwater level depth 32 feet bgs.
3. Assume a generic rebar cage for augercast pile (6 - #8 bars, 1.86% steel ratio).
4. Assume top of the pile 2 ft below ground surface.

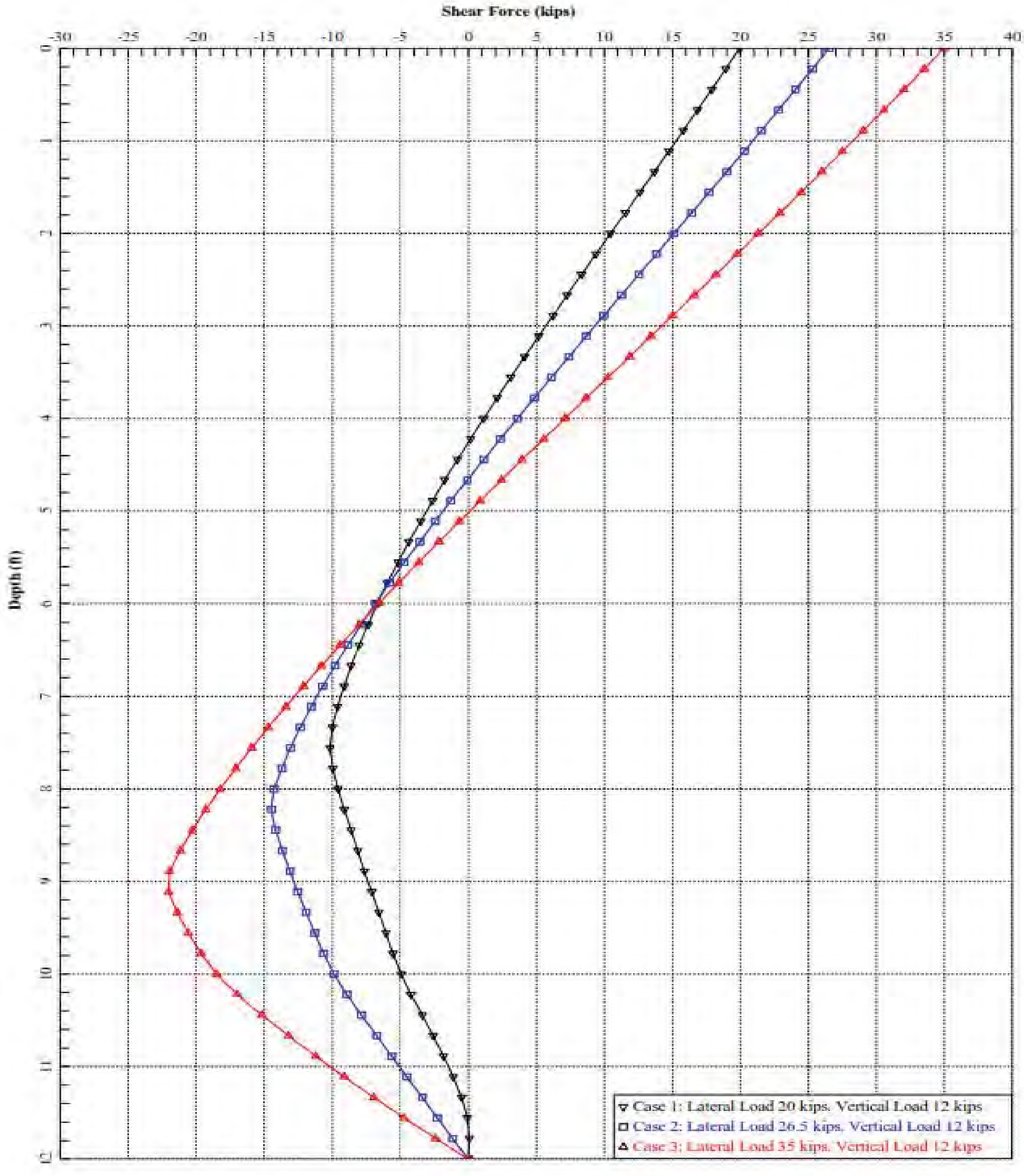
FIGURE 11

Job No.: 60544813

Bending Moment vs. Depth, 18-inch-Dia. Free Head Augercast Conrete Pile

AECOM

RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery - Anacortes, Washington



Notes:

1. Assumed soil profile: 12 ft Stratum 1a Cohesive Fill. Refer to Figure 4.
2. Assume groundwater level depth 32 feet bgs.
3. Assume a generic rebar cage for augercast pile (6 - #8 bars, 1.86% steel ratio).
4. Assume top of the pile 2 ft below ground surface.

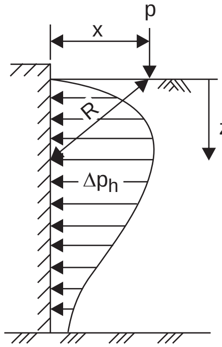
FIGURE 12

Job No.: 60544813

Shear Force vs. Depth, 18-inch-Dia. Free Head Augercast Concrete Pile

AECOM

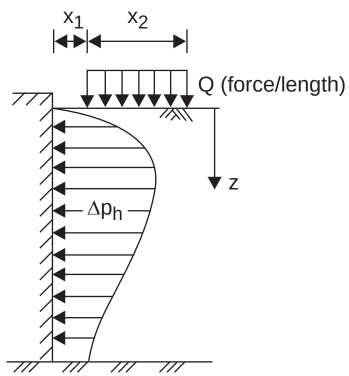
RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery - Anacortes, Washington



$$\Delta p_h = \frac{4p}{\pi}\,\frac{x^2 z}{R^4}$$

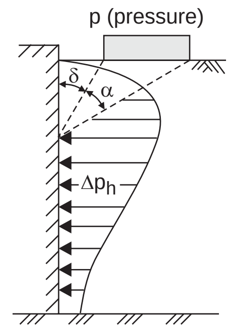
p = magnitude of line load

a) Infinite line load parallel
to the wall.
After Scott (1963)



$$\Delta p_h = \frac{Q}{\pi z}\left(\frac{1}{\left[1+\left(\frac{z}{x_2}\right)^2\right]^{3/2}} - \frac{1-2v}{\left[1+\left(\frac{z}{x_2}\right)^2\right]^{1/2}+\frac{z}{x_2}} - \frac{1}{\left[1+\left(\frac{z}{x_1}\right)^2\right]^{3/2}} + \frac{1-2v}{\left[1+\left(\frac{z}{x_1}\right)^2\right]^{1/2}+\frac{z}{x_1}}\right)$$

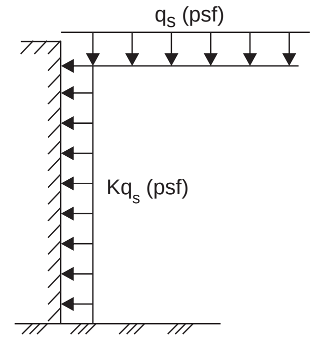
b) Line load of finite length
oriented perpendicular to the wall.
After Peck and Mesri (1987)



$$\Delta p_h = \frac{2p}{\pi}[\alpha - \sin\alpha\cos(\alpha + 2\delta)]$$

where α and δ are in radians

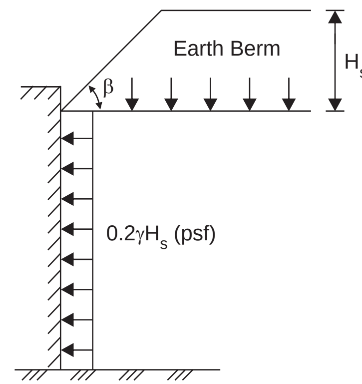
c) Infinite strip load oriented
parallel to the wall.
After Scott (1963)



K = K_a for Active
Earth Pressure Case

K = K_o for At-Rest
Earth Pressure Case

d) Infinite areal load.



$\beta \leq$ 1.5H : 1V
$H_s \leq$ 28 feet
γ = unit weight of earth berm

e) Earth berm
Derived from
Perloff et al. (1967)

Source: Foundation Engineering Handbook (1991), F.Y. Fang

Figure 13
Recommended Lateral Pressures from Surcharge Loading

Job No. 60544813

AECOM

RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery – Anacortes, Washington

APPENDIX A

FIELD EXPLORATION PROGRAM

APPENDIX A

FIELD EXPLORATION PROGRAM

A.1 Introduction

The subsurface exploration program for the proposed RP&S New Crude Tank and Product Tanks Projects in Anacortes, Washington consisted of drilling and sampling eight soil borings numbered RPS-1-17 through RPS-8-17, and excavating and sampling four test pits numbered TP-1-17 through TP-4-17. The exploration program was executed from June 5 to 9, 2017. The exploration locations are shown in Figure 2. The locations of the borings and test pits were determined using Trimble GeoXH GPS equipment. The elevations of the borings and test pits were estimated from topographic elevation contours on plans provided by Anvil; the topographic contours were based on a laser scan in January 2017. The accuracy of the boring and test pit locations and elevations is implied by the method used to determine them. The logs of the borings and test pits are included in this appendix, and a key to terms used in the boring and test pit logs is also provided.

A.2 Field Soil Classification

A geotechnical engineer from AECOM was present throughout the current field exploration periods to: observe the drilling, excavating, and sampling; retrieve representative soil samples for subsequent laboratory testing; and prepare descriptive field logs of the explorations. Soils were classified in general accordance with the ASTM International (ASTM) Designation D 2488-93, “Standard Recommended Practice for Description of Soils (Visual-Manual Procedure).” The Unified Soil Classification System (USCS), as described in the boring log key, was used to classify the soils encountered in the soil borings. The current exploration logs in this report represent AECOM’s interpretation of the contents of the field logs.

A.3 Drilling and Excavating Procedures

Environmental Drilling, Inc. (EDI) of Snohomish, Washington, under subcontract to AECOM, drilled the borings using a truck-mounted drill rig, except that the first 15 feet of the first boring, Boring RPS-1-17, were drilled with a track-mounted rig. (Note: The borings were originally all intended to be drilled with a track-mounted rig, but stiff to hard clay soil drilling conditions encountered the first day resulted in slow progress. Therefore, a more powerful truck-mounted rig was mobilized to the Site the second day.) The drilling with the track rig was accomplished using 3.25-inch-inside-diameter hollow-stem auger (HSA) drilling techniques. The drilling with the truck rig was performed with a 4.25-inch-inside-diameter HSA. Hollow-stem auger drilling consisted of advancing continuous-flight augers to remove soil from the borehole. Soil samples were taken from the bottom of the boring at each sampling interval by removing the center rod and lowering a split-barrel (“split-spoon”) sampler through the hollow stem to the sampling elevation. The split-spoon sampler was advanced by standard penetration testing (SPT, see below) using an automatic hammer, except for the first four samples in Boring RPS-1-17, where the SPT tests were performed with a manual safety hammer using a rope and cathead. The automatic hammer used for this exploration program is becoming the standard choice for geotechnical work because the SPT hammer blow count N-values are less prone to operator and equipment influences than N-values from hammers previously used by the industry (e.g., safety hammers and donut hammers used with rope-and-cathead equipment). However, information published in the literature and collected by AECOM shows that N-values from an automatic hammer are moderately to substantially lower than N-values obtained from older type hammers. Automatic hammer N-values should be multiplied by a factor ranging from 1.25 to 2 or more to obtain equivalent N-values for comparison with older data (e.g., Boring 29-57 and 30-57 at or near the Site) and for correlations between N-value and soil engineering properties.

At each of four test pit locations, Shell's on-call contractor WRS used a track excavator to excavate the pits to 7 to 9 feet below ground surface, the final depth being based on subsurface conditions encountered.

A.4 Soil Sampling and Field Testing

During drilling, representative samples of the soils encountered in the boreholes were obtained. The samples in boreholes were collected at 2.5-foot-intervals from 2.5 feet below ground surface to 10 feet below ground surface. The samples were collected at 5-foot-intervals below 10 feet below ground surface to the bottom of the boring. To obtain relatively disturbed samples from the borings, Standard Penetration Tests (SPT) were performed in accordance with ASTM designation D 1586, "Standard Method for Penetration Testing and Split-Barrel Sampling of Soils." The SPT consists of driving a 2-inch-outside-diameter, split-spoon steel sampler a distance of 18 inches into the bottom of the borehole at each sampling depth interval using a 140-pound hammer falling 30 inches. The number of blows required for the last 12 inches of penetration is termed the Standard Penetration Resistance, or N-value. This value is an empirical parameter that provides a means for evaluating relative density, or compactness, of granular soils, and the consistency, or stiffness of the cohesive soils. These values are plotted at the appropriate depths on the boring logs presented in this appendix.

AECOM's field engineer also collected "grab" samples from the test pits during excavation, typically from the soil brought to ground surface in the excavator bucket.

Field testing consisted of pocket penetrometer (PP) tests on SPT samples collected over the full depth of each boring and test pit. In addition, we performed organic vapor screening (using a meter with a photoionization detector, PID) on SPT and grab samples collected from samples shallower than about 35 feet below ground surface. Results of both types of field testing are shown in the "Remarks and Other Tests" column in the boring and test pit logs and identified with the abbreviation "PP" and "PID," respectively. Pocket penetrometer tests are index tests that give an approximation of q_u, the unconfined compressive strength of the cohesive soil. PID screening indicates whether the soil samples may be potentially environmentally contaminated, based on the results of monitoring with a MiniRAE 3000 organic vapor meter having a photoionization detector with a 10.6 electron volt (eV) lamp.

A.5 Boring and Test Pit Logs

A boring or test pit log is a written record of the subsurface conditions encountered. It graphically illustrates the geologic units (layers) encountered in the boring or test pit and the USCS symbol of each geologic layer. Other information shown in the logs includes SPT blow counts, groundwater conditions observed during drilling or excavating, approximate ground surface elevation, types and depths of sampling, and results of field testing. It also includes the results of laboratory index testing, including natural water content and fines content (percent passing the No. 200 sieve), where tested.

A.6 Boring and Test Pit Completion

At completing of drilling and sampling at each boring location except Boring RPS-3-17 (PZ), EDI backfilled the boring with bentonite grout to about 2 feet below ground surface, followed by bentonite chips to within about 0.5 feet below ground surface. The remaining hole was backfilled with onsite fill soil to match the ground surface. Excess soil cuttings were spread on the ground at each drill site as directed by Shell.

At completing of drilling and sampling of Boring RPS-3-17 (PZ), EDI installed a 2-inch-diameter monitoring well in the boring using open-hole piezometer construction. The well screen and solid riser consisted of Schedule 40 PVC casing. The filter pack around the well screen was constructed using medium sand, and to seal the well, bentonite chips were place from the top of the filter pack to 0.5 feet below ground surface. The well was finished with a steel flush-mount monument set in concrete.

After excavating and sampling each of the four test pits, WRS backfilled the test pit with the excavated soils placed to match the ground surface. WRS tamped the backfilled soils in lifts using the excavator bucket.

Table A.1 - Summary of Borings and Test Pits[1]
RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery - Anacortes, Washington

Boring No.[2,3] or Test Pit No.	Date Drilled	Location[4]		Location[4,5]		Ground Elev[6] (ft)	Total Depth (ft)	Bottom Brg Elev[6] (ft)	GW Depth (ft)	GW Elev[6] (ft)	Groundwater Measurement[7] Time and Remarks
		Latitude	Longitude	Northing	Easting						
RPS-1-17	6/5-6/6/2017	48.476242	-122.563950	12,470	8,940	179	51.5	128	24	155	ATD - noted by driller
PRS-2-17	6/7/2017	48.476235	-122.564336	12,465	8,847	178	31.5	147	28.5	150	ATD - noted by driller
RPS-3-17 (PZ)	6/6/2017	48.476469	-122.563760	12,554	8,984	179	31.5	148	12.5	167	6/8/17 @ 16:15 in well (well screen depth is 20 to 30 feet). Also encountered ATD at 18 ft as noted by driller.
RPS-4-17	6/6/2017	48.476009	-122.563755	12,386	8,989	177	31.5	146	24	153	ATD - noted by driller
RPS-5-17	6/8/2017	48.475503	-122.564948	12,195	8,705	158	31.5	127	N.E.	---	No groundwater encountered
RPS-6-17	6/7/2017	48.476465	-122.565554	12,542	8,550	160	41.5	119	35	125	ATD - noted by driller
RPS-7-17	6/7/2017	48.475914	-122.565573	12,341	8,550	153	36.3	117	N.E.	---	No groundwater encountered
RPS-8-17	6/8/2017	48.475474	-122.566185	12,177	8,405	143	31.5	112	N.E.	---	No groundwater encountered
TP-1-17	6/9/2017	48.475533	-122.563621	12,213	9,026	175	9	166	N.E.	---	No groundwater encountered
TP-2-17	6/9/2017	48.476185	-122.564915	12,444	8,707	166	7	159	N.E.	---	No groundwater encountered
TP-3-17	6/9/2017	48.475619	-122.565460	12,234	8,580	152	7	145	N.E.	---	No groundwater encountered
TP-4-17	6/9/2017	48.476149	-122.566009	12,424	8,442	149	9	140	N.E.	---	No groundwater encountered

Notes:

1. Borings were drilled by Environmental Drilling, Inc. with support by WRS, and were observed by AECOM. Test pits were excavated by WRS and observed by AECOM.
2. Boring number ending in "(PZ)" indicates groundwater monitoring well installed using standpipe piezometer construction.
3. Standard penetration tests (SPT) in the borings were performed using an autohammer, except for the first four samples in Boring RPS-1-17, for which SPT's were performed using a safety hammer manually operated with a rope and cathead.
4. Boring location latitude/longitude were obtained by AECOM using a hand-held GPS unit and then converted to Shell Refinery datum coordinates. Boring locations accuracy estimated at approximately +/-10 ft. Boring ground elevations were estimated from topographic contours on plans provided by Anvil; elevation accuracy estimated at approximately +/-1 ft.
5. Boring northing/easting coordinates based on Shell Refinery datum.
6. Elevations are referenced to Shell Refinery datum (survey markers at intersections of 8th Street and "A" Street and 8th Street and "B" Street).
7. Refer to boring and monitoring well logs for additional groundwater measurement information.

Project: RP&S New Crude Tank and Product Tanks Projects
Project Location: Shell Puget Sound Refinery, Anacortes, WA
Project Number: 60544813

Key to Log of Boring and Descriptive Terms for Soil

Unified Soil Classification System (ASTM D2487 & D2488)

Major Divisions			Symbols: Graph	Symbols: Letter	Typical Descriptions
Coarse Grained Soils More than 50% of No. 200 Sieve Size	**Gravels** More than 50% of Coarse Fraction Retained in No. 4 Sieve	**Clean Gravels** (less than 5% fines)		GW	Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
				GP	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
		Gravels with Fines (more than 12 % fines)		GM	Silty Gravels, Gravel-Sand-Silt Mixtures
				GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	Sands More than 50% of Coarse Fraction Passing through No. 4 Sieve	**Clean Sand** (less than 5% fines)		SW	Well-Graded Sands, Gravelly Sands, Little or no Fines
				SP	Poorly Graded Sands, Gravelly Sands, Little or no Fines
		Sands with Fines (more than 12 % fines)		SM	Silty Sands, Sand-Clay Mixtures
				SC	Clayey Sands, Sand-Clay Mixtures
Fine Grained Soils More than 50% of Material is Smaller than No. 200 Sieve Size	**Silts and Clays**	Liquid Limit Less than 50%		ML	Inorganic Silts and very Fine 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 Silty Clays of Low Plasticity
	Silts and Clays	Liquid Limit Greater than 50%		MH	Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils
				CH	Inorganic Clays of High Plasticity, Fat Clays
				OH	Organic Clays of Medium to High Plasticity, Organic Silts
Highly Organic Soils				PT	Peat, Humus, Swamp Soils with High Organic Contents (see ASTM D4427-92)

Abbreviations

SA	Sieve Analysis
M	Moisture
DD	Dry Density
AL	Atterberg Limits
HA	Hydrometer Analysis
C	Consolidation
Pc	Constant Head Permeability
Pf	Falling Head Permeability
DS	Direct Shear
TX	Triaxial
TV	Torvane Shear
LV	Laboratory Vane Shear
PP	Pocket Penetrometer
PID	Organic Vapor Meter
OC	Organic Content
N	Number of hammer blows for last 12 inches sampled
WOR	Weight of Rods
WOH	Weight of Rods & Hammer

Relative Density or Consistency

Coarse-Grained Soils		Fine-Grained Soils	
Relative Density	**N, SPT Blows / ft**	**Relative Consistency**	**N, SPT Blows / ft**
Very loose sand	0 - 4	Very soft	< 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Medium stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very dense	Over 50	Very stiff	15 - 30
		Hard	Over 30

Sampler Symbols

- 3" O.D. Split Spoon Sample with brass rings
- 3" O.D. Shelby Tube Sample
- Core
- Piston Sample
- Non-standard penetration test
- Grab Sample
- 2" O.D. Split Spoon with 140lb Hammer and 30-inch drop (SPT)

Minor Descriptors

Trace	0 - 5%
Slightly (clayey, silty, sandy, gravelly)	5 - 12%
Clayey, silty, sandy, gravelly	12 - 30%
Very (clayey, silty, sandy, gravelly)	30 - 50%

Moisture Content

Dry	Absence of moisture, dusty
Moist	Damp but no visible water
Wet	Visible free water, from below the water table

NOTES:

1. Descriptions and stratum lines are interpretive; field descriptions may have been modified to reflect lab test results. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times.
2. Dual Symbols are used to indicate borderline soil classifications

Figure A.1

Project: RP&S New Crude Tank and Product Tanks Projects
Project Location: Shell Puget Sound Refinery, Anacortes, WA
Project Number: 60544813

Log of Boring RPS-1-17

Date(s) Drilled	**6/5, 6/6/2017**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Drilling Method	**HSA**	Drill Bit Size/Type	**3.25"/4.25" I.D. HSA**	Total Depth of Borehole	**51.5 feet**
Drill Rig Type	**Mobile B-53 (0-15'), B-61 (15'-bottom)**	Drilling Contractor	**EDI**	Surface Elevation	**179 feet**
Borehole Backfill	**Bentonite Grout, Chips, Soil**	Sampling Method(s)	**SPT**	Hammer Data	**140-lb, Manual/Autohammer**
Location	**West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,470, E8,940**				

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0						CL/ ML	Gray Lean CLAY, trace fine to coarse, angular to rounded sand, gravel, occasional cobbles, dry to moist. [FILL]			
175			D1	3 4 6 N=10	100		ML	Dark gray SILT, trace fine, subangular to rounded gravel, moist, stiff. [FILL]		28.2	**PP = 4.5 tsf** **PID = 2.8 ppm**
	5		D2	1 6 9 N=15	89		CL/ SC	Brown to dark gray sandy Lean CLAY to clayey SAND, very stiff to medium dense, slight odor. [FILL]	48.8	27.1	**PP = 2 tsf** **PID = 75 ppm** AECOM Informed Shell about high PID readings.
170			D3	5 22 28 N=50	100		CL	Brown Lean CLAY, trace fine, rounded gravel, moist, hard.		21.5	**PP > 4.5 tsf** **PID = 4.5 ppm**
	10		D4	20 42 40 N=82	100			Gray to brown Lean CLAY, trace fine, rounded gravel, but 10.3 to 10.4 ft with brown silty fine to medium sand thin layer, moist, hard.			**PP > 4.5 tsf** **PID = 4.2 ppm**
165											
	15		D5	15 19 23 N=42	100		SM	15 to 15.3 ft: Same as above grayish brown Lean CLAY, moist, hard. 15.3 to 16.5 ft: Yellowish brown silty fine to medium SAND, trace fine, subrounded gravel, moist, dense.			**PID = 0.2 ppm** Stopped at 15 ft at 1345, 6/5/17., Resumed drilling at 0815, 6/6/17
160	20		D6	12 17 18 N=35	100			Yellowish brown to brown silty fine SAND, moist, dense.			**PID = 3.8 ppm**
155								24 ft ▼			Driller: GW at 24 ft ATD.
	25		D7	10 12 19 N=31	100			Brown silty fine SAND, wet, dense.			**PID = 13.9 ppm**
150							ML				**PP = 3.5 tsf**
	30										

Project: RP&S New Crude Tank and Product Tanks Projects	Log of Boring RPS-1-17
Project Location: Shell Puget Sound Refinery, Anacortes, WA	Sheet 2 of 2
Project Number: 60544813	

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	30		D8	11 19 35 N=54	100			Gray SILT, trace fine, subrounded gravel, wet, very stiff to hard.			PID = 0 ppm
145							CL				
	35		D9	14 30 39 N=69	100			Gray Lean CLAY, trace fine, subrounded gravel, moist, hard.		17.9	PP > 4.5 tsf PID = 0 ppm
140	40		D10	9 19 43 N=62	100		ML/ CL	Gray SILT to Lean CLAY, moist, hard.		22.2	PP > 4.5 tsf PID = 0 ppm
135	45		D11	12 29 50/4"	100			Gray Lean CLAY, moist, hard but 46.2 to 46.3 ft with dark gray silty fine to medium sand, wet.			PP > 4.5 tsf PID = 0 ppm
130	50		D12	22 17 26 N=43	100		SM	50 to 50.2 ft: Same as above Lean CLAY; 50.2 to 51.5 ft: Dark gray silty fine SAND, wet, dense.			PP > 4.5 tsf PID = 0 ppm
125	55							Bottom of boring at 51.5 ft below ground surface (bgs). Measured groundwater at 24.3 ft bgs after 15 minutes stopping of drilling. Backfilled with bentonite grout up to 2 ft bgs, 0.5 to 2 ft with bentonite chips, 0 to 0.5ft with on-site soil. PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp.			
120	60										
115	65										

Project: RP&S New Crude Tank and Product Tanks Projects
Project Location: Shell Puget Sound Refinery, Anacortes, WA
Project Number: 60544813

Log of Boring RPS-2-17

Date(s) Drilled	**6/7/2017**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Drilling Method	**HSA**	Drill Bit Size/Type	**4.25" I.D. HSA**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**Mobile B-61**	Drilling Contractor	**EDI**	Surface Elevation	**178 feet**
Borehole Backfill	**Bentonite Grout, Chips, Soil**	Sampling Method(s)	**SPT**	Hammer Data	**140-lb, Autohammer**
Location	**West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,465, E8,847**				

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0						CL	Dark gray Lean CLAY, trace fine to coarse, angular to rounded sand, gravel, occasional cobbles, moist, [FILL].			
175			D1	2 3 6 N=9	100			Dark gray Lean CLAY, trace fine to coarse, angular to rounded gravel, moist, stiff to very stiff. [FILL]		36.3	PP = 3.25 tsf PID = 3 ppm
	5		D2	2 3 6 N=9	100			Same as above but dark gray to blueish gray, stiff to very stiff, strong odor. [FILL] Sample collected for Corrosivity testing: RPS-2-17_6 at 0840 at 5.5 to 6 ft.			PP = 2.5 tsf PID = 6.8 ppm
170			D3	4 7 12 N=19	100		CL	Brown Lean CLAY, moist, very stiff to hard.			PP = 4.25 tsf PID = 0.2 ppm
	10		D4	5 12 23 N=35	100			Brown Lean CLAY, trace fine, subangular gravel, moist, hard.			PP > 4.5 tsf PID = 1.7 ppm
165											
	15		D5	9 19 30 N=49	100		SM/ ML	15 to 15.8 & 16.2 to 16.5 ft: Brown silty fine to medium SAND, trace fine, angular gravel, moist, dense; 15.8 to 16.2 ft: Brown SILT, moist, hard.			PP > 4.5 tsf PID = 0.1 ppm
160											
	20		D6	11 29 37 N=66	100			20 to 20.4 & 20.8 to 21.5 ft: Brown silty fine to medium SAND, moist, very dense; 20.4 to 20.8 ft: Brown SILT, moist, hard.			PP > 4.5 tsf PID = 0.05 ppm
155											
	25		D7	7 18 28 N=46	100			25 to 25.4 & 26.4 to 26.5 ft: Brown silty fine SAND, wet, dense; 25.4 to 26.4 ft: Brown SILT to sandy SILT, moist, very stiff.			PID = 1.75 ppm
150								28.5 ft ▼			Driller: GW at 28.5 ft ATD.
	30										

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	30		D8	10 14 25 N=39	100			30 to 30.6 ft: Gray silty fine SAND with thin layers of sandy SILT, wet, dense; 30.6 to 31.5 ft: Brown silty fine SAND, trace fine, angular gravel, wet, dense.			
								Bottom of boring at 31.5 ft below ground surface (bgs). Measured groundwater at 29.3 ft bgs after 10 minutes stopping of drilling. Backfilled with bentonite grout up to 2 ft bgs, 0.5 to 2 ft with bentonite chips, 0 to 0.5ft with on-site soil.			
								PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp.			
145											
	35										
140											
	40										
135											
	45										
130											
	50										
125											
	55										
120											
	60										
115											
	65										

Project: RP&S New Crude Tank and Product Tanks Projects
Project Location: Shell Puget Sound Refinery, Anacortes, WA
Project Number: 60544813

Log of Boring RPS-3-17(PZ)

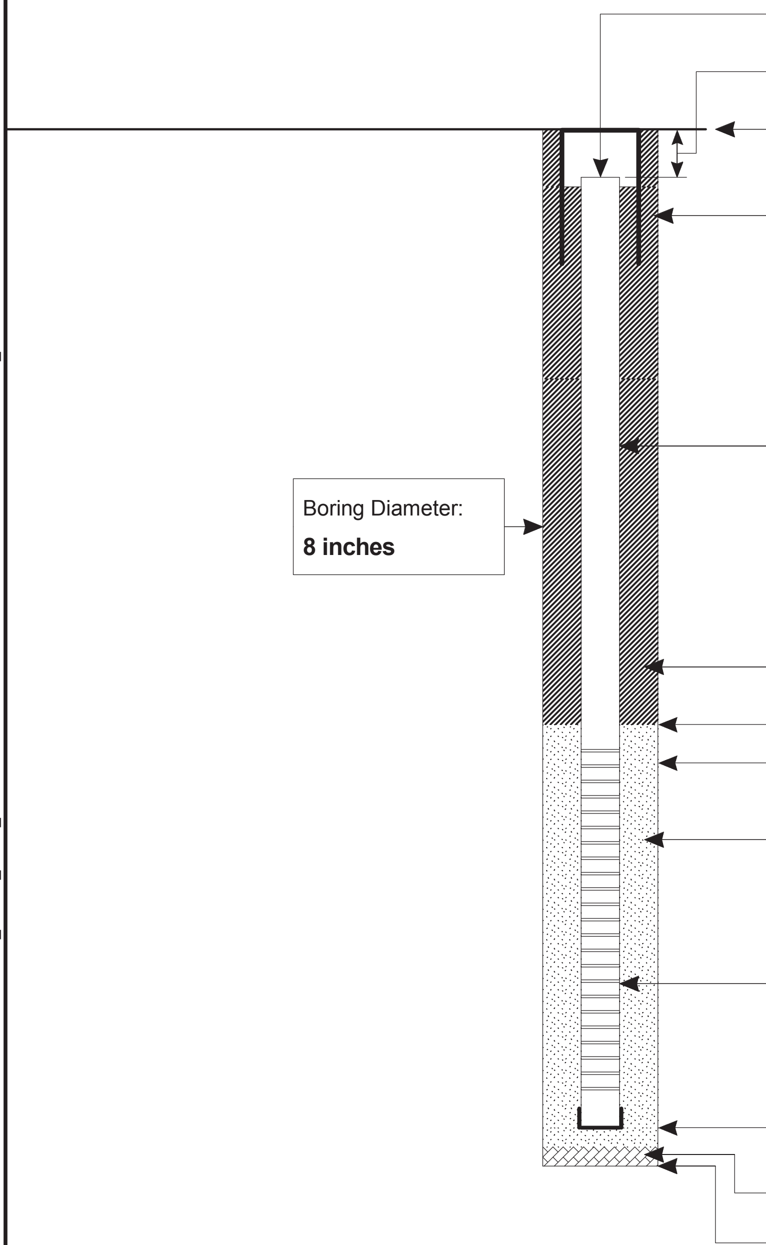
Date(s) Drilled	**6/6/17**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Drilling Method	**HSA**	Drill Bit Size/Type	**4.25" I.D. HSA**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**Mobile B-61**	Drilling Contractor	**EDI**	Approximate Surface Elevation	**179.0 feet**
Groundwater Level	**12.5 feet**	Sampling Method(s)	**SPT**	Hammer Data	**140-lb, Autohammer**
Borehole Completion	**Piezometer Monitoring Well**	Location	**West Landfarm, W of B St & N of 8th St. Shell Datum: N12,554, E8,984**		

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	0					CL	Brown Lean CLAY, trace fine to coarse, angular to rounded sand, gravel, occasional cobbles, dry to moist, [FILL].			
			D1	3 3 6 N=9	100		Dark gray to black Lean CLAY, trace fine to coarse sand, fine, subangular to rounded gravel, moist, stiff. [FILL]		32.6	PP = 3 tsf,PID = 11 to 149 ppm*
175	5		D2	2 5 12 N=17	100	SM	5 to 5.6 ft: Dark brown sandy SILT, moist, very stiff. [FILL] 5.6 to 6.5 ft: Orange silty fine SAND, trace fine, angular gravel, moist, medium dense. [FILL]			PP = 2.5 tsf,PID = 14 to 105 ppm*
			D3	5 10 14 N=24	89	SP/ SM	Orange poorly-graded fine SAND with silt, moist, medium dense. [FILL]	11.1	6.6	PID = 9.7 to 92.3 ppm*
170	10		D4	5 7 11 N=18	100		Same as above.			PID = 13 to 63 ppm*
							12.5 ft ▼			
165	15		D5	7 14 19 N=33	100	SM/ ML	15 to 15.3 ft: Brown silty fine to coarse SAND, wet, dense; 15.3 to 16.2 ft: Orange SILT, wet, very stiff; 16.2 to 16.5 ft: Orange silty fine SAND, wet, dense.			PP = 4.5 tsf,PID = 6 to 77.4 ppm*
160	20		D6	5 11 19 N=30	100	ML	Gray SILT, moist, hard.			Driller: GW at 18 ft ATD PP > 4.5 tsf,PID = 7.5 to 101.5 ppm*
155	25		D7	20 50/6"	100	SM	Gray silty fine SAND, wet, very dense.			PID = 25.6 ppm*
150	30					ML				PP =2.5 tsf

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	30		D8	14 28 39 N=67	100			Gray SILT to sandy SILT, wet, very stiff to hard.				PID = 3.3 to 42.6 ppm*
145	35							Bottom of boring at 31.5 ft below ground surface (bgs). Installed 2-inch monitoring well as follows: 2-inch diameter, PVC SCH40 screen with 0.010" slots from 20 ft to 30 ft; solid PVC riser from 20 ft to 0.2 ft below ground surface; medium filter sand from 17 ft to 31.5 ft; bentonite chips 0.5 ft to 17 ft bgs; Rapid set concrete from 0.5 ft bgs up to the ground surface outside the steel flush monument (10" long, 8" I.D.). (The monument cover can be opened with a wrench.) Washington Department of Ecology Unique Well # BIZ 355. PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp. * Unreliable PID readings due to calibration issues. GW observations: 13:15 on 6/6/2017 measured 18 ft bgs during drilling; 14:30 on 6/6/2017 measured 16.7 ft bgs 15 minutes after stopping drilling and before well installation; 10:00 on 6/7/2017 measured 12.5ft bgs in the well with stabilization time 19 hours; 16:15 on 6/8/2017 measured 12.5ft bgs in the well with stabilization time 2 days.				
140	40											
135	45											
130	50											
125	55											
120	60											
115	65											

Project: RP&S New Crude Tank and Product Tanks Projects Project Location: Shell Puget Sound Refinery, Anacortes, WA Project Number: 60544813	**PIEZOMETER CONSTRUCTION LOG FOR RPS-3-17(PZ)**

Location	West Landfarm, W of B St & N of 8th St. Shell Datum: N12,554, E8,984	Date(s) Installed 6/6/2017	Time 13:30
Installed By	Environmental Drilling, Inc.	Observed By K. Yang	Total Depth (ft) 31.5
Method of Installation	Hollow-Stem Auger, 4.25" I.D.		
Screened Interval	20-30 ft	Completion Zone 0 - 31.5 ft	
Remarks	WA Department of Ecology Well # BIZ 355. Observed GW 12.5 ft at 16:15, 6/8/2017.		



Elevation of Top of Riser Pipe: 178.8 ft

Depth of Riser Below Ground Surface: -0.2 ft

Ground Elevation: 179 ft

Size/Type of Monument
Flush-mounted, steel

ID/Type of Riser Pipe:
2-inch Schedule 40 PVC Pipe

Boring Diameter:
8 inches

Type of Seal:
Bentonite Chips

Depth of Top of Filter Pack: 17 ft

Depth of Top of Screen: 20 ft

Type of Filter Pack:
Medium Sand

ID/Type of Screen:
PVC SCH40
Screen Slot Size:
0.010"

Depth of Bottom of Screen: 30 ft

Type/Depth of Backfill/Seal Below Well:
1.5 ft Filter Sand

Total Depth of Boring: 31.5 ft

NOTE: DIAGRAM IS NOT TO SCALE

Project: RP&S New Crude Tank and Product Tanks Projects	**Log of Boring RPS-4-17**
Project Location: Shell Puget Sound Refinery, Anacortes, WA	Sheet 1 of 2
Project Number: 60544813	

Date(s) Drilled	**6/6/2017**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Drilling Method	**HSA**	Drill Bit Size/Type	**4.25" I.D. HSA**	Total Depth of Borehole	**30.9 feet**
Drill Rig Type	**Mobile B-61**	Drilling Contractor	**EDI**	Surface Elevation	**177 feet**
Borehole Backfill	**Bentonite Grout, Chips, Soil**	Sampling Method(s)	**SPT**	Hammer Data	**140-lb, Autohammer**
Location	**West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,386, E8,989**				

Elevation feet	Depth, feet	Samples: Type	Samples: Number	Samples: Blows/ 6in.	Samples: Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0						CL	Dark brown to black Lean CLAY, trace fine to coarse, angular to rounded sand, gravel, occasional cobbles, moist, stiff to very stiff. [FILL]			
175			D1	8 5 5 N=10	100		SM/ML	Dark brown to black silty fine to coarse SAND to sandy SILT, trace fine to coarse, angular to rounded gravel, occasional cobbles, moist, medium dense to stiff to very stiff. [FILL]	37.9	21.2	PP = 3.5 tsf PID = 11.6 to 57.6 ppm*
	5		D2	5 8 14 N=22	100		CL	Brown Lean CLAY, moist, very stiff to hard.			PP > 4.5 tsf PID = 1.6 to 11.7 ppm*
170			D3	5 8 17 N=25	100			Brown Lean CLAY, trace fine, angular to rounded gravel, moist, very stiff to hard.			PID = 2.4 to 30 ppm*
	10		D4	9 11 17 N=28	100		SM	10 to 10.6 & 11.4 to 11.5 ft: Orange silty fine SAND, trace fine to coarse, subrounded gravel, moist, medium dense; 10.6 to 11.4 ft: Orange Lean CLAY, moist, very stiff.			PP = 4.5 tsf PID = 0 ppm
165											
	15		D5	9 15 22 N=37	100			Orange brown silty fine to coarse SAND to well-graded fine to coarse SAND with silt, trace fine, subangular gravel, moist, dense.			PID = 0.7 ppm
160											
	20		D6	7 11 11 N=22	100			20 to 21 ft Greenish brown & 21 to 21.45 ft: Reddish brown silty fine SAND, wet, medium dense;			PID = 0 ppm
155							CL	21.45 to 21.5 ft: Gray Lean CLAY, moist, hard.			
								24 ft ▼			Driller: GW at 24 ft ATD.
	25		D7	7 14 30 N=44	100			Gray Lean CLAY, moist, hard.			PP > 4.5 tsf PID = 0 ppm
150											
	30										PP > 4.5 tsf

GEO_SEA3D J:\DCS\PROJECTS\WTR\60544813_SHELL_RP&S_TANKS\400-TECHNICAL\440-FIELD AND LAB DATA\442-GINT_BORING LOGS\60544813 SHELL RPS CRUDE TANK.GPJ URSSEA3B.GLB URSSEA3.GDT 7/28/17

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	30		D8	14 50/5"	100			Same as above but trace fine, angular gravel.			PID = 0 ppm
145								Bottom of boring at 31.5 ft below ground surface (bgs). Couldn't measure groundwater due to mud in the hole after 10 minutes stopping of drilling. Backfilled with bentonite grout up to 2 ft bgs, 0.5 to 2 ft with bentonite chips, 0 to 0.5 ft with on-site soil. PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp. * From depth 0 to 10 ft, unreliable PID readings due to calibration issues; from 10 to bottom, used a calibrated PID provided by Shell.			
	35										
140											
	40										
135											
	45										
130											
	50										
125											
	55										
120											
	60										
115											
	65										

Project: RP&S New Crude Tank and Product Tanks Projects	**Log of Boring RPS-5-17**
Project Location: Shell Puget Sound Refinery, Anacortes, WA	Sheet 1 of 2
Project Number: 60544813	

Date(s) Drilled	6/8/2017	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	HSA	Drill Bit Size/Type	4.25" I.D. HSA	Total Depth of Borehole	31.5 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	EDI	Surface Elevation	158 feet
Borehole Backfill	Bentonite Grout, Chips, Soil	Sampling Method(s)	SPT	Hammer Data	140-lb, Autohammer
Location	West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,195, E8,705				

Elevation feet	Depth, feet	Samples: Type	Samples: Number	Samples: Blows/ 6in.	Samples: Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0						SM	Dark brown silty fine to coarse SAND, trace fine to coarse, angular to rounded gravel, occasional cobbles, moist. [FILL]			
155			D1	8 9 9 N=18	100			Dark brown Silty fine to coarse SAND, trace fine, subangular gravel, moist, medium dense. [FILL]	32.0	20.6	PP = 0.5 to 0.75 tsf PID = 0 ppm
	5		D2	3 8 11 N=19	100		CL	5 to 5.2 ft: Same as above. Brown Lean CLAY, moist, very stiff.			PP > 4.5 tsf PID = 0 ppm
150			D3	7 9 15 N=24	100			Brown Lean CLAY, trace fine, angular to rounded gravel, moist, very stiff. [FILL]			PP = 3 tsf PID = 0 ppm
	10		D4	7 14 16 N=30	100		SM	Brown silty fine to coarse SAND, moist, dense.			PID = 0 ppm
145											
	15		D5	9 14 17 N=31	100		SP/ SM	Brown poorly-graded fine to medium SAND with silt, moist, dense.			
140											
	20		D6	9 18 25 N=43	100			Brown poorly-graded fine to medium SAND with silt, moist, dense.			PID = 0 ppm
135											
	25		D7	7 17 22 N=39	100			Brown poorly-graded fine to medium SAND with silt, moist, dense.			
130											
	30										

AECOM

Log of Boring RPS-5-17

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	30		D8	15 23 31 N=54	100		SM	Brown silty fine to coarse SAND, moist to wet, very dense.			
								Bottom of boring at 31.5 ft below ground surface (bgs). No groundwater encountered in the hole. Backfilled with bentonite grout up to 2 ft bgs, 0.5 to 2 ft with bentonite chips, 0 to 0.5ft with on-site soil.			
125								PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp.			
	35										
120											
	40										
115											
	45										
110											
	50										
105											
	55										
100											
	60										
95											
	65										

Project: RP&S New Crude Tank and Product Tanks Projects Project Location: Shell Puget Sound Refinery, Anacortes, WA Project Number: 60544813	**Log of Boring RPS-6-17** Sheet 1 of 2

Date(s) Drilled	6/7/2017	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	HSA	Drill Bit Size/Type	4.25" I.D. HSA	Total Depth of Borehole	41.5 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	EDI	Surface Elevation	160 feet
Borehole Backfill	Bentonite Grout, Chips, Soil	Sampling Method(s)	SPT, SHelby	Hammer Data	140-lb, Autohammer
Location	West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,542, E8,550				

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
160	0						CL	Dark brown Lean CLAY, trace wood pieces, fine to coarse, subangular to rounded sand, gravel, occasionally cobbles, moist. [FILL]			
											PP = 0.75 to 1.5 tsf PID = 1.95 ppm
			D1	2 4 4 N=8	100			Dark brown Lean CLAY, trace wood pieces, fine to coarse, subangular sand, gravel, moist, medium stiff. [FILL]		32.6	
155	5										PP = 0.5 tsf PID = 0.35 ppm
			D2	2 2 4 N=6	89			5 to 5.8 ft: Same as above;		20.8	
							CL	5.8 to 6.5 ft: Brown Lean CLAY, trace fine, subangular gravel, moist, medium stiff.			Driller: hard to push the Shelby. Bottom one ft of Shelby tube crushed.
		S	S3		64			Brown Lean CLAY, trace fine, angular to rounded gravel, moist, very stiff.			
											PP = 2.25 tsf PID = 0.05 ppm
150	10		D4	6 7 10 N=17	89			Brown Lean CLAY, moist, very stiff.		24.3	
145	15										PP = 4.5 tsf PID = 0 ppm
			D5	4 6 11 N=17	100			Brown Lean CLAY, trace fine, subangular gravel, moist, very stiff.	31.4	28.0	
							SP/ SM				
140	20		D6	9 15 20 N=35	100			Brown poorly-graded fine SAND with silt, moist, very dense.			PID = 0 ppm
135	25		D7	10 20 24 N=44	100			Brown poorly-graded fine SAND with silt, moist, dense.			PID = 0 ppm
130	30										

Project: RP&S New Crude Tank and Product Tanks Projects	Log of Boring RPS-6-17
Project Location: Shell Puget Sound Refinery, Anacortes, WA	Sheet 2 of 2
Project Number: 60544813	

Elevation feet	Depth, feet	Samples: Type	Samples: Number	Samples: Blows/ 6in.	Samples: Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
130	30		D8	17 50/2"	100		SM	Brown silty fine to coarse SAND, trace fine to coarse, subangular gravel, moist, very dense.			
125	35		D9	26 38 43 N=81	100			35 ft ▼ 35 to 36.4 ft: Reddish brown to brown silty fine to coarse SAND, trace fine, angular gravel, wet to moist, very dense;			Driller: GW at 35 ft ADT. PP = 3.25 tsf
							ML	36.4 to 36.5 ft: Gray SILT, moist, hard.			
120	40		D10	15 45 40 N=85	100			Gray SILT to sandy SILT, wet, very stiff to hard.			PP = 3.5 tsf
								Bottom of boring at 41.5 ft below ground surface (bgs). Measured groundwater at 37.3 ft bgs after 10 minutes of stopping drilling. Backfilled with bentonite grout up to 2 ft bgs, 0.5 to 2 ft with bentonite chips, 0 to 0.5ft with on-site soil. PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp.			
115	45										
110	50										
105	55										
100	60										
95	65										

Project: RP&S New Crude Tank and Product Tanks Projects Project Location: Shell Puget Sound Refinery, Anacortes, WA Project Number: 60544813	# Log of Boring RPS-7-17 Sheet 1 of 2

Date(s) Drilled	**6/7/2017**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Drilling Method	**HSA**	Drill Bit Size/Type	**4.25" I.D. HSA**	Total Depth of Borehole	**36.3 feet**
Drill Rig Type	**Mobile B-61**	Drilling Contractor	**EDI**	Surface Elevation	**153 feet**
Borehole Backfill	**Bentonite Grout, Chips, Soil**	Sampling Method(s)	**SPT**	Hammer Data	**140-lb, Autohammer**
Location	**West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,341, E8,550**				

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0						CL	Brown sandy Lean CLAY with fine to coarse, angular to rounded gravel, occasionally cobbles, dry to moist. [FILL]			
150			D1	2 7 7 N=14	89			Dark gray to greenish gray Lean CLAY, trace fine, angular to rounded gravel, moist, medium stiff to stiff. [FILL]		26.3	PP = 0.5 to 2 tsf PID = 0.75 ppm
	5		D2	4 8 14 N=22	100		CL	Brown Lean CLAY, moist, very stiff.		21.6	PP = 4.5 tsf PID = 0.15 ppm
145			D3	5 6 10 N=16	100		CL/ CH	Brown Lean CLAY to Fat CLAY, moist, very stiff.		21.8	PP = 4.5 tsf PID = 0 ppm
	10		D4	4 5 7 N=12	100			Brown Lean CLAY, moist, very stiff.			PP = 2.75 tsf PID = 0 ppm
140											
	15		D5	14 34 40 N=74	100			15 to 16.3 ft: Brown Lean CLAY, moist, very stiff.		16.1	PP = 3.5 to 4.5 tsf PID = 0 ppm
							SM	16.3 to 16.5 ft: Brown silty fine to medium SAND, moist, very dense.			
135											
	20		D6	11 23 31 N=54	100		SP/ SM	Brown poorly-graded fine to medium SAND with silt, moist, dense.			PID = 0 ppm Stopped drilling at 21.5 ft at 17:00 on 6/7/17, resumed drilling at 07:35 on 6/8/17.
130											
	25		D7	11 20 29 N=49	100			Brown poorly-graded fine to medium SAND with silt, moist, dense.			PID = 0 ppm
125											
	30										

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	30		D8	12 22 26 N=48	100			Brown poorly-graded fine to medium SAND with silt, moist, dense.			PID = 0 ppm
120											
	35		D9	29 45 50/4"	100		SM	Blueish gray silty fine to coarse SAND, trace fine to coarse, angular to rounded gravel, moist, very dense.			
								Bottom of boring at 36.3 ft below ground surface (bgs). No groundwater encountered in the hole. Backfilled with bentonite grout up to 2 ft bgs, 0.5 to 2 ft with bentonite chips, 0 to 0.5ft with on-site soil. PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp.			
115											
	40										
110											
	45										
105											
	50										
100											
	55										
95											
	60										
90											
	65										

Project: RP&S New Crude Tank and Product Tanks Projects Project Location: Shell Puget Sound Refinery, Anacortes, WA Project Number: 60544813	Log of Boring RPS-8-17 Sheet 1 of 2

Date(s) Drilled	6/8/2017	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	HSA	Drill Bit Size/Type	4.25" I.D. HSA	Total Depth of Borehole	31.5 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	EDI	Surface Elevation	143 feet
Borehole Backfill	Bentonite Grout, Chips, Soil	Sampling Method(s)	SPT	Hammer Data	140-lb, Autohammer
Location	West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,177, E8,405				

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0						SM/ CL				
140			D1	2 2 4 N=6	100			2.5 to 3.1 & 3.8 to 4 ft: Brown silty fine to medium SAND, trace fine, angular to subrounded gravel, moist, loose; 3.1 to 3.8 ft: Black Lean CLAY, trace fine to coarse, subangular gravel, moist, medium stiff. [FILL]			PP = 1.25 tsf PID = 0 ppm
	5		D2	4 5 9 N=14	89		SM	Brown silty fine to medium SAND, moist, medium dense. [FILL]	17.2	12.0	PID = 0 ppm
135			D3	5 6 11 N=17	100			Brown silty fine SAND, moist but 8.5 to 8.7 ft wet, medium dense. [FILL]			
	10		D4	10 3 6 N=9	100		CL	Brown Lean CLAY, trace fine, subangular gravel, moist, stiff to medium stiff.			PP = 1.25 tsf
130											
	15		D5	5 6 10 N=16	100			Brown Lean CLAY, trace fine, angular gravel, moist, very stiff.			PP = 3.25 tsf
125											
	20		D6	5 7 16 N=23	100			20 to 21.3 ft: Brown Lean CLAY, trace fine, angular gravel, moist, very stiff;			PP = 4 tsf
							SM	21.3 to 21.5 ft: Gray silty fine to medium SAND, trace fine, angular gravel, moist, medium dense.			
120											Driller: gravelly at 23.5 ft.
	25		D7	21 50/5"	100			Brownish gray silty fine to coarse SAND, trace fine, angular to rounded gravel, moist, very dense.			
115											
	30										

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	30		D8	15 33 42 N=75	100			Brownish gray silty fine to coarse SAND, trace fine to coarse, angular gravel, moist, very dense.			
110								Bottom of boring at 31.5 ft below ground surface (bgs). No groundwater encountered in the hole. Backfilled with bentonite grout up to 2 ft bgs, 0.5 to 2 ft with bentonite chips, 0 to 0.5ft with on-site soil. PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp.			
	35										
105											
	40										
100											
	45										
95											
	50										
90											
	55										
85											
	60										
80											
	65										

Project: RP&S New Crude Tank and Product Tanks Projects Project Location: Shell Puget Sound Refinery, Anacortes, WA Project Number: 60544813	**Log of Test Pit TP-1-17** Sheet 1 of 1

Date(s) Excavated	**6/9/2017**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Excavation Equipment	**John Deere 135C Excavator**	Excavation Contractor	**WRS**	Total Depth of Test Pit	**9 feet**
Excavation Dimensions	**5 ft x 15 ft**	Pit Alignment	**N - S**	Ground Surface Elevation	**175 ft**
Groundwater Level	**Not Encountered**	Sampling Method(s)	**Grab**		
Location	**West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,213, E9,026**				

Elevation feet	Depth, feet	Type	Number	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Dry Unit Weight, pcf	Moisture Content, %	REMARKS AND OTHER TESTS
175	0				CL	Brown, occasionally gray Lean CLAY, trace fine to coarse, angular to rounded gravel, occasional cobbles, some wood pieces from 4 to 6 ft, moist, very stiff. [FILL]				
		Grab	G1						25.7	**PP = 3 to 4.5 tsf** **PID = 4.1 ppm**
170	5									
					CL	Blueish gray to brown Lean CLAY, trace fine to coarse, subangular to rounded gravel, moist, very stiff to hard.				
		Grab	G2							**PP > 4.5 tsf** **PID = 2.1 ppm**
						Bottom of pit at 9 ft below ground surface (bgs). No groundwater encountered within 9 ft bgs. Backfilled with onsite soil and compacted with bucket of excavator. PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp.				
165	10									
160	15									
155	20									
150	25									
145	30									

Project: RP&S New Crude Tank and Product Tanks Projects **Project Location: Shell Puget Sound Refinery, Anacortes, WA** **Project Number: 60544813**	# Log of Test Pit TP-2-17 Sheet 1 of 1

Date(s) Excavated	**6/9/2017**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Excavation Equipment	**John Deere 135C Excavator**	Excavation Contractor	**WRS**	Total Depth of Test Pit	**7 feet**
Excavation Dimensions	**5 ft x 18 ft**	Pit Alignment	**N - S**	Ground Surface Elevation	**166 ft**
Groundwater Level	**Not Encountered**	Sampling Method(s)	**Grab**		
Location	**West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,444, E8,707**				

Elevation feet	Depth, feet	Type	Number	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Dry Unit Weight, pcf	Moisture Content, %	REMARKS AND OTHER TESTS
166	0				SM	Dark brown silty fine to coarse SAND, trace fine to coarse, angular to rounded gravel, moist, loose, slight odor. [FILL]				
165		Grab	G1							PID = 1.1 ppm
	2				CL	Brown to dark gray Lean CLAY, trace fine to coarse, angular to rounded gravel, moist, very stiff to hard. [FILL]				
		Grab	G2						30.6	PP = 4.25 tsf PID = 4.6 ppm
161.5	4.5				CL	Brown to brownish gray Lean CLAY, trace fine to coarse, subrounded to rounded gravel, moist, very stiff to hard.				
160		Grab	G3							PP > 4.5 tsf PID = 2.5 ppm
	7					Bottom of pit at 7 ft below ground surface (bgs). No groundwater encountered within 7 ft bgs. Backfilled with onsite soil and compacted with bucket of excavator. PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp.				

Elevation scale: 165, 160, 155, 150, 145, 140. Depth scale: 0, 5, 10, 15, 20, 25, 30.

Project: RP&S New Crude Tank and Product Tanks Projects **Project Location: Shell Puget Sound Refinery, Anacortes, WA** **Project Number: 60544813**	# Log of Test Pit TP-3-17 Sheet 1 of 1

Date(s) Excavated	**6/9/2017**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Excavation Equipment	**John Deere 135C Excavator**	Excavation Contractor	**WRS**	Total Depth of Test Pit	**7 feet**
Excavation Dimensions	**5 ft x 20 ft**	Pit Alignment	**N - S**	Ground Surface Elevation	**152 ft**
Groundwater Level	**Not Encountered**	Sampling Method(s)	**Grab**		
Location	**West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,234, E8,580**				

Elevation feet	Depth, feet	Type	Number	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Dry Unit Weight, pcf	Moisture Content, %	REMARKS AND OTHER TESTS
	0				CL	Dark gray sandy Lean CLAY, trace fine to coarse, angular to rounded gravel, occasional cobbles, moist, medium stiff to very stiff. [FILL]				
150		Grab	G1							PP = 3 to 3.25 tsf PID = 4.4 ppm
		Grab	G2		CL	Blueish gray to brown Lean CLAY, trace fine to coarse, angular to rounded gravel, occasional cobbles, moist, very stiff to hard.			18.5	PP > 4.5 tsf PID = 3.6 ppm
	5									
145						Bottom of pit at 7 ft below ground surface (bgs). No groundwater encountered within 7 ft bgs. Backfilled with onsite soil and compacted with bucket of excavator. PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp.				
	10									
140										
	15									
135										
	20									
130										
	25									
125										
	30									

Project: RP&S New Crude Tank and Product Tanks Projects
Project Location: Shell Puget Sound Refinery, Anacortes, WA
Project Number: 60544813

Log of Test Pit TP-4-17

Date(s) Excavated	**6/9/2017**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Excavation Equipment	**John Deere 135C Excavator**	Excavation Contractor	**WRS**	Total Depth of Test Pit	**9 feet**
Excavation Dimensions	**5 ft x 20 ft**	Pit Alignment	**N - S**	Ground Surface Elevation	**149 ft**
Groundwater Level	**Not Encountered**	Sampling Method(s)	**Grab**		
Location	**West Landfarm, W of B St & N of 8th St. Shell Datum Coordinates: N12,424, E8,442**				

Elevation feet	Depth, feet	Type	Number	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Dry Unit Weight, pcf	Moisture Content, %	REMARKS AND OTHER TESTS
	0	Grab	G1		CL	Brown to gray sandy Lean CLAY to Lean CLAY, trace fine to coarse, angular to rounded gravel, occasional cobbles, moist, medium stiff to very stiff. [FILL] Sample collected for Corrosivity testing: TP-4-17_2 at 0800 at 1.5 to 2 ft.			26.5	PP = 4 tsf PID = 0 ppm
145	5	Grab	G2		SM	Brown to gray fine SAND, trace fine to coarse, subangular to rounded gravel, occasionally cobbles, moist, dense. [FILL]				PID = 0 ppm
		Grab	G3		CL	Brown Lean CLAY, trace fine to coarse, angular to rounded gravel, occasionally with cobbles, moist, very stiff to hard.				PP > 4.5 tsf PID = 0 ppm
140	10					Bottom of pit at 9 ft below ground surface (bgs). No groundwater encountered within 9 ft bgs. Backfilled with onsite soil and compacted with bucket of excavator. PID measurements as obtained with a MiniRAE 3000 Organic Vapor Meter (OVM) with a 10.6eV Lamp.				
135	15									
130	20									
125	25									
120	30									

APPENDIX B

HISTORIC SUBSURFACE INFORMATION

APPENDIX B.1

BORING LOGS FROM PROPOSED NORTHWEST REFINERY
FOUNDATION INVESTIGATION
(DAMES & MOORE 1957a)

APPENDIX B.1

BORING LOGS FROM DAMES & MOORE (1957a)

The logs for the 1957 borings, including the three herein, contain location coordinates that were based on the coordinate grid baselines origin that was in use at the Refinery in 1957 and for some time thereafter. The historic origin was located at the intersection of S. Texas Road and “C” Street, and had the northing/easting coordinates N10,000 / E10,000. At some date unknown to AECOM, the Refinery baselines origin was moved from the original location to its current (2017) location near the intersection of 4th Street and “C” Street (30 feet north of 4th Street and 30 feet east of “C” Street). As a result, the coordinates shown on the 1957 logs must be adjusted as follows if they are to be shown on plans and figures based on the current baselines:

Northing: Subtract 1,385 feet from 1957 northing to obtain coordinate based on current N-S baseline.

Easting: Subtract 30 feet from 1957 easting to obtain coordinate based on current E-W baseline.

The coordinates of the borings contained herein were thus adjusted as follows in order to locate them on Figure 2 of this report:

<u>Boring B-28-57</u>

Northing:	13,820 – 1,385 = N 12,435
Easting:	9,600 – 30 = E 9,570

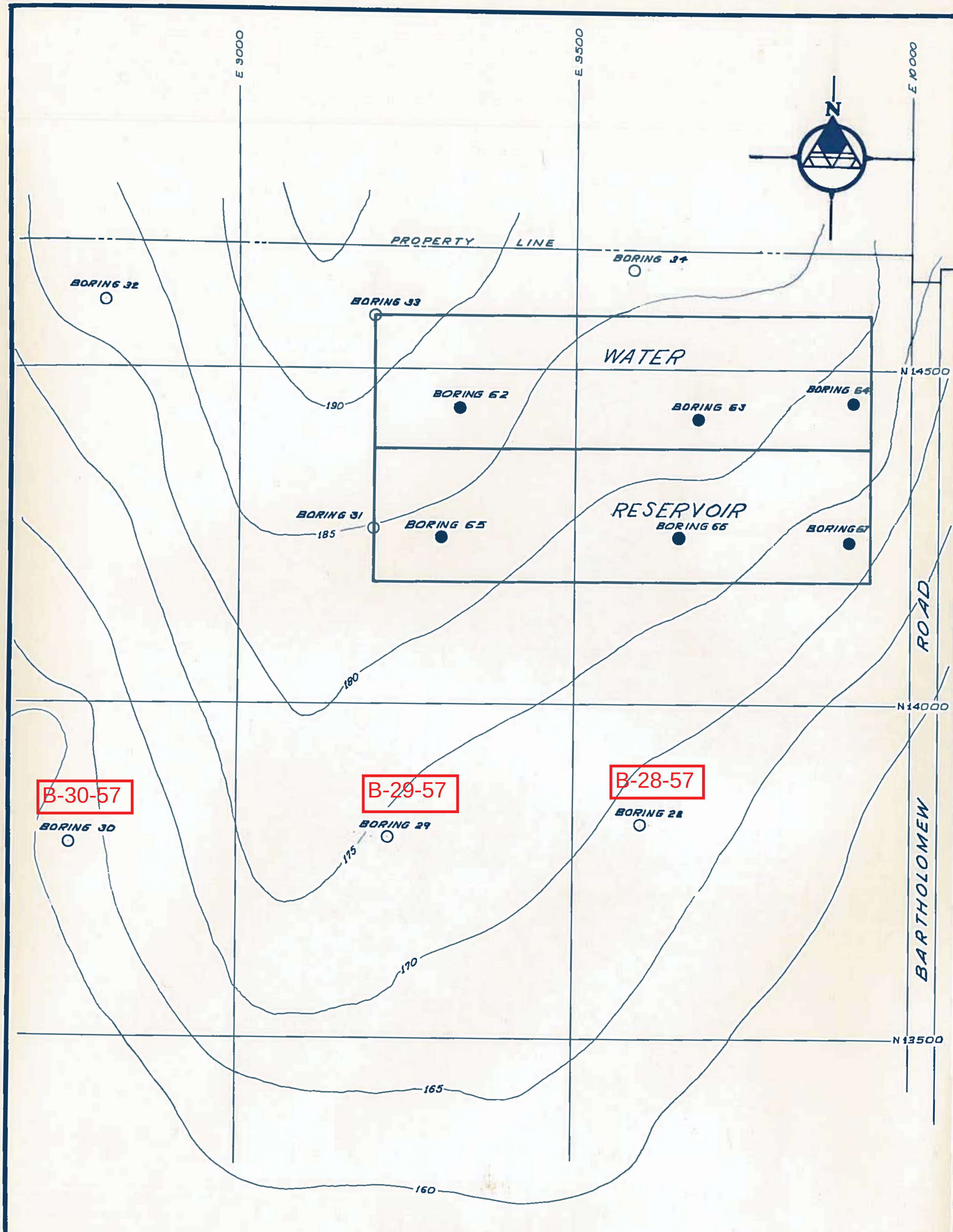
<u>Boring B-29-57</u>

Northing:	13,800 – 1,385 = N 12,415
Easting:	9,225 – 30 = E 9,195

<u>Boring B-30-57</u>

Northing:	13,790 – 1,385 = N 12,405
Easting:	8,750 – 30 = E 8,720

Note: For clarity, the boring location plan on the next page, which shows the three borings listed above, is from the Dames & Moore (1957b) report rather than from the Dames & Moore (1957a) report.



PLOT PLAN

FEET
100 0 100 200

● BORINGS DRILLED IN THIS INVESTIGATION
○ BORINGS DRILLED IN PRELIMINARY INVESTIGATION

NOTE:
GROUND SURFACE ELEVATIONS ARE BASED ON U.S.C.& G.S. DATUM, MEAN LOWER LOW WATER = ELEV. 0.0

REFERENCE:
BECHTEL CORPORATION DWG. NO. 40-RO-501, REVISION 1, RECEIVED 2-13-57

Source: Dames & Moore (1957b)

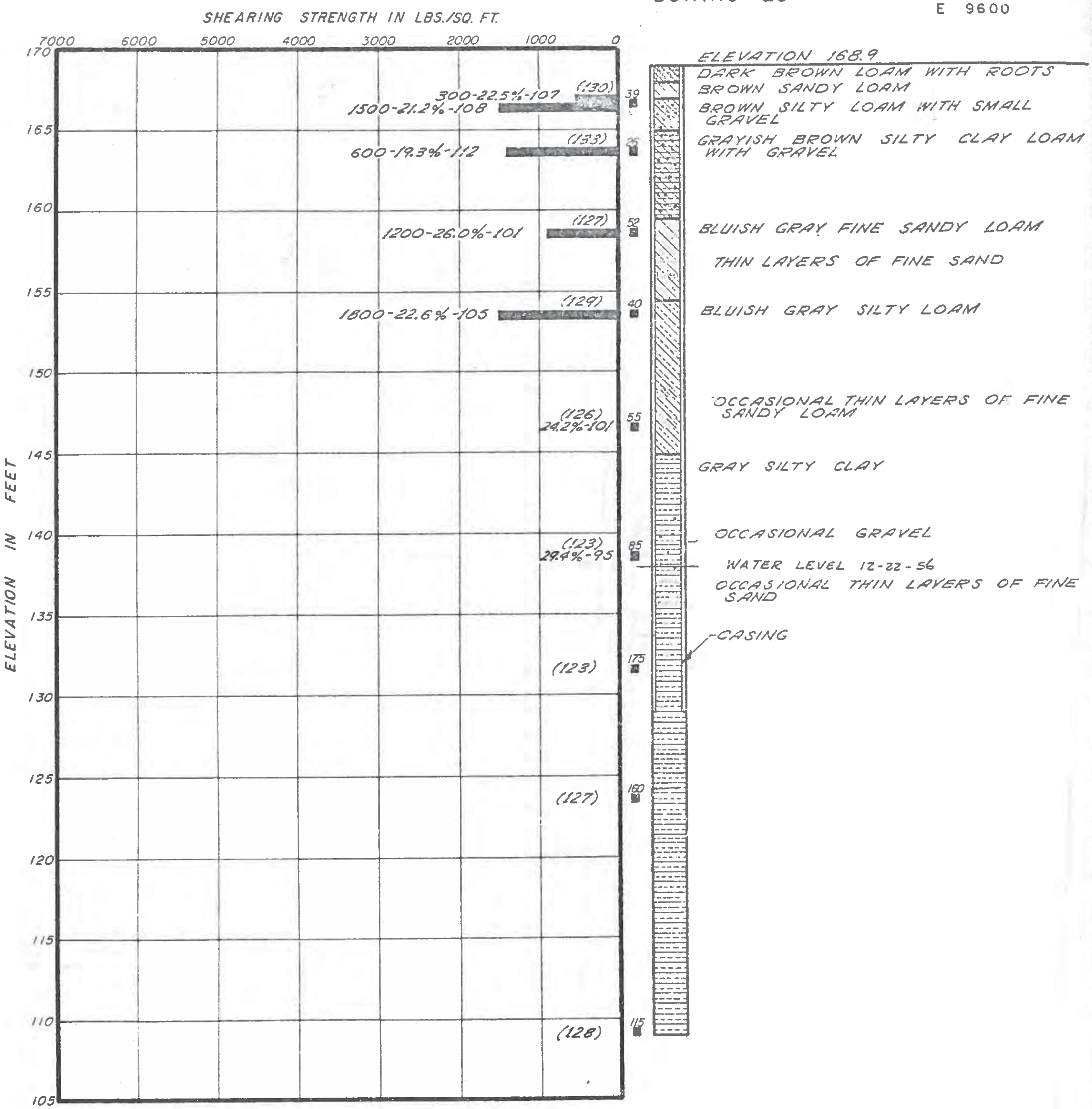
DAMES & MOORE
SOIL MECHANICS ENGINEERS

B-28-57

N 12435
E 9570

BORING 28

N 13820
E 9600



LOG OF BORINGS

BY B.V.F. DATE 12/27/57
CHECKED BY DATE

DAMES & MOORE
SOIL MECHANICS ENGINEERS

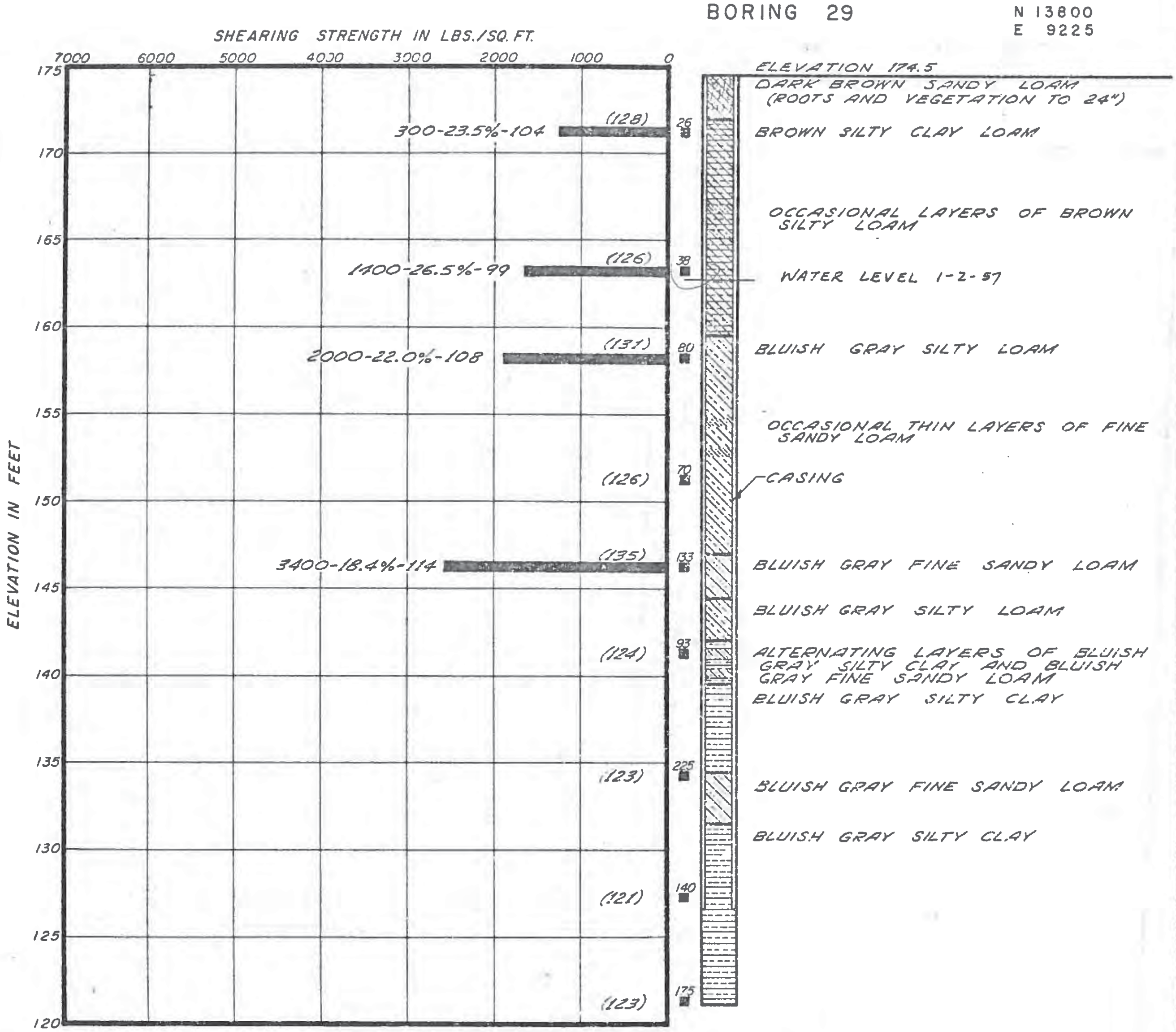
PLATE A-24

B-29-57

N 12415
E 9195

BORING 29

N 13800
E 9225



LOG OF BORINGS

DAMES & MOORE
SOIL MECHANICS ENGINEERS

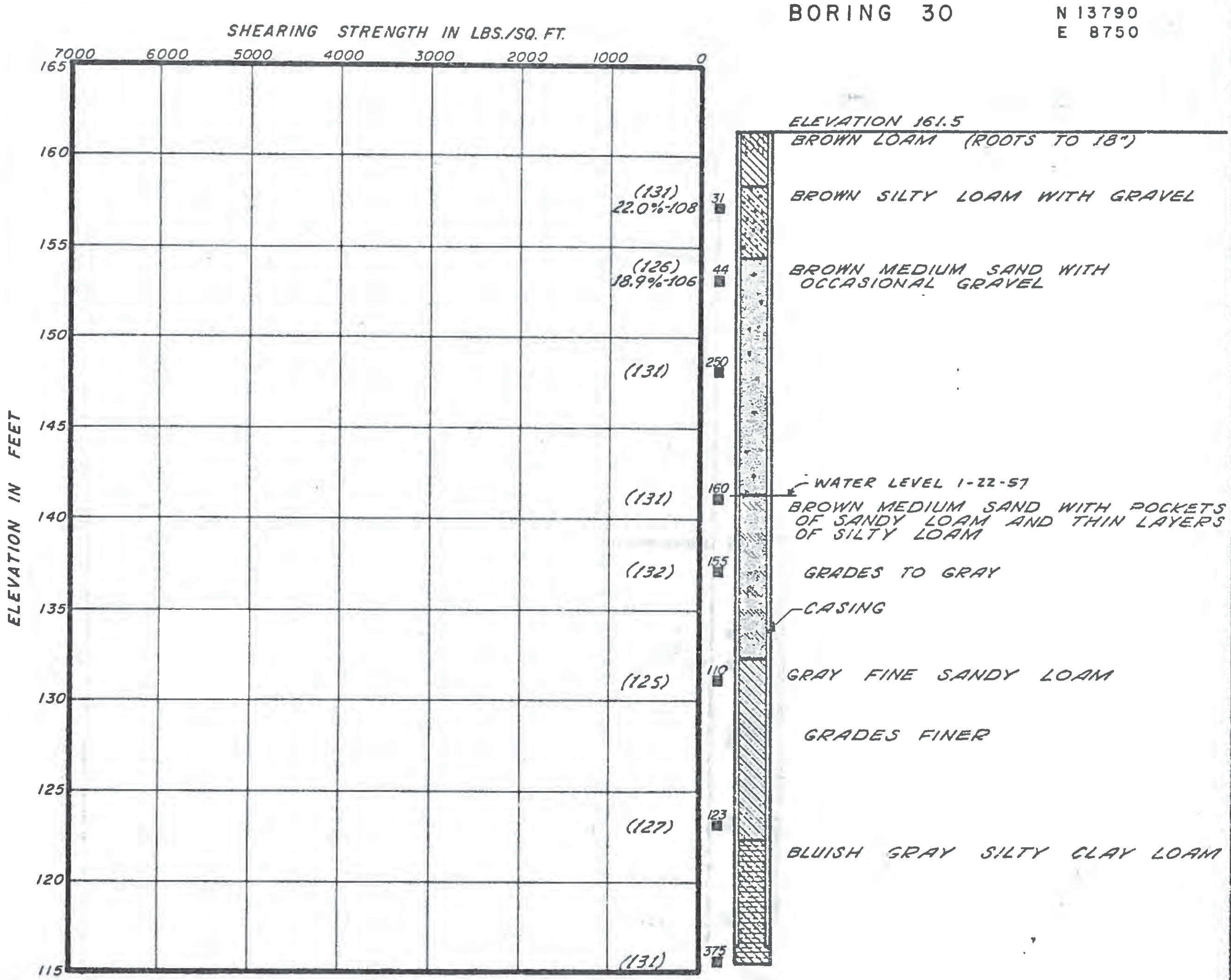
PLATE A-25

B-30-57

N 12405
E 8720

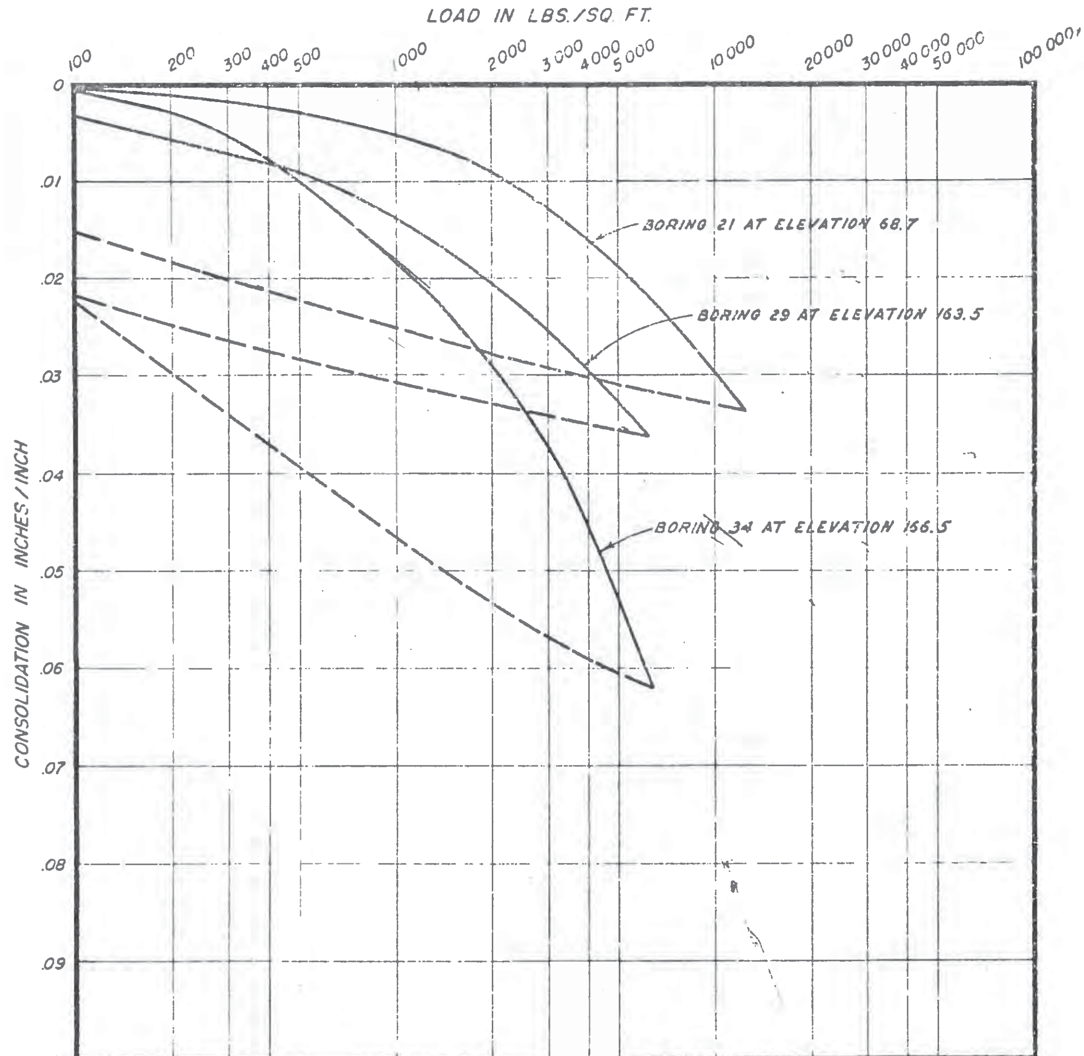
BORING 30

N 13790
E 8750



LOG OF BORINGS

DAMES & MOORE
SOIL MECHANICS ENGINEERS



DEPTH	BORING	ELEVATION	SOIL TYPE	MOISTURE CONTENT BEFORE	MOISTURE CONTENT AFTER	DRY DENSITY IN LBS/CU. FT.	
30.5	21	68.7	BLUISH GRAY FINE SANDY LOAM	21.0%	21.0%	104	
[illegible]	29	163.5	BROWN SILTY LOAM	22.5%	23.7%	102	$\sigma_0 = 1104$
21.5	34	166.5	GRAY CLAY	33.6%	33.6%	91	

CONSOLIDATION TEST DATA

TANKAGE AREA

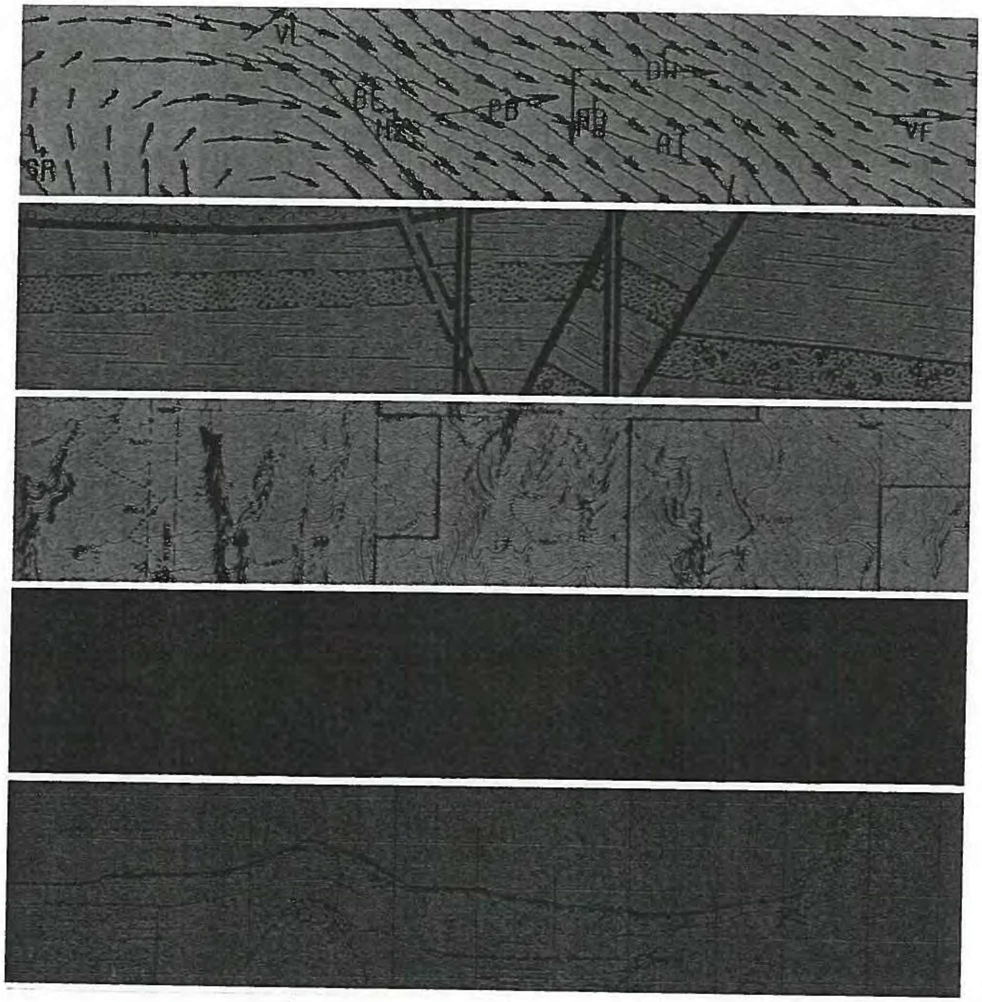
DAMES & MOORE
SOIL MECHANICS ENGINEERS

JOB NO. ___ THIS DRAWING IS ONE OF A SERIES OF ___ DRAWINGS LOCATION ___ CLIENT TEXAS CO. DATE JOB STARTED ___ DATE PRINTED ___ DRAFTING CHECK BY ___ REPORT DICTATED BY ___ DATE ___

APPENDIX B.2

BORING LOGS FROM MTBE STORAGE TANK
GEOTECHNICAL INVESTIGATION
DAMES & MOORE (1981)

31



REPORT OF
GEOTECHNICAL INVESTIGATION
PROPOSED MTBE STORAGE TANK
PUGET SOUND PLANT
ANACORTES, WASHINGTON

For:

TEXACO REFINING AND MARKETING, INC.
JOB NO. 00068-372-016
August 29, 1991

SAI

DAMES & MOORE

DAMES & MOORE A PROFESSIONAL LIMITED PARTNERSHIP
500 MARKET PLACE TOWER, 2025 FIRST AVENUE, SEATTLE, WASHINGTON 98121
(206) 728-0744

August 29, 1991

Texaco Refining and Marketing, Inc.
Puget Sound Plant
600 South Texas Road
Anacortes, Washington 98221

Attention: Mr. Chuck MacKenzie

Dear Mr. MacKenzie:

We submit herewith four copies of our "Report of Geotechnical Investigation, Proposed MTBE Storage Tank, Puget Sound Plant, Anacortes, Washington," for Texaco Refining and Marketing.

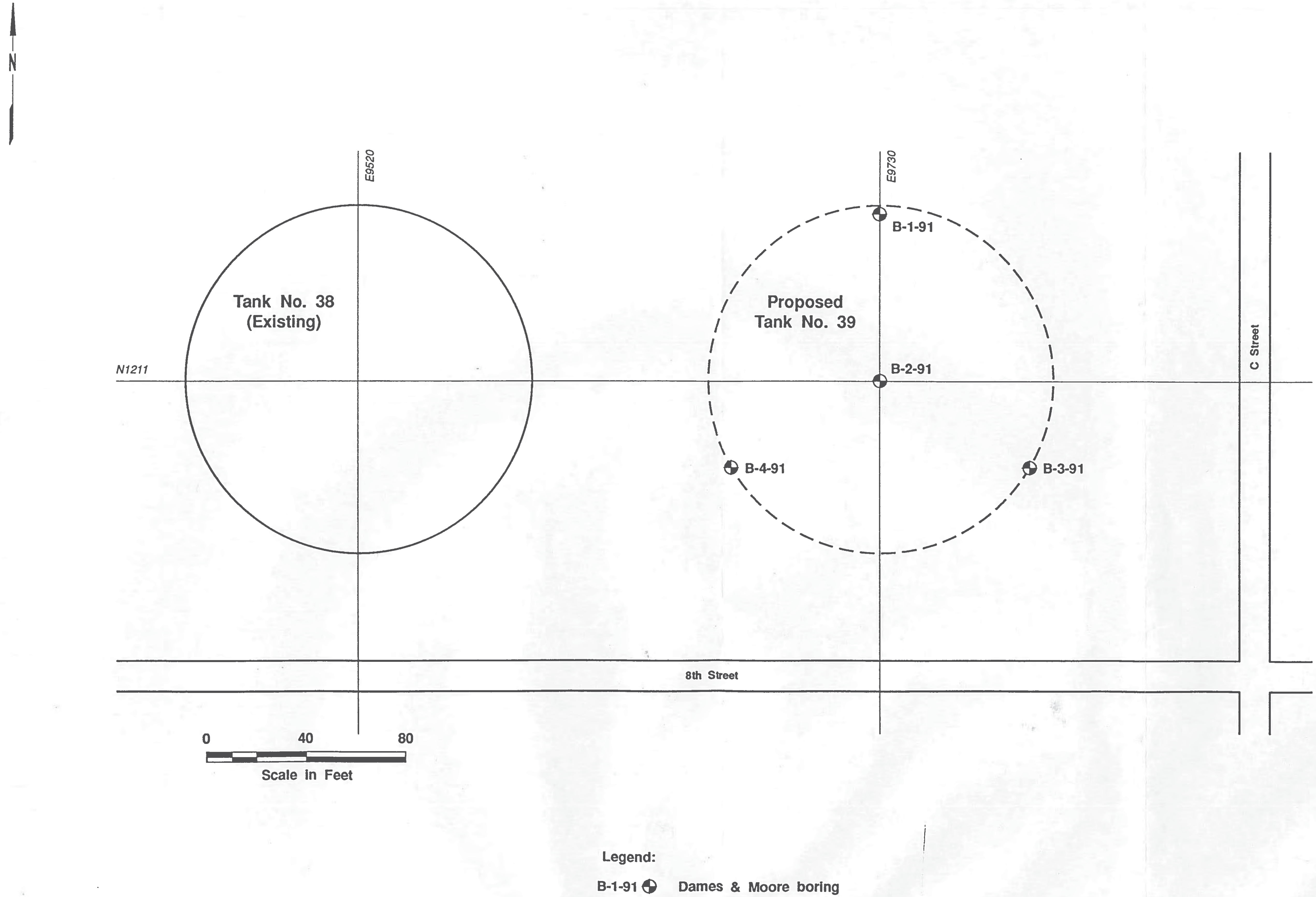
This investigation was authorized by your letter dated July 23, 1991 (Reference PSP-LA-881, PSP-921: MTBE Handling Facilities) and is based on our proposal dated July 30, 1991. Our findings and recommendations have been discussed with Mr. Jim Jansky of Christenson Engineering during progress of our studies.

We appreciate the opportunity to carry out this work. We are available to confer with your design engineers regarding our findings and recommendations.

Yours very truly,

DAMES & MOORE

Harbans L. Chabra, P.E.
Principal Engineer/Partner (Ltd.)



Job No. 68-372-016

Plate 1
Site Plan
Dames & Moore

APPENDIX
SITE EXPLORATIONS AND LABORATORY TESTS

SITE EXPLORATIONS

The field exploration program comprised 4 borings. The borings were drilled to depths of 24 to 58.5 feet at the locations shown on the Site Plan, Plate 1. The drilling was carried out with a truck-mounted B-61 drill rig, utilizing 4-inch I.D. hollow-stem auger. Logs of borings are presented on Plates A-1 to A-7. A key to information on the boring logs is presented on Plate A-8. The soils have been classified in accordance with the Unified Soil Classification System which is shown on Plate A-9.

The drilling was monitored by a Dames & Moore field engineer who classified the soils, maintained a continuous log of the conditions encountered, and obtained samples for laboratory testing and examination. Samples were taken by driving a Dames & Moore Type U Sampler, depicted on page A-3, with a 300 pound weight falling 30 inches. The number of blows required to drive the sampler the last 12 inches of each sample drive was recorded, and is shown adjacent to each sample notation on the boring logs.

B-1-91

Surface Elevation: 160.5

REMARKS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	BLOWS PER FOOT	SAMPLE TYPE	DEPTH (FT) WATER LEVEL
					0
	12.8	120	31	■	
					5
	21.8	108	27	■	
					10
			16	■	
					15
	28.5	93	72	■	
					20
			50/6"	■	
					25
	26.3	98	50/5"	■	
					30
			53/6"	■	
					35

ML	Light brown silt
CL	Brown and gray silty clay with some fine to coarse sand and occasional gravel (very stiff)
CL	Bluish gray silty clay with occasional fissured zones (hard)

SUperLOG V 2.0, 3-1991

Logged by CJN 08-28-1991

LOG OF BORING

Dames & Moore

Job No. 00068-372-016

PLATE A-1

B-1-91

(Continued)

REMARKS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	BLOWS PER FOOT	SAMPLE TYPE
	23.5	102	51/6"	■
			61/6"	■
	21.2	106	32/6"	■
			100/5"	■
	23.8	102	50/4"	■

DEPTH (FT) WATER LEVEL: 35, 40, 45, 50, 55, 60, 65, 70

CL	
ML	Gray to bluish gray clayey silt with trace organics (hard)
	Lenses of light gray fine sand
SP	Gray to dark grey fine sand (dense)
ML	Gray to bluish gray clayey silt with lenses of fine sand and trace organics (hard)

Boring completed at depth of 58.5 feet on 7/25/91.

Perched water encountered at a depth of 24 feet during drilling. Groundwater encountered at a depth of 36.5 feet during drilling.

Logged by CJN 08-28-1991 SUperLOG V 2.0, 3-1991

LOG OF BORING

Dames & Moore

Job No. 00068-372-016

PLATE A-2

B-2-91

Surface Elevation: 158.0

Remarks	Moisture Content (%)	Dry Density (PCF)	Blows Per Foot	Sample Type
	14.7	119	47	■
	23.0	104	18	■
	34.2	89	79	■
	27.6	94	76/11"	■
	24.4	103	82/11"	■

Depth (ft) / Water Level: 0, 5, 10, 15, 20, 25, 30, 35

SM	Brown to light brown silty sand with occasional gravel
ML	Brown and gray clayey silt with gravel (hard)
CL	Light brown and gray silty clay with occasional gravel (very stiff)
ML	Gray silt with lenses of fine sand and occasional gravel (hard)
CL	Bluish gray silty clay with trace organics (hard)
	lenses of light gray fine sand

Boring completed at depth of 24 feet on 7/25/91.
No groundwater encountered during drilling

Logged by CJN 08-28-1991

SUperLOG V 2.0, 3-1991

LOG OF BORING

Dames & Moore

Job No. 00068-372-016

PLATE A-3

B-3-91

Surface Elevation: 154.5

REMARKS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	BLOWS PER FOOT	SAMPLE TYPE
			24	
	23.0	102	24	
	31.0	92	58	
	25.7	95	50/6"	
			84/5"	
	27.0	97	91/11"	
			50/6"	

DEPTH (FT): 0, 5, 10, 15, 20, 25, 30, 35

WATER LEVEL

ML	Medium to light brown sandy silt with some gravel
CL	Brown and gray silty clay with occasional gravel (very stiff)
CL	Bluish gray silty clay with trace organics (hard)
ML	Light gray silt (hard)

Logged by CJN 08-28-1991 SUperLOG V 2.0, 3-1991

LOG OF BORING

Dames & Moore

B-3-91

(Continued)

Remarks	Moisture Content (%)	Dry Density (PCF)	Blows per Foot	Sample Type	Depth (ft)	Water Level	Soil	Description
					35		ML	
							SP	Dark gray fine sand (very dense)
	23.4	100	50/6"	■				
					40		CL	Bluish gray silty clay with trace organics (hard)
			85/5"	■				
					45			
	24.0	103	60/5"	■				
							ML/CL	Gray and bluish gray silt with bluish gray silty clay laminations (hard)
					50			
			50/5"	■				
					55			
							SP	Gray to light gray fine sand (very dense)
	21.4	102	85/5"	■				
								Boring completed at depth of 58.5 feet on 7/26/91.
								No groundwater encountered during drilling
					60			
					65			
					70			

Logged by CJN 08-28-1991

SUperLOG V 2.0, 3-1991

LOG OF BORING

Dames & Moore

Job No. 00068-372-016

PLATE A-5

B-4-91

Surface Elevation: 156

Remarks	Moisture Content (%)	Dry Density (PCF)	Blows per Foot	Sample Type
	19.0	109	21	■
	25.1	106	29	■
	18.1	112	20	■
	25.3	98	57	■
			50/5"	■
	24.5	102	65/5"	■
			50/6"	■

Depth (ft) / Water Level: 0, 5, 10, 15, 20, 25, 30, 35

CL	Brown to light brown silty clay with some sand and occasional gravel (very stiff)
ML	Gray to bluish gray silt with silty clay interbeds (very stiff)
SP/SM	Dark gray fine sand (dense)
	Becoming silty
CL	Bluish gray silty clay (hard)

Logged by CJN 08-28-1991 SUperLOG V 2.0, 3-1991

LOG OF BORING

Dames & Moore

Job No. 00068-372-016

PLATE A-6

B-4-91

(Continued)

REMARKS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	BLOWS PER FOOT	SAMPLE TYPE	DEPTH (FT) / WATER LEVEL		DESCRIPTION
					35	CL	
	24.8	100	50/6"	■			
					40		Laminations of silt and fine sand
			50/6"	■			
					45		
	26.4	102	89/11"	■			
					50		
			50/6"	■			
					55		
						SM	Bluish gray silty fine sand (very dense)
	24.4	100	50/6"	■			
							Boring completed at depth of 58.5 feet on 7/26/91. No groundwater encountered during drilling
					60		
					65		
					70		

Logged by CJN 08-28-1991 SUperLOG V 2.0, 3-1991

LOG OF BORING

Dames & Moore

Job No. 00068-372-016

PLATE A-7

APPENDIX B.3

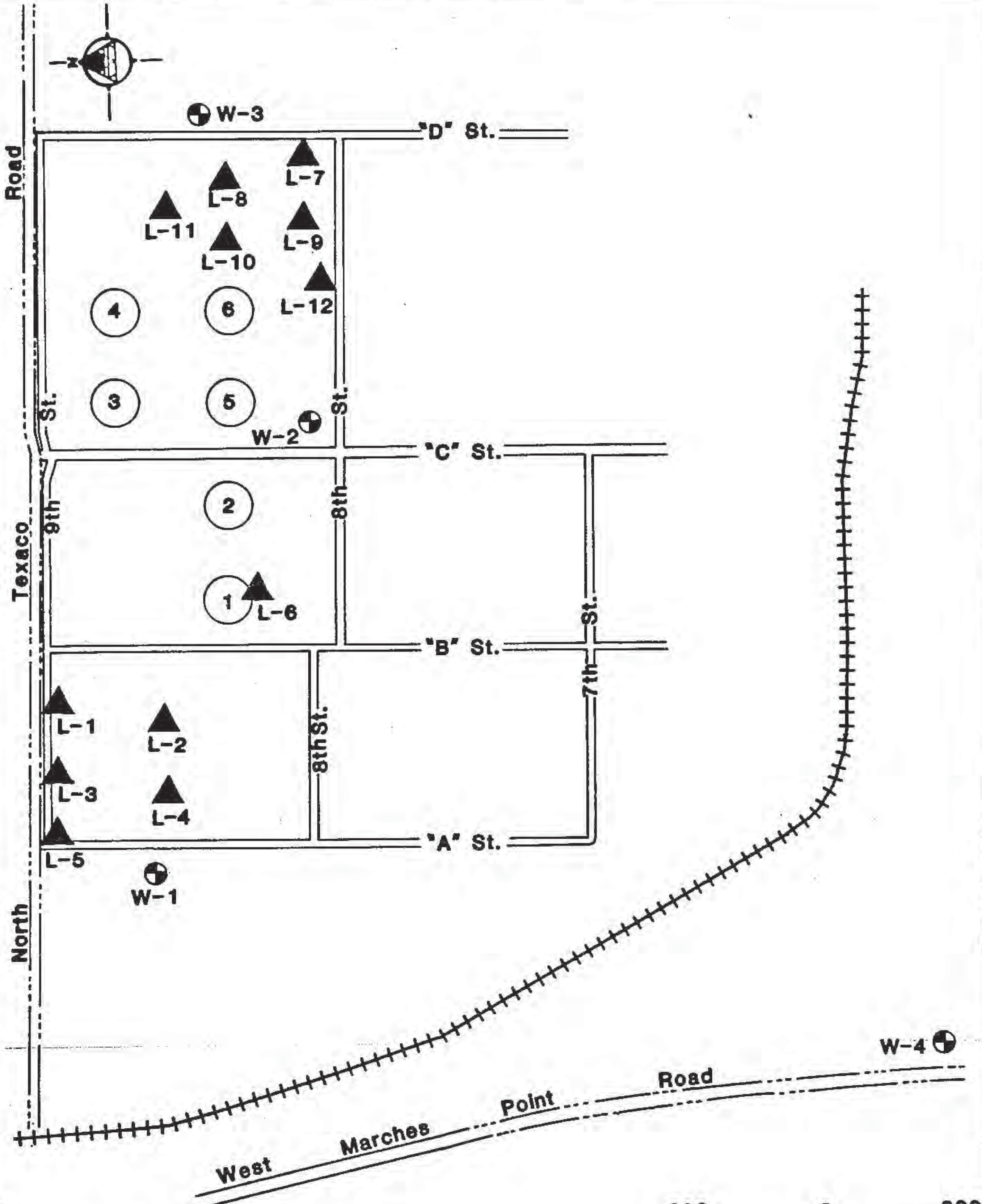
BORING LOGS FROM REPORT OF AS-BUILT CONDITIONS
GROUND WATER MONITORING WELLS AND LYSIMETERS
DAMES & MOORE (1981)

REPORT OF
AS-BUILT CONDITIONS
GROUND WATER MONITORING WELLS AND LYSIMETERS
TEXACO MARCH POINT REFINERY
ANACORTES, WASHINGTON
FOR
TEXACO, INC.

SA-1

November 18, 1981
00068-200-05

Dames & Moore



Key:

W-1 Number & location of Ground Water Monitoring Wells

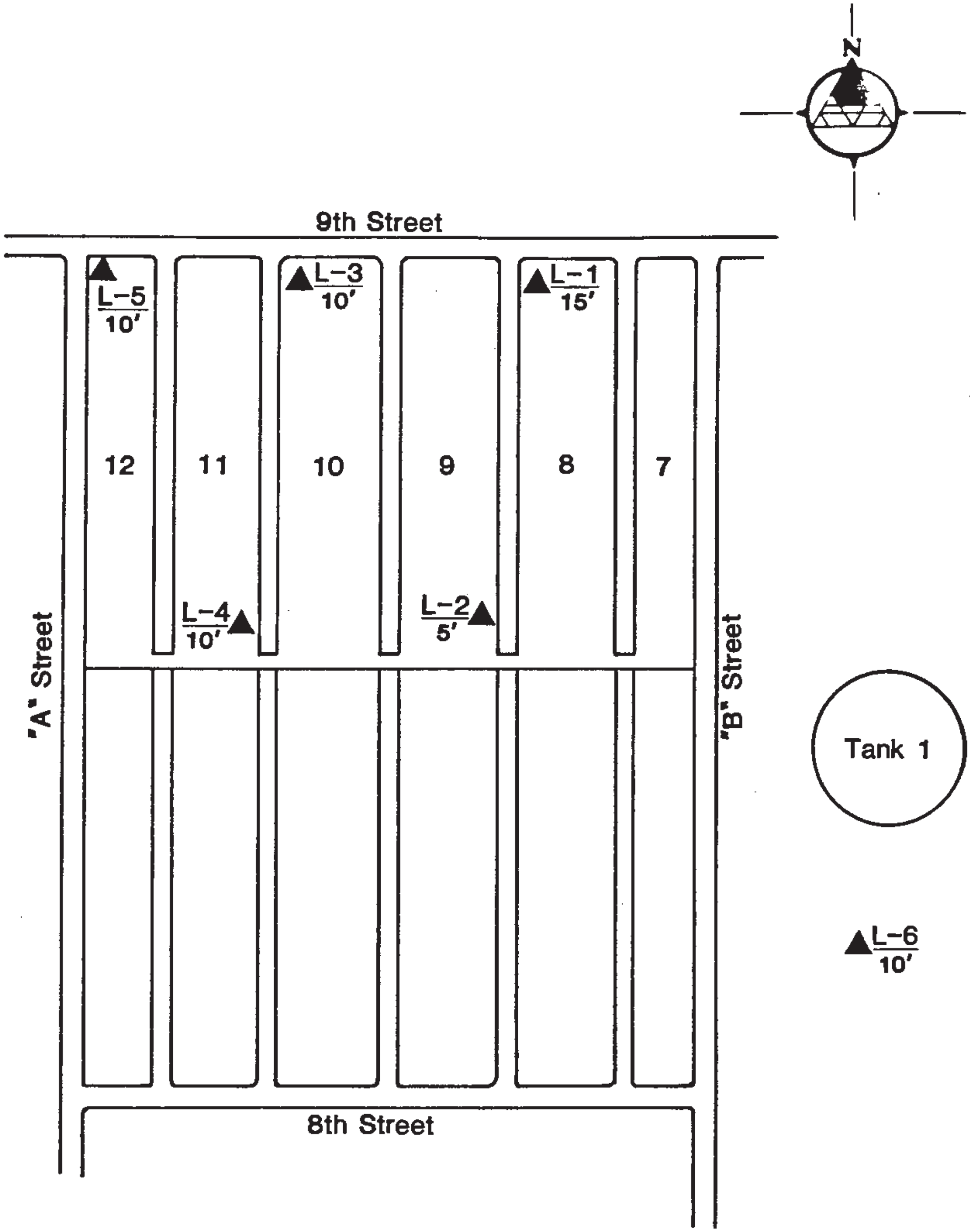
L-1 Number & location of Lysimeters

600 0 600

Scale in Feet

PLOT PLAN

Dames & Moore

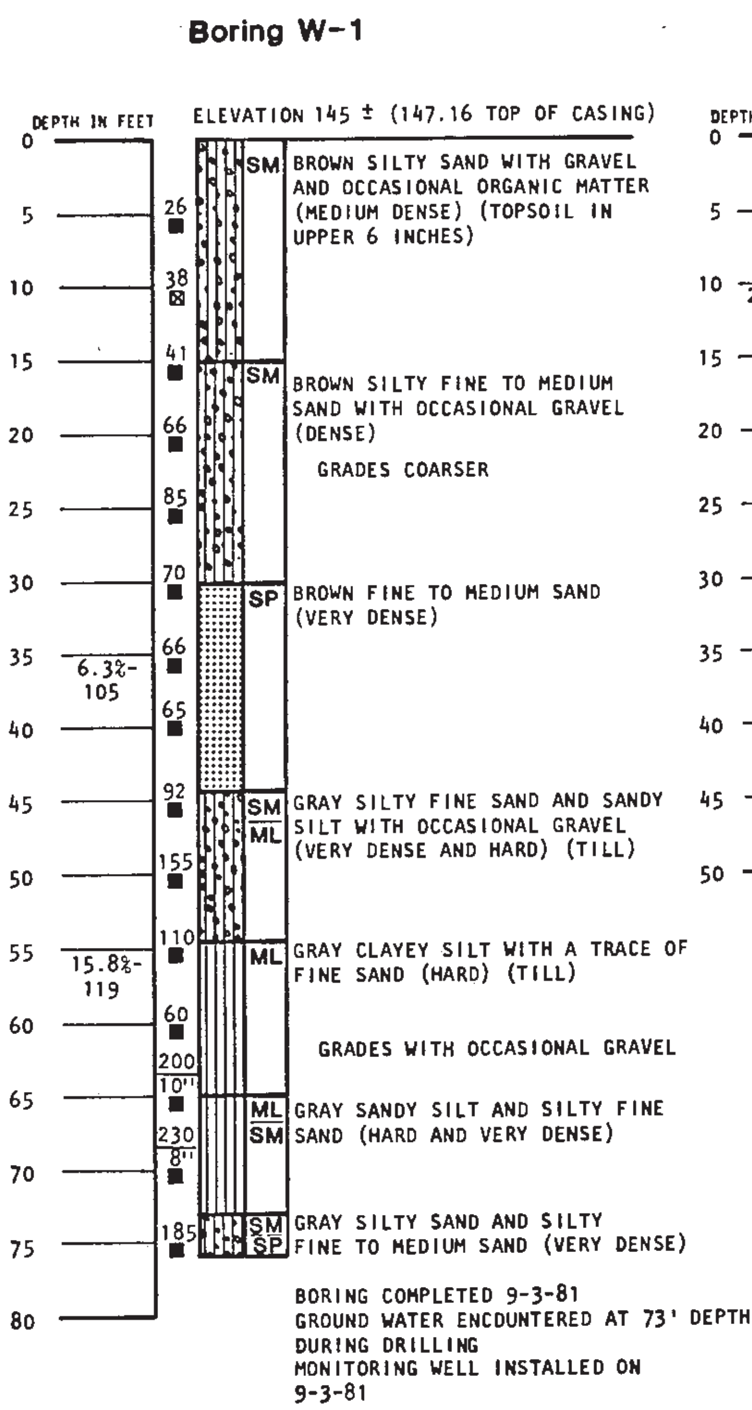


Location of Installed Lysimeters
L-1 Through L-6
Scale: 1"=200'

KEY:

▲ L-1 / 15' Lysimeter Location, Number and Depth

Dames & Moore



Key:

MOISTURE CONTENT → 6.3%-
105 ← DRY DENSITY IN PCF

BLOWS REQUIRED TO DRIVE DAMES & MOORE SAMPLER ONE FOOT WITH A HAMMER WEIGHT OF 350 LBS. AND A STROKE OF 24 INCHES.

65 ■ INDICATES DEPTH AT WHICH UNDISTURBED DAMES & MOORE SAMPLE WAS EXTRACTED.

⊠ INDICATES DEPTH AT WHICH DISTURBED DAMES & MOORE SAMPLE WAS EXTRACTED.

Note:

THE DISCUSSION IN THE TEXT OF THIS REPORT IS NECESSARY FOR A PROPER UNDERSTANDING OF THE NATURE OF THE SUBSURFACE MATERIALS ENCOUNTERED AND AS-BUILT DETAILS OF THE GROUND WATER MONITORING WELL INSTALLATIONS.

LOG OF BORINGS

BORING L-1

Depth in Feet		Elevation 177'$\pm$
0 - 2½	ML	BROWN SANDY SILT WITH GRAVEL (MEDIUM STIFF)
2½ -15	ML/SM	BROWN AND GRAY SANDY SILT AND SILTY FINE SAND WITH OCCASIONAL GRAVEL (STIFF AND DENSE)

UNDISTURBED SAMPLES OBTAINED AT 3', 6', 8½', 11', AND 13½' DEPTHS.

BORING COMPLETED 9-15-81
LYSIMETER INSTALLED AT DEPTH OF 15 FEET.

BORING L-2

Depth in Feet		Elevation 176'$\pm$
0 - 1	ML	BROWN SANDY SILT WITH OCCASIONAL GRAVEL (MEDIUM STIFF)
1 - 10	SW	BROWN AND GRAY FINE TO COARSE SAND WITH A TRACE OF SILT (LOOSE TO MEDIUM DENSE)

UNDISTURBED SAMPLES OBTAINED AT 3½', 5½', AND 8½' DEPTHS.

BORING COMPLETED 9-15-81
PERCHED GROUND WATER ENCOUNTERED AT 8' DEPTH.
LYSIMETER INSTALLED AT DEPTH OF 5' APPROXIMATELY 20' N.E. OF BORING L-2 LOCATION.

BORING L-3

Depth in Feet		Elevation 170'$\pm$
0 - 1½	SM	BROWN SILTY FINE SAND WITH OCCASIONAL GRAVEL AND COBBLES (LOOSE)
1½ - 10	ML	BROWN AND GRAY SANDY SILT WITH OCCASIONAL FINE GRAVEL (STIFF)

UNDISTURBED SAMPLES OBTAINED AT 3½', 6', AND 8½' DEPTHS.

BORING COMPLETED 9-16-81
NO GROUND WATER ENCOUNTERED
LYSIMETER INSTALLED AT DEPTH OF 10 FEET.

NOTES: 1. ALL SAMPLES OBTAINED USING A DAMES & MOORE SAMPLER DRIVEN WITH A 300 LBS. HAMMER FALLING A DISTANCE OF APPROXIMATELY 30 INCHES.
2. MOISTURE-DENSITY DATA IS PRESENTED ON PLATE 11.

Dames & Moore

BORING L-4

Depth in Feet		Elevation 167'±
0 - 2	ML	BROWN SANDY SILT WITH OCCASIONAL GRAVEL (MEDIUM STIFF)
2 - 10	ML	BROWN SILT WITH OCCASIONAL SAND AND FINE GRAVEL (STIFF)
		GRADES TO HARD AT 8' DEPTH

UNDISTURBED SAMPLES OBTAINED AT 3½',5½', AND 8½' DEPTHS.

BORING COMPLETED 9-16-81
NO GROUND WATER ENCOUNTERED
LYSIMETER INSTALLED AT DEPTH OF 10 FEET.

BORING L-5

Depth in Feet		Elevation 154'±
0 - 5½	ML/SM	BROWN SANOY SILT AND SILTY FINE SAND WITH OCCASIONAL GRAVEL (MEDIUM STIFF TO STIFF)
5½ - 7½	ML	BROWN SANDY SILT WITH OCCASIONAL GRAVEL (STIFF)
7½ - 10	SP	BROWN FINE TO MEDIUM SAND (DENSE)

UNDISTURBED SAMPLES OBTAINED AT 3½', 6', AND 8½' DEPTHS.

BORING COMPLETED 9-16-81
NO GROUND WATER ENCOUNTERED
LYSIMETER INSTALLED AT DEPTH OF 10 FEET.

BORING L-6

Depth in Feet		Elevation 184'±
0 - 10	ML	MOTTLED BROWN AND GRAY SILT WITH A TRACE OF FINE GRAVEL (STIFF)

UNDISTURBED SAMPLES OBTAINED AT 3½', 5½', AND 8½' DEPTHS.

BORING COMPLETED 9-17-81
NO GROUND WATER ENCOUNTERED
LYSIMETER INSTALLED AT DEPTH OF 10 FEET.

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
Coarse Grained Soils More than 50% of material is LARGER than No. 200 sieve size.	Gravel and Gravelly Soils More than 50% of coarse fraction RETAINED on No. 4 sieve.	Clean Gravels (Little or no fines)		GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
				GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.
		Gravels with Fines (Appreciable amount of fines)		GM	Silty gravels, gravel-sand-silt mixtures.
				GC	Clayey gravels, gravel-sand-clay mixtures.
	Sand and Sandy Soils More than 50% of coarse fraction PASSING No. 4 sieve.	Clean Sand (Little or no fines)		SW	Well-graded sands, gravelly sands, little or no fines.
				SP	Poorly-graded sands, gravelly sands, little or no fines.
		Sands with Fines (Appreciable amount of fines)		SM	Silty sands, sand-silt mixtures.
				SC	Clayey sands, sand-clay mixtures.
Fine Grained Soils More than 50% of material is SMALLER than No. 200 sieve size.	Silts and Clays Liquid Limit LESS than 50			ML	Inorganic silts and very fine 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 silt and organic silty clays of low plasticity.
	Silts and Clays Liquid Limit GREATER than 50			MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils.
				CH	Inorganic clays of high plasticity, fat clays.
				OH	Organic clays of medium to high plasticity, organic silts.
Highly Organic Soils				PT	Peat, humus, swamp soils with high organic contents.

Note: Dual symbols are used to indicate borderline soil classifications.

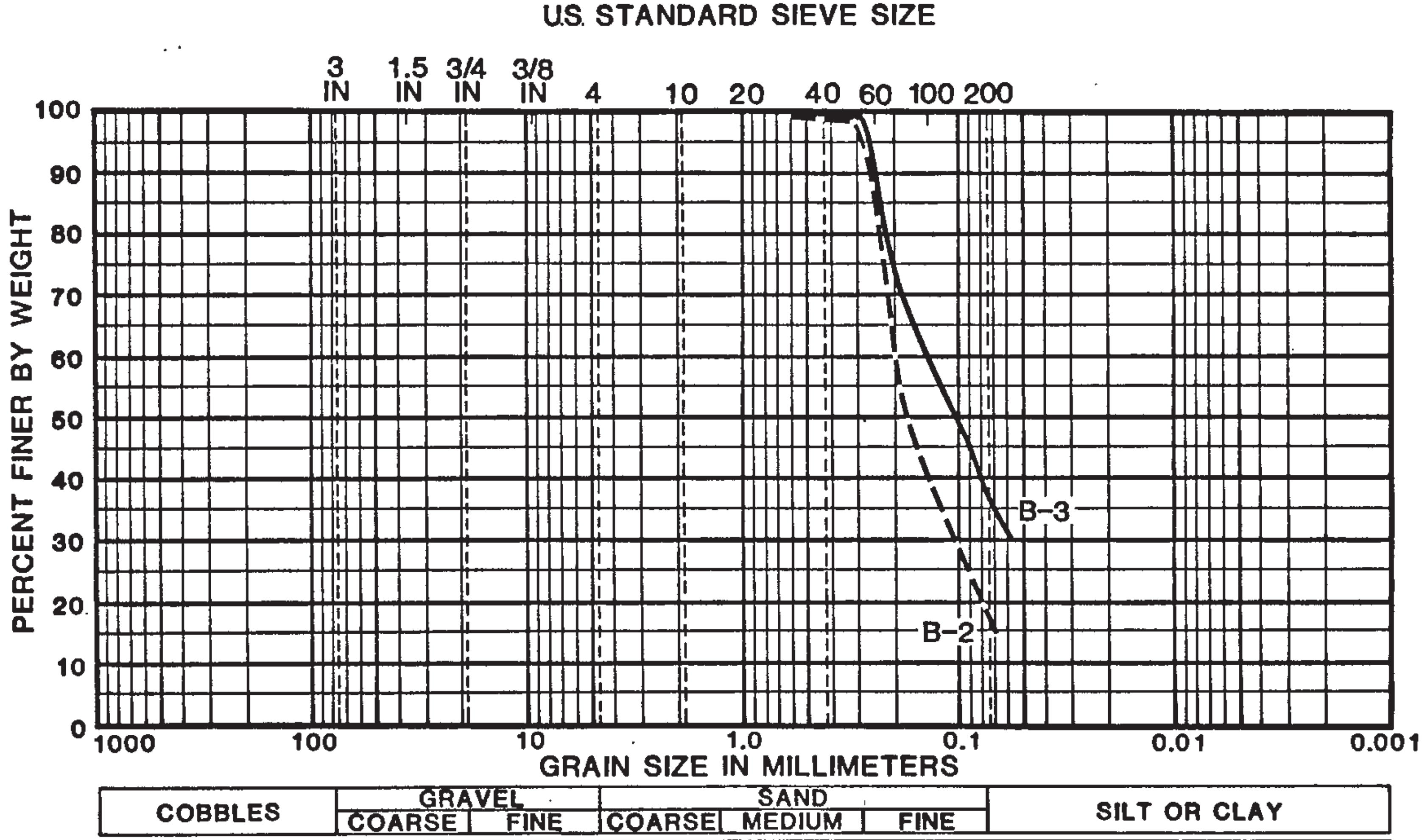
Unified Soil Classification System

Dames & Moore

Moisture-Density Test Results

Boring	L2	L4	L6	L7	L10	L12
Sample Depth (feet)	5-1/2	3-1/2	8-1/2	3-1/2	1-1/2	6
Dry Density (lbs./cu. ft.)	118.0	91.3	86.2	117.1	107.8	120.9
Moisture Content (% dry wt.)	13.2	31.5	32.9	14.3	19.8	14.6

Dames & Moore



BORING	DEPTH	CLASSIFICATION
2	45'	SILTY FINE SAND
3	70'	SILTY FINE SAND

GRADATION CURVE

Dames & Moore

Permeability Test Results

Boring Designation	Sample Depth (feet)	Soil Description	Inferred Permeability (feet/minute)
W-2	45	silty fine sand with lenses of silt	17×10^{-2}
W-3	70	silty fine sand with organic matter	4×10^{-2}

Dames & Moore

APPENDIX B.4

SELECTED TABLES AND FIGURES FROM
LANDAU (1988) AND LANDAU (1989) HYDROGEOLOGIC REPORTS

This compilation of selected pages from the Landau (1988) and Landau (1989) reports contains annotations by AECOM in relation to the RP&S New Crude Tank and Product Tanks Projects.

Final Report

HYDROGEOLOGIC INVESTIGATION TEXACO PUGET SOUND PLANT

Prepared for

Texaco Refining and Marketing Inc.
P.O. Box 622
Anacortes, WA 98221

Prepared by

Landau Associates, Inc.
P.O. Box 694
Edmonds, WA 98020

June 17, 1988

TABLE 3-1

PROPERTIES OF GEOLOGIC UNITS

Geologic Unit	General Description	Unified Soil Classification[a]	Appropriate Range of Thickness (ft)[b]	Approximate Range of Dry Density (pcf)[b]	Approximate Range of Moisture Content (Percent)[b]	Estimated Range of Permeability (K in cm/sec)[b]
West Land Treatment Facility						
(Unit A) Shallow fill soil and fine sand	Brown sandy silt fill with abundant wood debris and underlying fine sand and silty fine sand with sparse gravel, of possible beach deposit origin. Fine sand thins to west, not noted below elevation of ~ 130 feet[c]. Shallow conditions have been altered by cutting and grading. Fill soil and sand are thickest to the west of the WLTF.	ML SP SM	0 - 15	65 - 95 (fill) 95 - 105 (sand)		$10^{-4} - 10^{-7}$
(Unit B) Diamicton	Unstratified fine soils containing variable amounts of matrix-supported gravel and sand, comprised of one or both of two subunits.	ML CL	4 - 15	100 - 135	10 - 20	$10^{-6} - 10^{-8}$
(B-1)	A gravelly silty clay of probable glacial marine origin.					
(B-2)	An underlying very dense gravelly sandy silt of lodgment origin. Near-surface soil (~ 20 feet) is tan-brown, mottled, with some desiccation fissures. Nondifferentiated on west side.					
(Unit C) Brown fine-coarse sand	Brown fine to coarse sand, minor gravelly sand, silty sand and subordinate sandy silt and silt. Distinctive rusty gray-brown color. Foreset bedding (observed in trench exploration) dips to south. Dry density and blow counts during drilling suggest subglacial consolidation.	SW SP Subordinate SM, ML	5 - 40	100 - 110	5 - 23	$10^{-3} - 10^{-6}$
(Unit D) Interlayered silt and fine sand	Laminated gray and greenish gray silts and clays, gravelly silts, and sandy silts interlayered with gray fine sand and silty sand. Laminated clays and silts contain sparse shells, worm burrows, and plant debris.	ML/CL SP SM	30+ - 50+	95 - 100	5 - 15	$10^{-3} - 10^{-8}$
(D-2)	The silt and clay layer that underlies brown sand unit and acts as an aquitard between Unit C and underlying saturated gray sands in Unit D.	ML CL Subordinate GM	5 - 50	95 - 105	20 - 30	$10^{-6} - 10^{-8}$

LANDAU ASSOCIATES, INC.

TABLE 3-2

HYDROLOGIC ZONES

Hydrologic Zone	General Description	Approximate Range of Thickness (ft)	Mean Horizontal (K_h) and Vertical (K_v) Hydraulic Conductivity (cm/sec) (a)	Average Porosity (percent) (b)	Estimated Drainable Porosity (percent) (c)
East Land Treatment Facility					
E-1	Upper water-bearing zone near-surface weathered portion of geologic Unit B.	15 - 20	K_h 2.4×10^{-5} K_v 1.2×10^{-8}	0.38	0.08
E-2	Aquitard, unweathered geologic Unit B and Unit D-2.	40 - 70	K_h 1.6×10^{-7} K_v 6.9×10^{-8}	0.35	0.05
E-3	Lower water-bearing zone, geologic Unit E.	>5 (lower boundary has not been penetrated, maximum depth drilled 25 feet)	K_h 5.9×10^{-5} (d) K_v 2.2×10^{-6} (d)	0.41	0.31
West Land Treatment Facility					
W-1	Unsaturated surficial soils (geologic Unit A)	0 - 15	K_h — K_v 5.0×10^{-6}	0.42	0.32
W-2	Aquitard (geologic Unit B)	10 - 20	K_h — K_v 5.8×10^{-8}	0.35	0.05
W-3	Upper water-bearing zone (geologic Unit C)	0 - 45	K_h 2.8×10^{-4} K_v 4.6×10^{-5}	0.38	0.28
W-4	Aquitard (D-1 member of geologic Unit D)	0 - >50	K_h — K_v 1.5×10^{-7}	0.38	0.08
W-5	Lower water-bearing zone (geologic Unit D)	>40	K_h 7.3×10^{-5} (d) K_v 7.5×10^{-5} (d)	0.37	0.27

(a) See Table 3-3.
(b) Appendix B.
(c) Estimated by subtracting field capacity from total porosity (average porosity) (Bear 1979). Field capacities for various soil types from Dunne & Leopold (1978).
(d) Data from sand layers in interbedded sand and clay unit.

TABLE 3-3

SUMMARY OF HYDRAULIC CONDUCTIVITY VALUES
(cm/sec)

Hydro-logic Zone[(a)]	Orientation	Number of Obser-vations	Hydraulic Conductivity Average	Median	Maximum	Minimum
East Land Treatment Facility						
E-1	Horizontal	4	2.4×10^{-5}	2.3×10^{-5}	7.0×10^{-5}	9.8×10^{-6}
	Vertical	7	1.2×10^{-8}	1.0×10^{-8}	2.7×10^{-8}	7.2×10^{-9}
E-1.5	Horizontal	11	1.7×10^{-6}	1.5×10^{-6}	6.9×10^{-6}	5.2×10^{-7}
	Vertical	0	--	--	--	--
E-2	Horizontal	9	1.5×10^{-7}	1.5×10^{-7}	5.0×10^{-7}	6.3×10^{-8}
	Vertical	13	6.9×10^{-8}	5.7×10^{-8}	1.6×10^{-6}	1.5×10^{-8}
E-3	Horizontal	7	5.6×10^{-5}	3.5×10^{-5}	7.8×10^{-3}	1.8×10^{-7}
	Vertical	5	2.2×10^{-6}	1.5×10^{-6}	3.1×10^{-5}	3.6×10^{-7}
E-3.5	Horizontal	0	--	--	--	--
	Vertical	2	2.4×10^{-8}	--	4.8×10^{-8}	1.2×10^{-8}
West Land Treatment Facility						
W-1	Horizontal	0	--	--	--	--
	Vertical	5	5.0×10^{-6}	1.0×10^{-5}	2.2×10^{-4}	3.0×10^{-8}
W-2	Horizontal	0	--	--	--	--
	Vertical	9	5.8×10^{-8}	3.4×10^{-8}	1.1×10^{-6}	1.3×10^{-8}
W-3	Horizontal	13	2.6×10^{-4}	3.1×10^{-4}	1.8×10^{-2}	1.0×10^{-5}
	Vertical	14	4.6×10^{-5}	9.5×10^{-5}	4.3×10^{-4}	1.0×10^{-6}
W-4	Horizontal	0	--	--	--	--
	Vertical	13	1.5×10^{-7}	9.8×10^{-8}	2.0×10^{-5}	1.4×10^{-8}
W-5	Horizontal	4	6.0×10^{-5}	4.3×10^{-5}	2.5×10^{-3}	2.8×10^{-6}
	Vertical	6	7.5×10^{-5}	8.9×10^{-5}	3.2×10^{-4}	4.0×10^{-6}

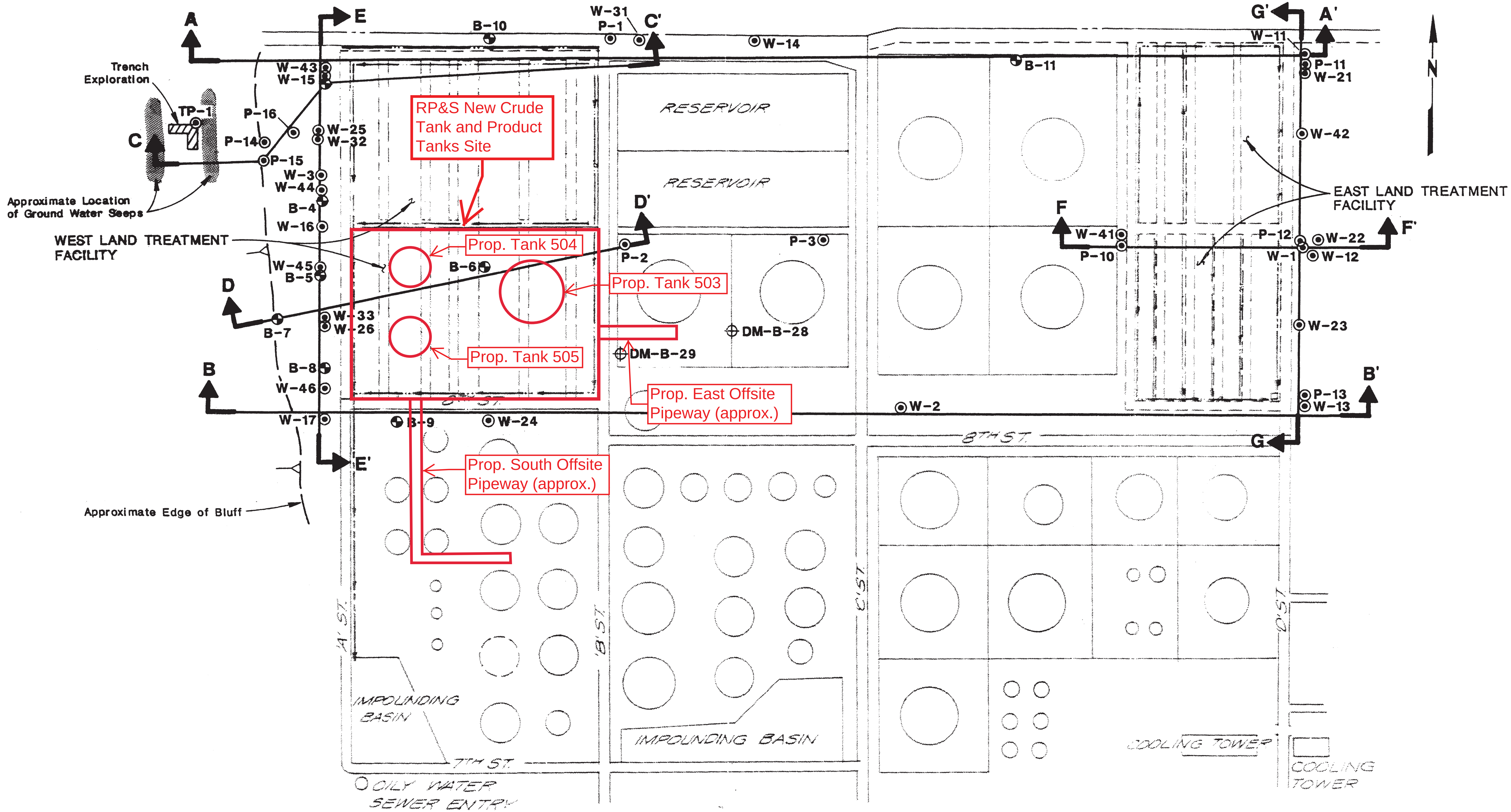
(a) Zone E-1.5 refers to K_h values located at depths transitional between Zones E-1 and E-2. Zone E-3.5 refers to K_v data in silts and clays of Zone E-3.

TABLE 3-4

GROUND WATER ELEVATIONS[a]

Well/ Piezometer	Ground[b] Surface Elevation	June 15,[c] 1984	Nov 9,[c] 1984	Mar 14,[c] 1985	July 26,[c] 1985	Sept 6,[c] 1985	Dec 10,[c] 1985	Apr 2,[c] 1986	Aug 26,[d] 1986	Oct 21,[d] 1986	Jan 12, 1987	April 7, 1987	June 25, 1987	Sept 28, 1987	Nov. 23, 1987	April 20, 1988
W-1	96.1	40.6	39.9	40.1	39.8	40.3	40.0	40.8	40.1	39.0	40.2	40.6	40.4	39.6	39.5	28.6
W-2	144.1	114.8	—[e]	114.2	113.8	114.1	114.5	115.2	114.4	114.1	114.5	114.4	114.1	113.4	113.2	114.4
W-3	145.4	102.9	—	102.6	102.1	102.1	102.1	102.8	101.9	101.6	102.0	102.2	101.8	101.3	100.9	101.1
W-4	17.1	14.1	Abandoned July 1986 in accordance with WAC 173-160-310					—	—	—	—	—	—	—	—	—
W-11	97.8	86.6	82.4	85.9	83.7	84.5	86.4	85.8	83.6	83.4	82.3	85.8	84.7	83.4	82.6	85.1
W-12	94.9	77.4	72.5	89.9	87.0	86.3	90.4	90.7	88.2	88.0	90.8	90.2	88.5	85.6	83.3	90.8
W-13	94.4	93.7	95.3	90.5	86.7	85.2	92.1	91.8	87.1	86.3	92.2	90.5	88.2	84.8	83.3	91.4
W-14	185.3	168.1	166.9	168.1	166.4	165.8	167.7	169.1	166.7	166.1	168.1	167.5	166.5	165.5	165.1	167.9
W-15	144.5	127.4	—	127.6	126.1	125.9	127.0	127.8	126.1	125.6	126.9	126.9	126.1	125.3	123.3	121.8
W-16	142.3	118.3[f]	90.7	90.9	90.6	90.9	90.7	91.2	91.1	91.1	91.0	91.1	91.0	90.9	90.7	90.7
W-17	131.9	87.3	—	85.8	85.0	84.7	84.0	85.3	84.7	84.0	84.3	84.5	83.9	83.1	82.3	82.7
W-21	97.7	—	—	93.6	92.0	93.1	96.3	96.0	93.1	94.2	96.5	94.5	93.6	92.5	93.6	94.5
W-22	93.8	—	—	93.5	91.7	92.1	94.3	94.4	92.1	92.4	94.5	93.9	92.2	91.0	91.7	94.0
W-23	94.6	—	—	92.3	89.6	88.9	93.9	93.9	89.8	90.2	93.8	95.5	90.8	88.4	88.4	92.7
W-24	151.9	—	—	116.6	116.6	116.8	116.7	117.2	116.6	116.5	116.5	116.5	116.5	116.4	dry	116.4
W-25	145.9	—	—	110.8	110.4	111.0	111.0	111.3	111.1	111.0	111.3	110.7	—	110.4	—	110.6
W-26	137.7	—	—	88.7	88.6	88.8	88.7	89.4	88.1	87.8	88.1	87.1	—	86.5	—	dry
W-31	191.0	—	—	—	—	—	—	—	174.9	173.3	176.4	176.6	174.4	172.7	170.4	175.7
W-32	145.8	—	—	—	—	—	—	—	105.2	106.6	107.8	108.0	107.6	107.2	106.7	106.7
W-33	138.1	—	—	—	—	—	—	—	88.5	88.2	88.1	87.1	86.9	86.6	86.2	85.7
W-41	121.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	116.8
W-42	99.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	81.6[h]
W-43	143.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	119.6
W-44	144.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	96.5
W-45	140.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	87.4
W-46	134.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	84.3
P-1	192.3	181.5	178.7	183.1	176.9	178.1	180.1	183.0	178.0	176.2	180.0	180.4	177.5	175.8	174.4	179.6
P-2	180.9	168.0	166.7	167.9	165.7	166.6	166.0	168.1	166.3	165.3	167.1	167.4	166.5	165.5	164.7	167.0
P-3	165.0	159.4	159.5	159.2	159.3	159.0	159.9	159.9	158.1	157.3	159.5	159.0	160.0	158.7	158.9	160.3
P-4	119.5	—	—	116.7	115.7	115.0	117.3	117.4	115.7	115.9	112.7	111.7	110.8	109.8	111.7	112.4
P-5	120.0	—	—	117.7	116.5	116.3	117.8	118.5	116.5	116.6	113.1	111.4	111.7	110.6	109.6	111.7
P-6	120.6	—	—	117.9	116.6	116.6	117.7	118.7	116.9	116.8	112.0	110.5	110.4	110.1	108.7	109.4
P-7	116.7	—	—	113.0	111.7	112.2	112.5	113.8	113.3	112.6	111.6	110.0	110.1	108.8	107.3	110.3
P-8	111.7	—	—	108.4	107.9	108.3	108.5	109.3	108.8	108.0	109.2	107.6	107.3	105.9	105.9	109.1
P-10(A)	121.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	119.2
P-10(B)	121.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	108.6
P-10(C)	121.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	97.9
P-10(D)	121.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	71.9
P-10(E)	121.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	44.8
P-11	97.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7.4
P-12(A)	95.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	94.3
P-12(B)	95.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	81.4
P-12(C)	95.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	76.5
P-12(D)	95.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	66.6
P-12(E)	95.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	37.5
P-13	93.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35.0
P-14	130.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	dry
P-15	129.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	86.4
P-16	137.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	dry
TP-1[g]	88.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	81.8

(a) Feet Above Mean Lower Low Water (MLLW).
(b) Ground surface elevations presented in this column reflect results of August 1986 survey.
(c) All ground water elevation measurements made from 14 March 1985 to date reflect the distance (or feet) between the top of the ground water surface and the uncorrected ground surface elevation.
(d) Ground water elevations made on 26 August and 21 October 1986 were based on relative distance from the top of the ground water surface to the corrected ground surface elevation.
(e) No measurements taken.
(f) This elevation measurement is an anomaly.
(g) Water level taken on 27 April 1988
(h) Measurement taken following development prior to recovery; not used to prepare water level contours.



KEY

W-44 ◉ Number and Approximate Location of Well or Piezometer

B-1 ⊕ Number and Approximate Location of Soil Boring

DM-B-29 ⊕ Number and Approximate Location of Previous Soil Boring (Data from Texaco, 1986)

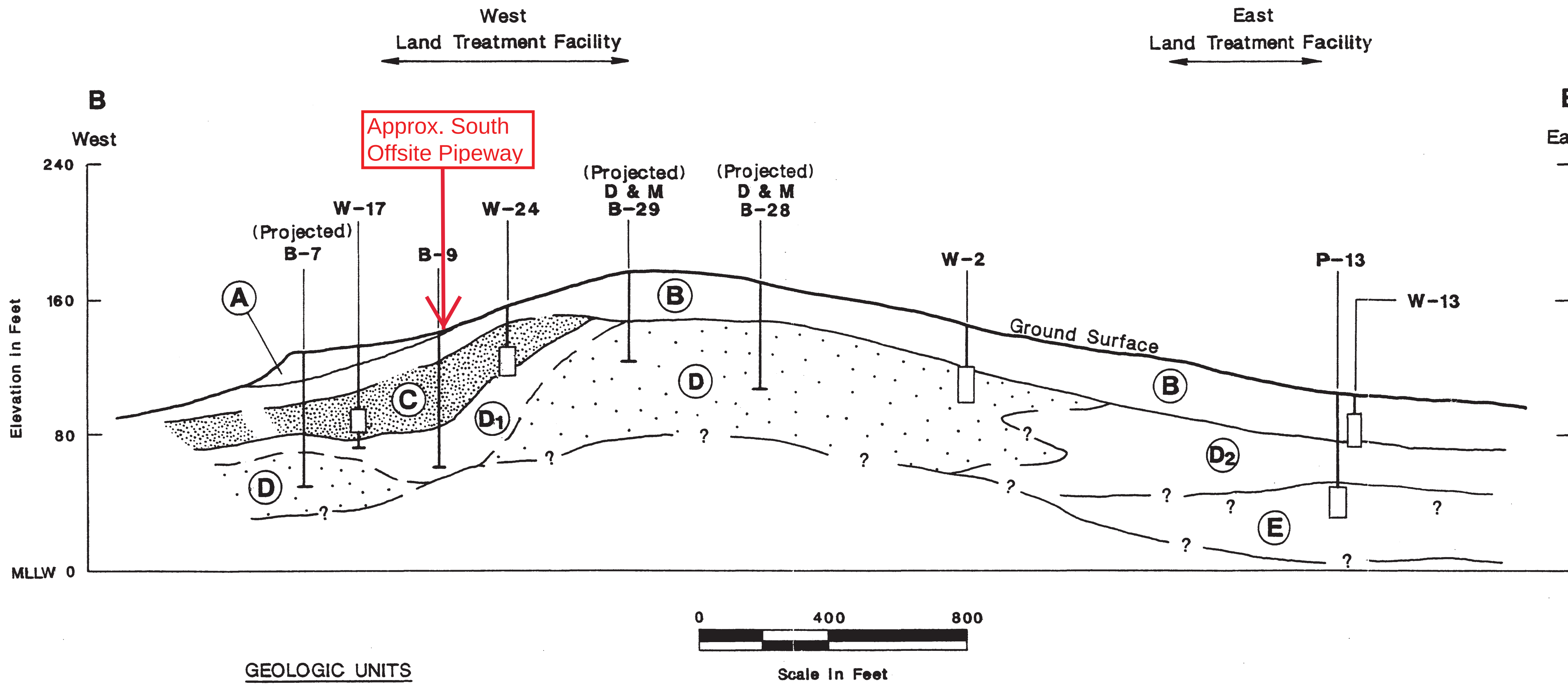
Approximate Location of Cross-Section

0 300 600

Scale in Feet

DATE	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
June 1988	
LANDAU ASSOCIATES, INC.	Site Plan With Cross Section Locations

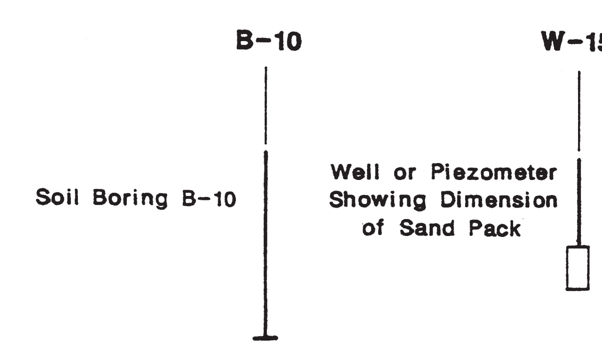
Figure 3-1



GEOLOGIC UNITS

A	Fill soil and (native) fine SAND
B	DIAMICTON (undifferentiated)
C	Brown fine to coarse SAND, minor GRAVEL
D	Interbedded gray SILT, CLAY, and fine SAND
D_1	Gray SILT, CLAY, and silty SAND (aquitard) member of Unit D recognized beneath WLTF
D_2	Laminated gray SILT and CLAY, no sand interbeds detected with shells, ELTF stratigraphic equivalent of Unit D
E	Older brown CLAY with gray fine SAND lenses

KEY



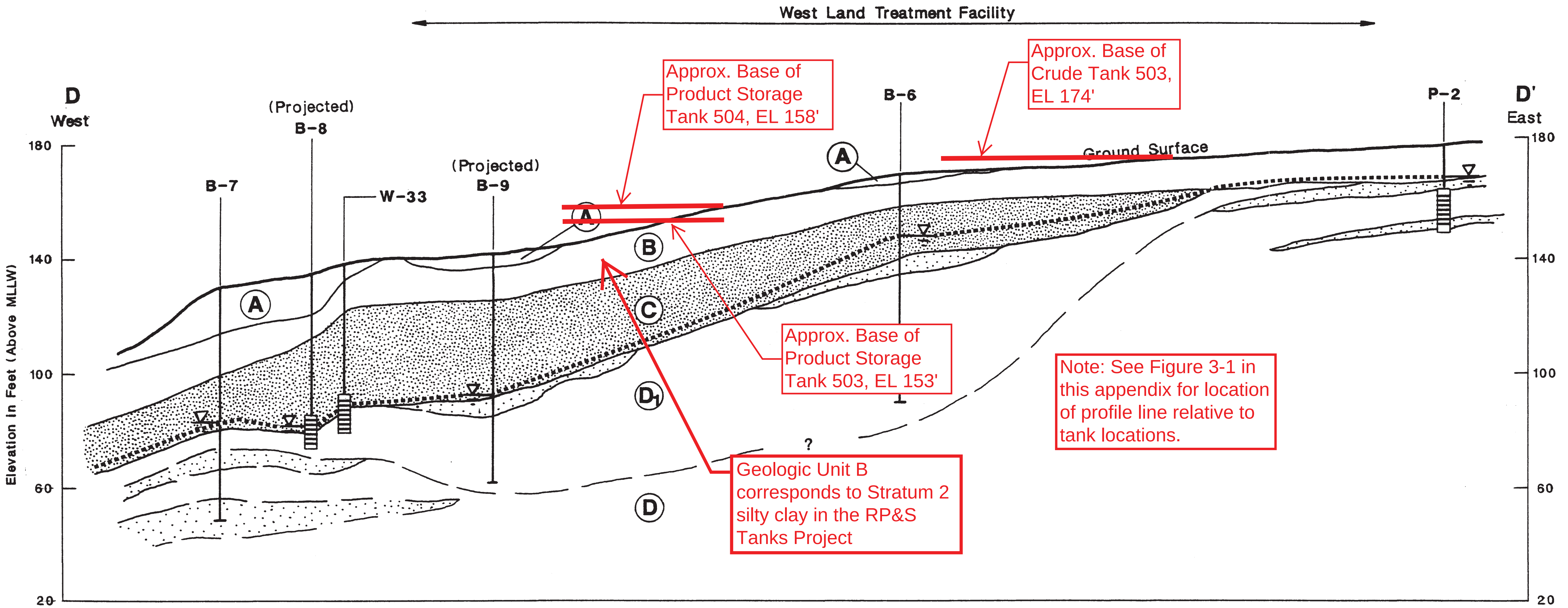
DATE
June 1988

TEXACO REFINING & MARKETING INC.
PUGET SOUND PLANT
ANACORTES, WASHINGTON

LANDAU ASSOCIATES, INC.

Geologic Cross-Section B-B'

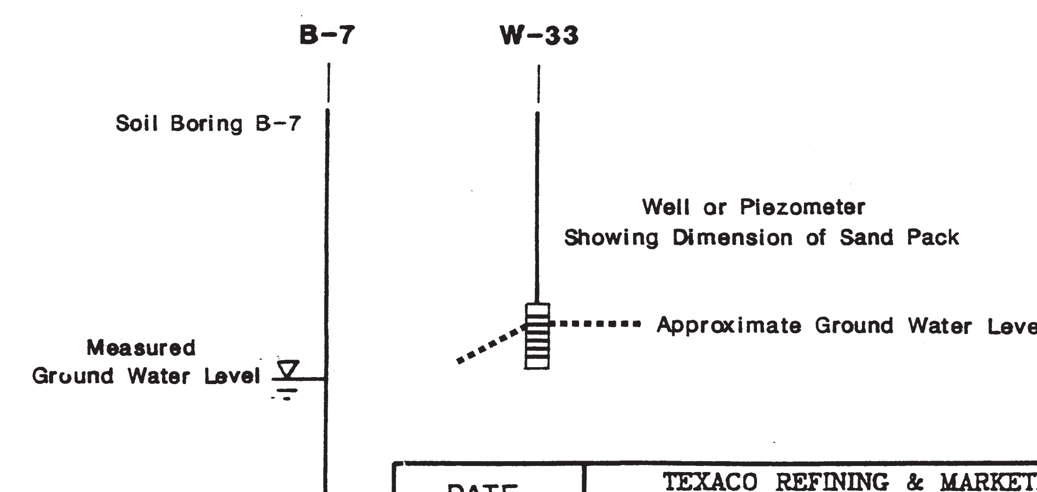
Figure 3-3



GEOLOGIC UNITS

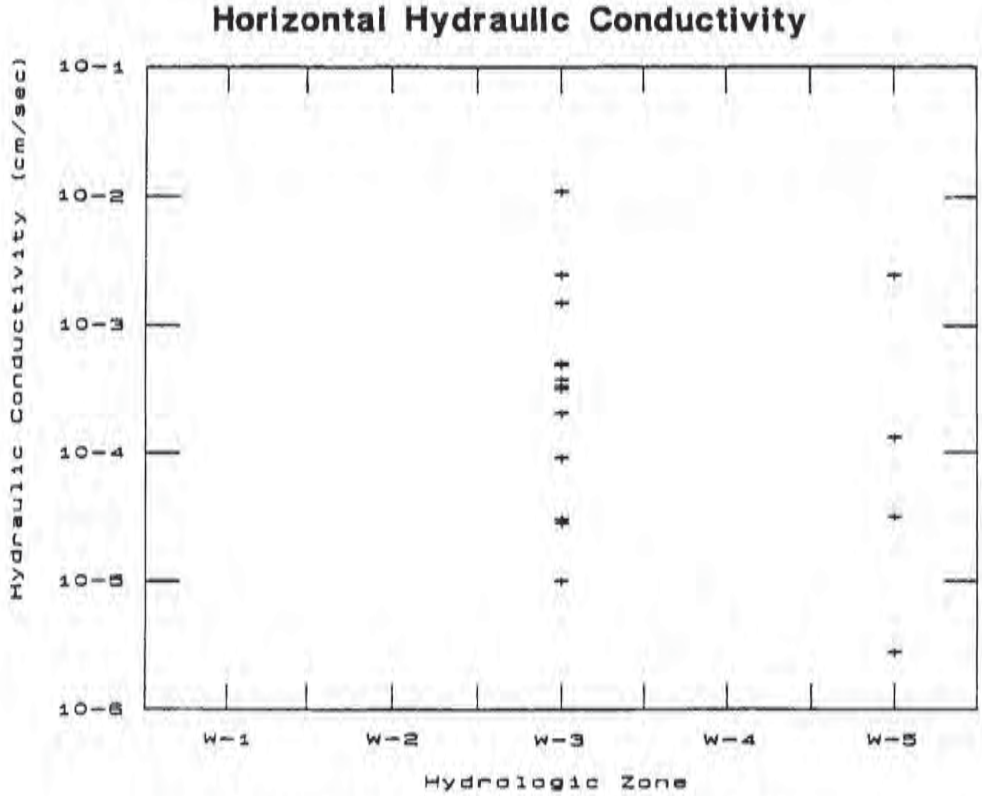
- A — Fill soil and (native) fine SAND
- B — DIAMICTON (undifferentiated)
- C — Brown fine to coarse SAND, minor GRAVEL
- D — Interbedded gray SILT, CLAY, and fine SAND
- D1 — Gray SILT, CLAY, and silty SAND (aquitard) member of Unit D recognized beneath WLTF

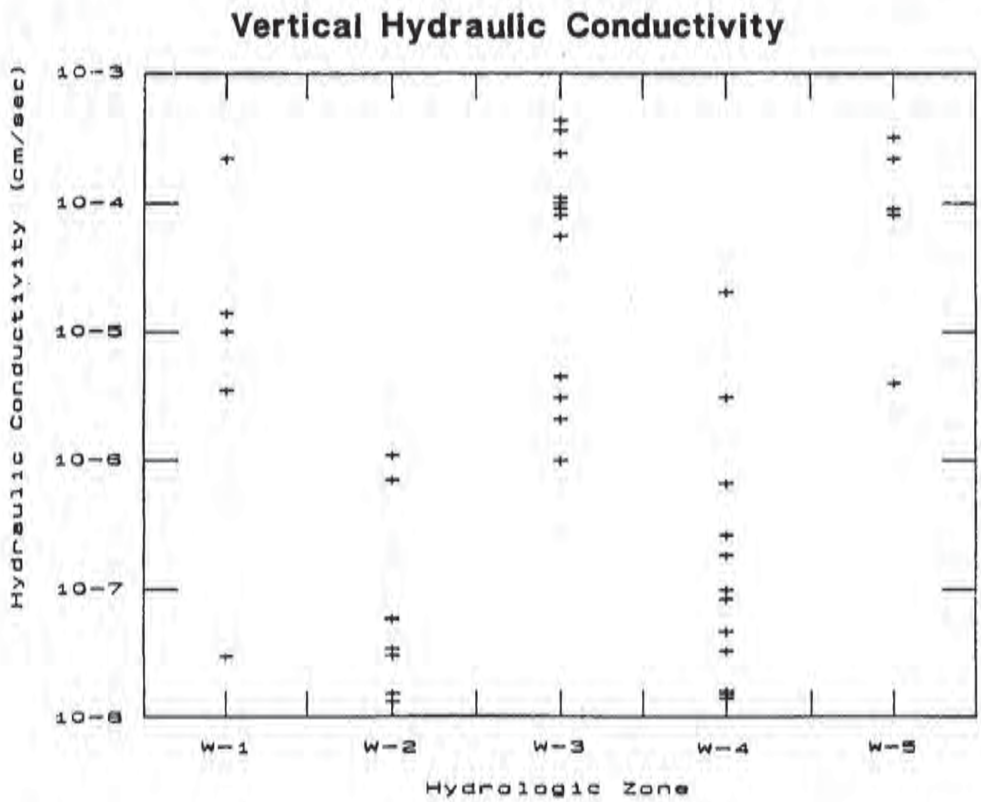
KEY



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Geologic Cross Section D-D' West Land Treatment Facilty

Figure 3-5



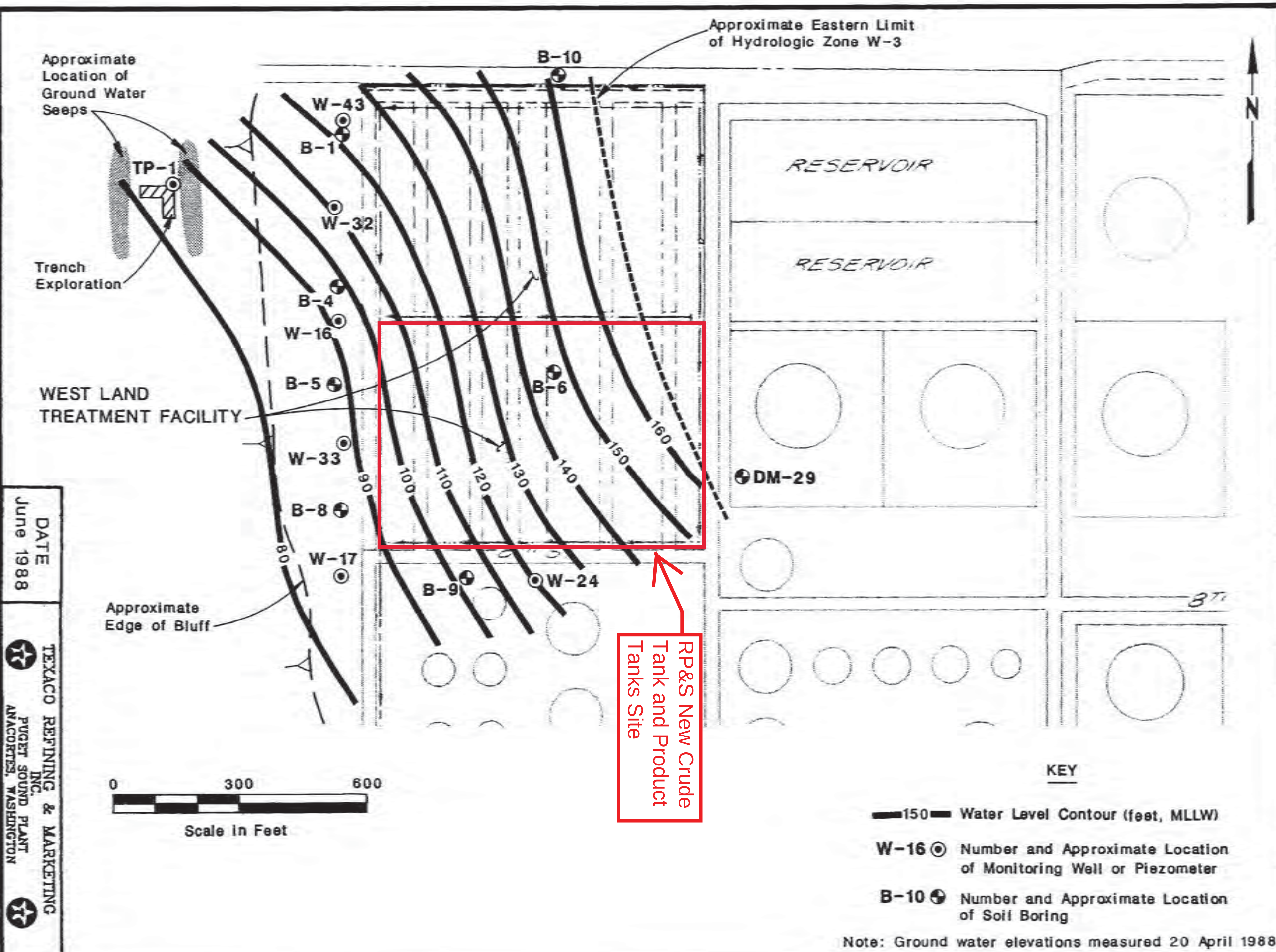


KEY

+ Hydraulic Conductivity Value

DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Hydraulic Conductivity West Land Treatment Facility

Figure 3-16



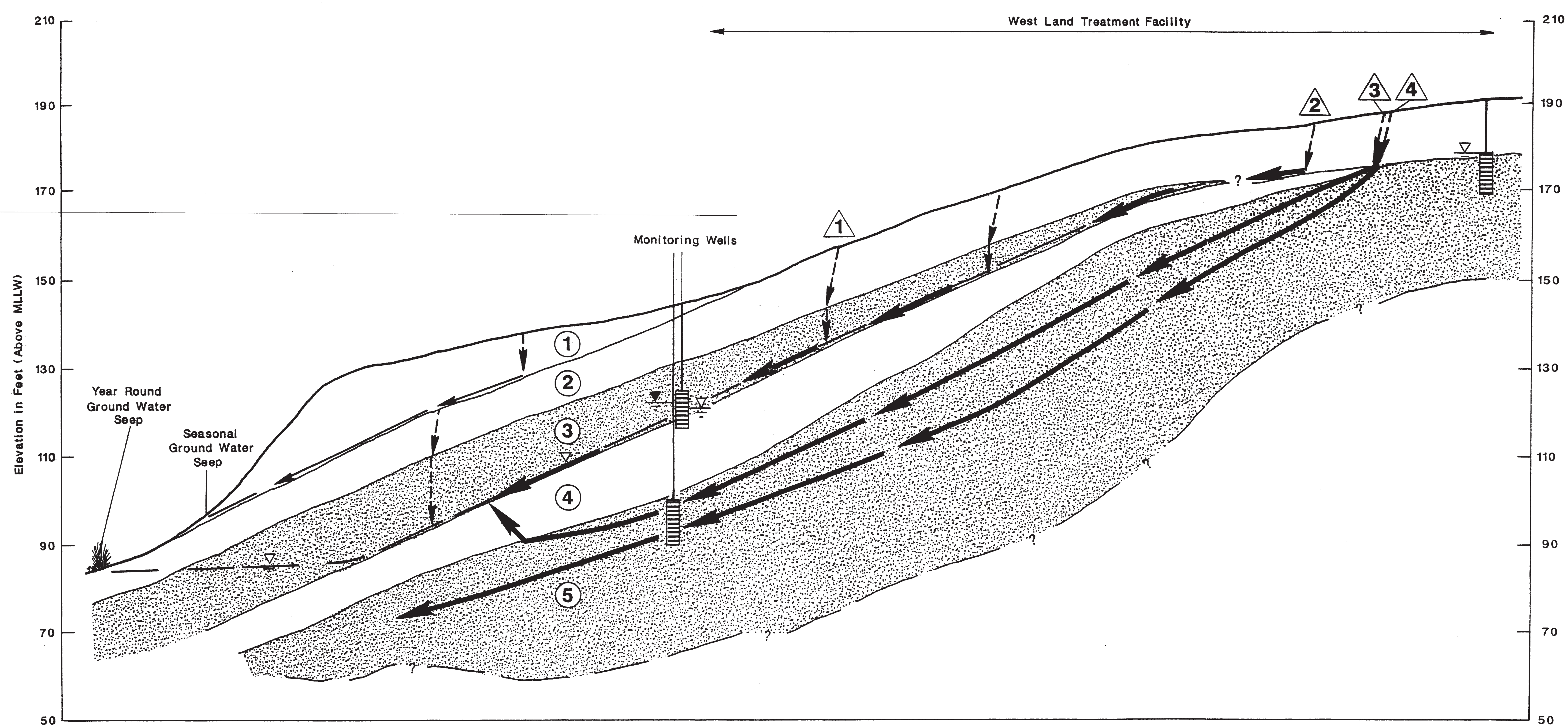
DATE
June 1988

TEXACO REFINING & MARKETING INC.
PUGET SOUND PLANT
ANACORTES, WASHINGTON

LANDAU ASSOCIATES, INC.

Ground Water Level Contours, Zone W-3
West Land Treatment Facility

Figure 3-17



HYDROGEOLOGIC UNITS

1. Zone W-1 Shallow Zone
2. Zone W-2 Upper Aquitard
3. Zone W-3 Upper Water Bearing Zone
4. Zone W-4 Lower Aquitard
5. Zone W-5 Lower Water Bearing Zone

KEY

- Ground Water Flow Path
- Ground Water Level Upper Water Bearing Zone
- Ground Water Level Lower Water Bearing Zone
- Ground Water Percolation Path
- Ground Water Flow Path
- Monitoring Well and Screen

DATE	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
June 1988	

LANDAU ASSOCIATES, INC.

Ground Water Flow Path Diagram
West Land Treatment Facility

Figure 3-22

Final Report

HYDROGEOLOGIC INVESTIGATION TEXACO PUGET SOUND PLANT JAN. - FEB. 1989

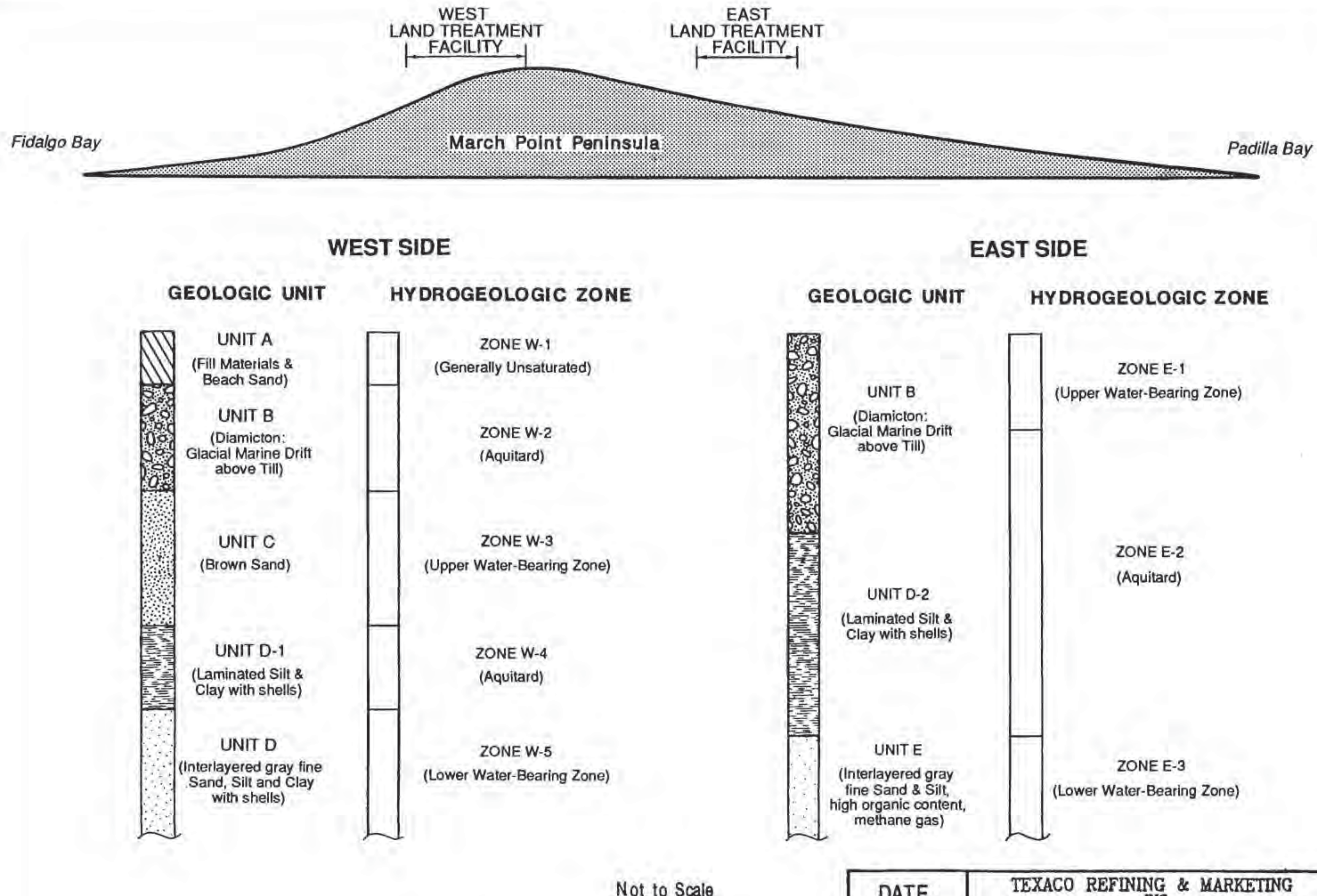
Prepared for

Texaco Refining and Marketing, Inc.

Prepared by

Landau Associates, Inc.

March 3, 1989



(After Texaco, 1988)

DATE Feb. 1989

TEXACO REFINING & MARKETING INC.
PUGET SOUND PLANT
ANACORTES, WASHINGTON

LANDAU ASSOCIATES, INC.

Geologic Unit and Hydrogeologic Zone Summary

Figure 2

TABLE 2

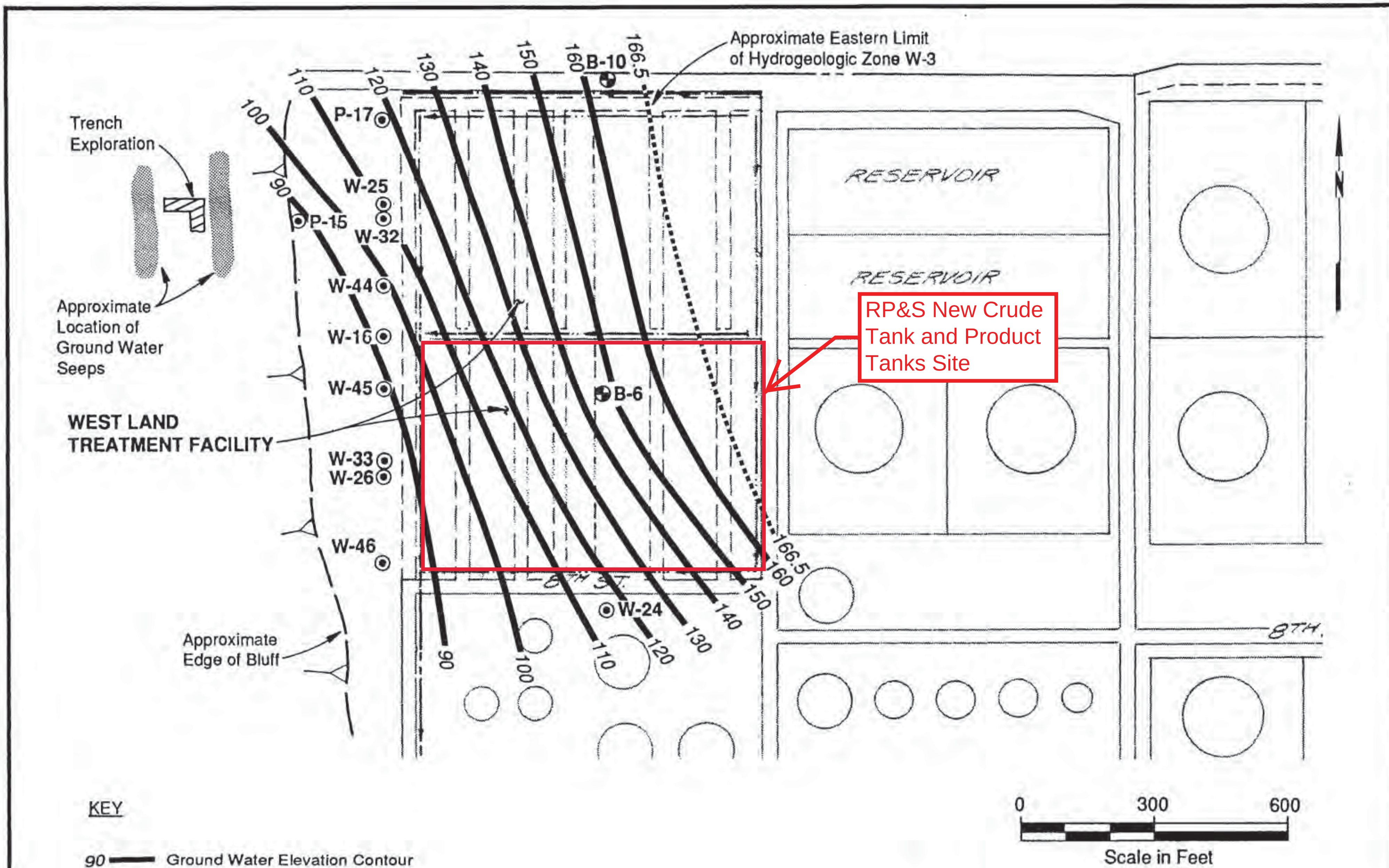
GROUND WATER ELEVATIONS[a]

Well/ Piezo- meter	Ground Surface Elevation(b)	Feb. 17, 1989(c)
W-1	96.1	40.18
W-2	144.1	130.60
W-3	145.4	101.76
W-11	97.8	84.85
W-12	94.9	90.88
W-13	94.4	92.44
W-14	185.3	168.00
W-15	144.5	126.80
W-16	142.3	91.04
W-17	131.9	72.20
W-21	97.7	95.73
W-22	93.8	94.61
W-23	94.6	93.94
W-24	151.9	116.58
W-25	145.9	110.90
W-26	137.7	86.30
W-31	191.0	177.40
W-32	145.8	108.20
W-33	138.1	85.95
W-41	121.7	118.23
W-42	99.7	92.86
W-43(d)	143.8	--
W-44	144.0	96.60
W-45	140.9	87.46
W-46	134.8	83.82
W-47	100.8	98.07
W-48	142.9	98.10
P-1	192.3	181.26
P-2	180.9	167.00
P-3	165.0	159.18
P-4	119.5	118.30
P-5	120.0	111.93
P-6	120.6	108.90
P-7	116.7	111.65
P-8	111.7	110.90

TABLE 2
(continued)

Well/ Piezo- meter	Ground Surface Elevation(b)	Feb. 17, 1989(c)
P-10(A)	121.9	119.05
P-10(B)	121.7	108.54
P-10(C)	121.7	97.86
P-10(D)	121.7	70.45
P-10(E)	121.7	43.81
P-11	97.4	4.57
P-12(A)	95.6	95.06
P-12(B)	95.1	84.86
P-12(C)	95.8	76.05
P-12(D)	95.2	66.53
P-12(E)	95.7	38.50
P-13	93.8	33.29
P-14	130.2	dry
P-15	129.2	87.19
P-16	137.4	(e)
P-17	144.3	117.85
TP-1(f)	88.6	--

(a) Feet above Mean Lower Low Water (MLLW).
(b) Ground surface elevations presented in this column reflect results of August 1986, April 1988, and January 1989 surveys.
(c) Water levels collected during period of heavy precipitation.
(d) Abandoned January 17, 1989.
(e) Water present in bottom end cap of P-16. Water surface at Elevation 121.62.
(f) Abandoned October 27, 1988.



KEY

90 — Ground Water Elevation Contour

W-16 ⦿ Number and approximate location of Monitoring Well

B-6 ⊕ Number and approximate location of Soil Boring

DATE Feb. 1989	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Ground Water Level Contours, Zone W-3 West Land Treatment Facility

Figure 6

APPENDIX B.5

BORING LOGS FROM CLEAN SOILS PILE AREA AT
SHELL PUGET SOUND REFINERY
(URS 2014)

APPENDIX B.5

CRUDE BY RAIL UNLOADING FACILITY SITE BORING LOGS

This appendix includes selected logs of borings from the subsurface exploration program performed by AECOM (previously URS) for the Shell Refinery Crude by Rail Unloading Facility (CRUF) geotechnical investigation during 2013 and 2014 (URS, 2014). The borings were performed at the existing Clean Soils Pile (CSP) near the northeast corner of the Refinery property; refer to Figure B.5.1 in this appendix for the boring locations. The soils from the CSP are planned to be used as fill for constructing the proposed facilities at the RP&S New Crude Tank and Product Tanks site. The reader of this report should be aware that additional fill has been placed since the borings were drilled in 2013 and 2014; therefore, the actual ground surface elevations may vary from those shown by the topographic contours in the figure in this appendix. In addition, the nature of the soils shown near ground surface as described in the boring logs may not be representative of the soils that presently exist near the ground surface.

The logs of the following borings are included herein:

- U-15-13 through U-20-13: Geotechnical borings performed in 2013 during primary phase of subsurface exploration program (Note: Some environmental contamination was encountered during drilling.)

- U-22-14 through U-27-14: Additional borings performed in 2014 to collect soil samples for environmental characterization (Note: Some environmental contamination was encountered during drilling.)

Geotechnical laboratory testing was not performed on samples from the CSP during the 2013 and 2014 subsurface investigation programs, except that moisture content of the 2014 samples was obtained as part of the analytical testing that had been performed. However, geotechnical testing was performed on selected samples from the CSP borings as part of the current geotechnical investigation for the RP&S New Crude Tank and Products Tanks Projects. The results of these tests are included in Appendix C. Fill placed on the CSP since the 2013 and 2014 borings has not been tested by AECOM, as agreed with Shell.

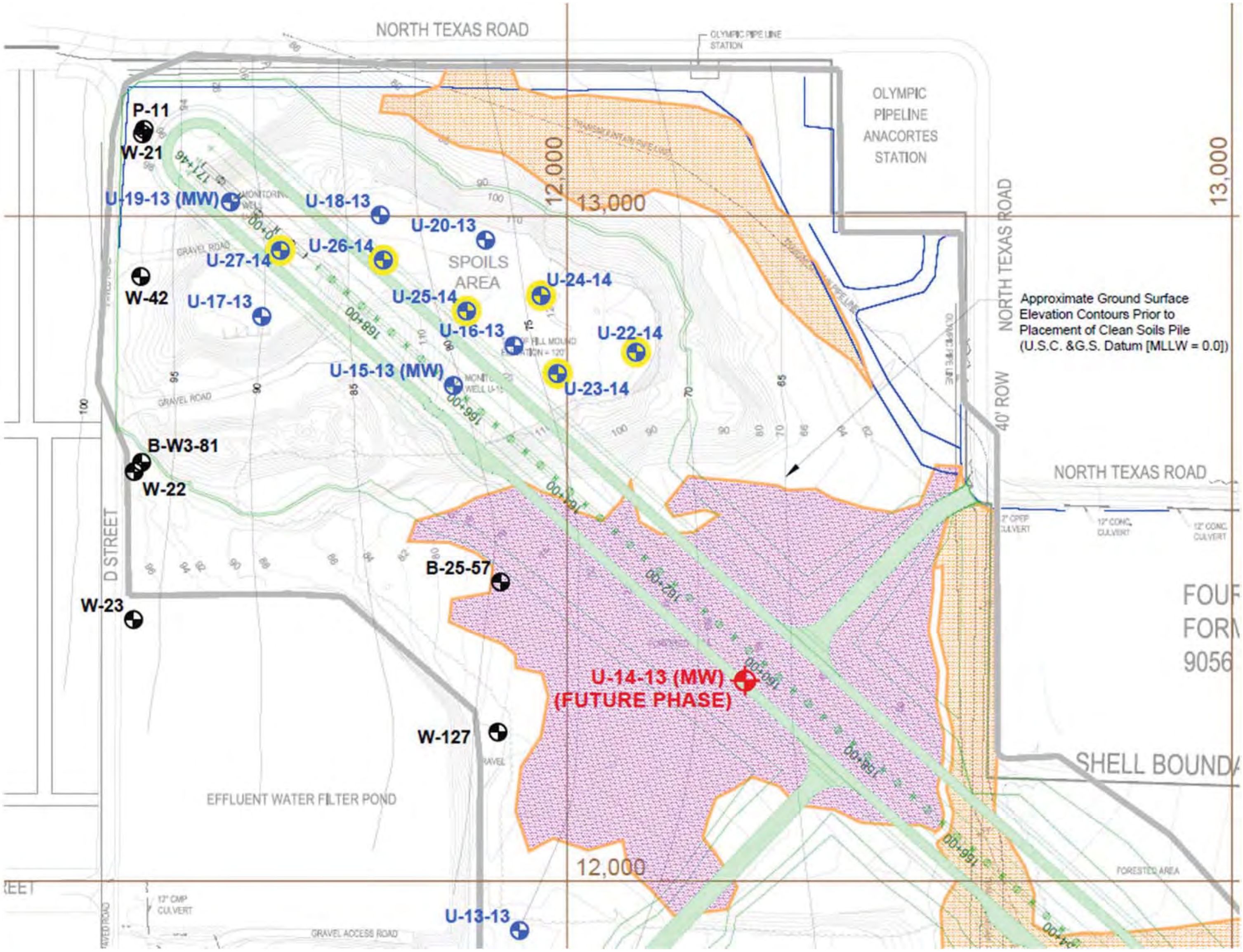


Figure B.5.1
Clean Soils Pile Boring Location Plan

Job No. 60544813

AECOM

RP&S New Crude Tank and Product Tanks Projects
Shell Puget Sound Refinery – Anacortes, Washington

Project: Crude Rail Unloading Facility East, Shell PSR Project Location: Anacortes, WA Project Number: 33764104	**Key to Log of Boring and Descriptive Terms for Soil**

Unified Soil Classification System (ASTM D2487 & D2488)

Major Divisions			Symbols: Graph	Symbols: Letter	Typical Descriptions
Coarse Grained Soils More than 50% of No. 200 Sieve Size	**Gravels** More than 50% of Coarse Fraction Retained in No. 4 Sieve	**Clean Gravels** (less than 5% fines)		GW	Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
				GP	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
		Gravels with Fines (more than 12 % fines)		GM	Silty Gravels, Gravel-Sand-Silt Mixtures
				GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	Sands More than 50% of Coarse Fraction Passing through No. 4 Sieve	**Clean Sand** (less than 5% fines)		SW	Well-Graded Sands, Gravelly Sands, Little or no Fines
				SP	Poorly Graded Sands, Gravelly Sands, Little or no Fines
		Sands with Fines (more than 12 % fines)		SM	Silty Sands, Sand-Clay Mixtures
				SC	Clayey Sands, Sand-Clay Mixtures
Fine Grained Soils More than 50% of Material is Smaller than No. 200 Sieve Size	**Silts and Clays**	Liquid Limit Less than 50%		ML	Inorganic Silts and very Fine 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 Silty Clays of Low Plasticity
	Silts and Clays	Liquid Limit Greater than 50%		MH	Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils
				CH	Inorganic Clays of High Plasticity, Fat Clays
				OH	Organic Clays of Medium to High Plasticity, Organic Silts
Highly Organic Soils				PT	Peat, Humus, Swamp Soils with High Organic Contents (see ASTM D4427-92)

Abbreviations

SA	Sieve Analysis
M	Moisture
DD	Dry Density
AL	Atterberg Limits
HA	Hydrometer Analysis
C	Consolidation
Pc	Constant Head Permeability
Pf	Falling Head Permeability
DS	Direct Shear
TX	Triaxial
TV	Torvane Shear
LV	Laboratory Vane Shear
PP	Pocket Penetrometer
OVA	Organic Vapor Analyzer
OC	Organic Content
N	Number of hammer blows for last 12 inches sampled

Field Test Symbols

Pocket Penetrometer Test

Hand Vane Shear Test

Relative Density or Consistency

Coarse-Grained Soils: Relative Density	N, SPT Blows / ft	Fine-Grained Soils: Relative Consistency	N, SPT Blows / ft
Very loose sand	0 - 4	Very soft	< 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Medium stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very dense	Over 50	Very stiff	15 - 30
		Hard	Over 30

Sampler Symbols

3" O.D. Split Spoon Sample with brass rings

3" O.D. Shelby Tube Sample

Core

Piston Sample

Non-standard penetration test

Grab Sample

2" O.D. Split Spoon with 140lb Hammer and 30-inch drop (SPT)

Minor Descriptors

Trace	0 - 5%
Slightly (clayey, silty, sandy, gravelly)	5 - 12%
Clayey, silty, sandy, gravelly	12 - 30%
Very (clayey, silty, sandy, gravelly)	30 - 50%

Moisture Content

Dry	Absence of moisture, dusty
Moist	Damp but no visible water
Wet	Visible free water, from below the water table

NOTES:

1. Descriptions and stratum lines are interpretive; field descriptions may have been modified to reflect lab test results. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times.
2. Dual Symbols are used to indicate borderline soil classifications

URS

Project: Crude Rail Unloading Facility East, Shell PSR	**Log of Boring U-15-13**
Project Location: Anacortes, WA	Sheet 1 of 5
Project Number: 33764104	

Date(s) Drilled	**4/23/2013 - 4/24/2013**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Drilling Method	**Hollow-Stem Auger (HSA)**	Drill Bit Size/Type	**HSA, 4.25-inch I.D.**	Total Depth of Borehole	**84.0 feet**
Drill Rig Type	**Mobile B-61**	Drilling Contractor	**Environmental Drilling, Inc.**	Approximate Surface Elevation	**121.5**
Groundwater Level	**45 feet**	Sampling Method(s)	**SPT**	Hammer Data	**140-lb, 30-inch auto hammer**
Borehole Completion	**Monitoring Well**	Location	**Stockpile, 550' E D St, 500' S N Texas Rd, N12745, E11829 (Shell Datum)**		

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	0						CL	Gray sandy Lean CLAY with gravel, occasionally cobbles, boulders, fine to coarse, angular to rounded, dry to moist, stiff. [FILL]				
120	2											
			D1	4 5 5 N=10				Dark gray to dark brown Lean CLAY, trace organics, grass roots, fine, subangular gravel, moist, medium stiff to stiff. [FILL]				PP = 0.75 tsf; PID = 0 ppm
	4											
115	6											
	8		D2	2 2 5 N=7				Same as above except no organics, no grass roots, medium stiff.				PP = 1.25 tsf
	10											
110	12											
			D3	4 4 5 N=9	100			Same as above except trace fine to coarse sand, fine gravel, subangular, stiff.				PP = 2 tsf
	14											
105	16											
	18		D4	2 3 4 N=7				Same as above except trace fine to coarse, subangular gravel, medium stiff to stiff.				PP = 0.25 to 4 tsf
	20											

Project: Crude Rail Unloading Facility East, Shell PSR Project Location: Anacortes, WA Project Number: 33764104	**Log of Boring U-15-13** Sheet 2 of 5

Elevation feet	Depth, feet	Samples: Type	Samples: Number	Samples: Blows/ 6in.	Samples: Recovery, %	Samples: Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
100	20											
	22–24		D5	0 4 9 N=13	100			Brown, gray to bluish gray Lean CLAY, trace fine to coarse sand, fine gravel, subangular, moist, stiff. [FILL]				PP = 1.5 tsf; PID = 0 ppm
95	26											
	28		D6	8 8 6 N=14	100			27.5' to 28': dark gray silty SAND with fine, angular to rounded gravel, moist, medium dense; 28' to 29': Dark gray Lean CLAY, trace fine, subangular gravel, moist, stiff. [FILL]				PP = 1 tsf
90	30–32											
	34		D7	0 3 6 N=9	100			32.5' to 33' & 33.1' to 34': Gray Lean CLAY, trace fine, subangular gravel and organics, moist, medium stiff to stiff; 33' to 33.1': Dark organics with grass roots, moist, stiff. [FILL]				PP = 1 tsf
85	36											
	38		D8	5 9 15 N=24	100			Dark to dark gray organic Lean CLAY, trace fine to coarse, angular gravel, moist, very stiff. [FILL]				PP = 2.5 tsf; PID = 0.3 ppm Driller noted gravelly at 39ft bgs.
80	40–42											
				0 3				D9A: 42.5' to 43': Dark organics, trace fine gravel and grass roots, wet, medium stiff ;				PP = 1.25 tsf at 43.7ft; PID = 0 ppm

GEO_SEA_WELL J:\PROJECTS\S\SHELL\SHELL ANACORTES\CRUDE UNLOAD EAST, PHASE 2\11 BORING LOGS\GINT 33764104.GPJ URSSEA3B.GLB URSSEA3.GDT 12/13/13

URS

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	43–44		D9	3 N=6	100			D9B: 43' to 44': Gray Lean CLAY, trace fine, angular gravel, moist, medium stiff. [FILL]				
	45							45 ft				ATD
75	46						CL					
	48		D10	8 14 19 N=33	100			Brown Lean CLAY, trace fine to coarse, subangular gravel, moist, hard.				PP = 4.5 tsf
	50											Driller reported GW at 50ft bgs.
70	52		D11	6 10 12 N=22	100			Same as above except no gravel, very stiff.				PP = 3.5 tsf
65	56											
	58		D12	5 8 10 N=18	100			Same as above except very stiff.				PP = 1.5 tsf
	59						CH					
60	62		D13	0 3 4 N=7	100			Gray Fat CLAY, moist to wet, medium stiff.				PP = 2 tsf
55	66											

GEO_SEA_WELL J:\PROJECTS\S\SHELL\SHELL ANACORTES\CRUDE UNLOAD EAST, PHASE 2\11 BORING LOGS\GINT 33764104.GPJ URSSEA3B.GLB URSSEA3.GDT 12/13/13

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Log of Boring U-15-13

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	68		D14	0 3 5 N=8	100		Same as above except trace fine, subangular gravel.	PP = 0.5 tsf
	70							
50	72		D15	0 2 3 N=5	100		Same as above except trace fine to coarse, subangular gravel, moist to wet.	PP = 0.25 tsf
	74							
	75					CL		Driller noted gravelly at 75ft bgs.
45	76							
	78		D16	7 18 27 N=45	100		Gray Lean CLAY, moist, hard.	PP > 4.5 tsf
	80							
40	82		D17	10 22 35 N=57	100		Gray Lean CLAY with several white stains at top, moist, hard.	PP = 4.5 tsf
	84							
35	86							
	88							
	90							

Bottom of boring at 84 ft below ground surface (bgs) on 4:30pm on 4/23/2013. Measured groundwater at 45 ft bgs at 7:45am, on 4/24/2013. Installed 2-inch diameter PVC diameter well as follows:

Backfilled with bentonite chips up to 70 ft bgs, 2-inch diameter, PVC SCH40, creen with 0.010" slots from 44ft to 64ft; medium filter sand from 39ft to 70ft; bentonite grout 3ft to 39ft; bentonite chips 0.5 ft to 3 ft bgs, and on-site soil and quickcrete 0.5 ft to ground surface. 2-inch diameter solid PVC pipe from 44ft up to 3ft above ground surface (ags); 5.5-inch-diameter protective steel pipe from 1.4ft bgs up to 3.6ft ags; medium filter sand from ground up to 2.9ft ags between 2-inch diameter PVC pipe and 5.5-inch-diameter 5ft long protective steel casing.

Washington Department of Ecology Unique Well # BHE 485.

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	90							GW observations: 7:00am on 4/25/2013 measured GW at 37.5ft bgs; 4:55pm on 4/25/2013 measured the same GW level; 7:10am on 4/29/2013 measured GW at 37.5ft bgs; 4:50pm on 4/29/2013 measured GW level at 37.6 ft bgs; 7:15am on 4/30/2013 measured GW at 37.6ft bgs; 4:45pm on 4/30/2013 measured the same GW level; 7:05am on 5/1/2013 measured GW at 37.7ft bgs; 4:40pm on 5/1/2013 measured GW level 37.8ft bgs; 7:10am on 5/2/2013 measured GW at 37.8ft bgs; 4:15pm on 5/2/2013 measured the same GW level; 9/13/2013 measured GW at 43.4ft bgs; 5:55pm, 9/25/2013 measured GW at 41.3ft bgs; 3:15pm, 10/10/2013 measured GW at 40.7ft bgs; 3:10pm on 11/13/2013 measured GW 40.7 ft bgs.				
30	92											
	94											
25	96											
	98											
	100											
20	102											
	104											
15	106											
	108											
	110											
10	112											

Project: Crude Rail Unloading Facility East, Shell PSR **Project Location: Anacortes, WA** **Project Number: 33764104**	**MONITORING WELL CONSTRUCTION LOG FOR WELL U-15-13**

Well Location	**Stockpile, 550' E D St, 500' S N Texas Rd, N12745, E11829**	Date(s) Installed	**4/24/2013**	Time	**10:00am**
Installed By	**EDI**	Observed By	**K. Yang**	Total Depth	**84 feet**
Method of Installation	**manually**				
Screened Interval	**44-64**	Completion Zone			
Remarks	**WA Department of Ecology Well # BHE 485. Top of 5ft long steel casing Elev. 125.1 ft. (Shell PSR Datum)**				

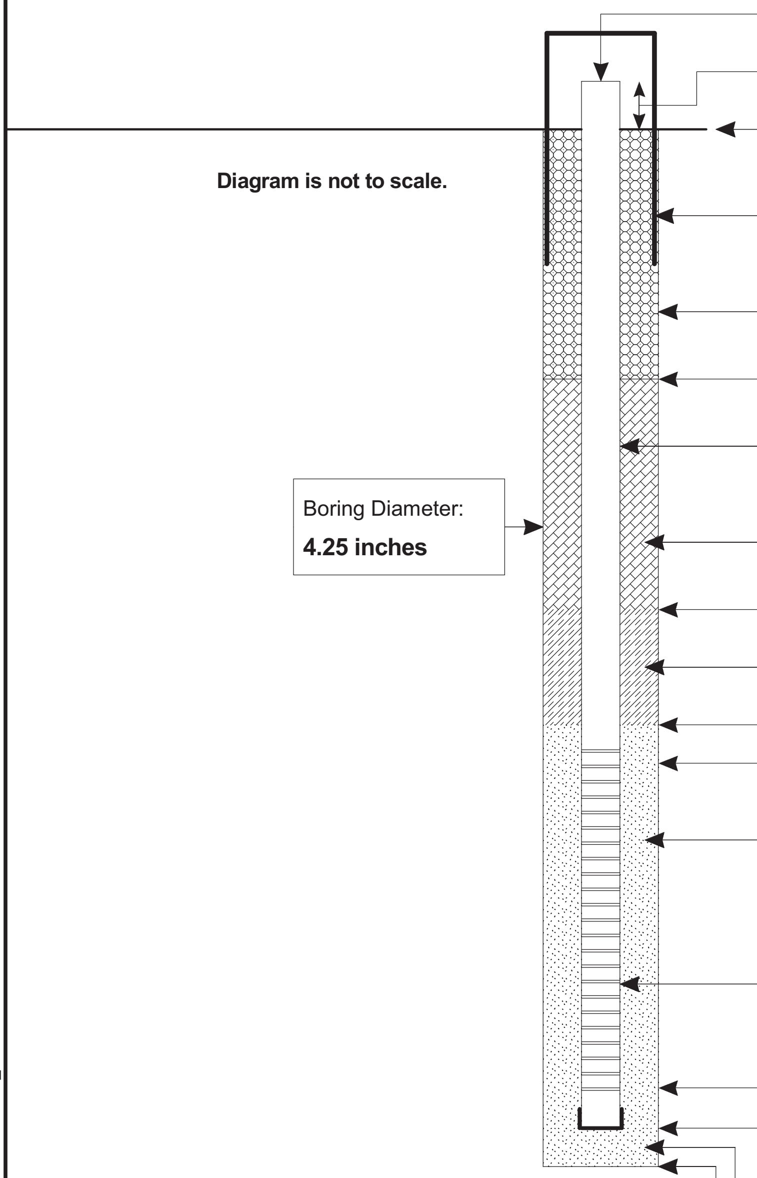


Diagram is not to scale.

Boring Diameter: **4.25 inches**

Elevation of Top of Riser Pipe: **124.5** ft

Height of Riser Above Ground: **3.0 ft**

Ground Elevation: **121.5 ft**

ID/Type of Surface Casing: **5.5" dia. stick-up steel**

Type of Surface Seal: **Quickcrete**

Depth of Surface Seal: **0.5 ft**

ID/Type of Riser Pipe: **2-inch PVC Pipe**

Type of Backfill: **Bentonite Chips**

Depth of Seal: **3 ft**

Type of Seal: **Bentonite Grout**

Depth of Top of Filter Pack: **39 ft**

Depth of Top of Screen: **44 ft**

Type of Filter Pack: **Medium Sand**

ID/Type of Screen: **2-inch PVC SCH40**
Screen Slot Size: **0.010"**

Depth of Bottom of Screen: **64 ft**

Depth of Bottom of Plugged Blank Casing: **64 ft**

Type/Depth of Backfill/Seal Below Well: **Bentonite Chips**

Total Depth of Boring: **84 ft**

NOTE: DIAGRAM IS NOT TO SCALE

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Date(s) Drilled	3/7/13, 4/22-23//13	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	Hollow-Stem Auger (HSA)	Drill Bit Size/Type	HSA, 4.25-inch I.D.	Total Depth of Borehole	89 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	Environmental Drilling, Inc.	Surface Elevation	119.6 feet
Borehole Backfill	Bentonite Grout, On-Site Soil	Sampling Method(s)	SPT	Hammer Data	140-lb, 30-inch auto hammer
Location	Fill Stockpile appro. 600 ft east of D St, 450 ft South of N Texas Rd, N12805, E11920 (Shell Datum)				

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	0						CL	Dark brown Lean CLAY, trace fine, angular gravel, moist, stiff. [FILL]			
	2										
			D1	4 5 6 N=11	100			Same as above.			PP = 1.5 tsf
	4										
115											
	6										
	8		D2	3 3 5 N=8	100			Same as above except dark brown to brown, trace sand and fine, angular to subangular gravels, medium stiff.			PP = 1 tsf
110											
	10										
	12										
			D3	0 3 3 N=6	100			Same as above except with very thin layers of fine to medium sand, medium stiff.			PP = 0.5 tsf
	14										
105											
	16										
	18		D4	1 1 2 N=4	67			Same as above except with 1" layer of gray, fine to medium sand layer, soft.			PP = 1 tsf
100											
	20										

Elevation feet	Depth, feet	Samples: Type	Samples: Number	Samples: Blows/ 6in.	Samples: Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	20										
	22										PP = 3 tsf
	22.5–24		D5	5 7 12 N=19	100			22.5' to 23.2' and 23.9 to 24': gray Lean CLAY, trace fine, rounded gravel, moist, stiff to very stiff; 23.2' to 23.9': Gray silty SAND with gravel, fine to coarse, angular to rounded, moist, medium dense. [FILL]			
95	24										Driller reported stiff soil from 24 to 25'.
	26										PP = 0.5 tsf; PID = 70 ppm
	27.5–29 (28)		D6	1 2 3 N=5	100			Gray Lean CLAY, trace fine, subangular gravel, moist, medium stiff with petroleum oddor. [FILL]			Shell collected a soil sample for lab analysis from Sample D6.
90	30										
	32										PP = 1.75 tsf; PID = 1.3 ppm
	32.5–34		D7	0 4 5 N=9	100			Same as above except stiff, no petroleum oddor. [FILL]			Shell collected a soil sample for lab analysis from Sample D7. Stopped at 37.5' on 3/7/2013 at direction of Shell personel, and pending results of chemical testing.
85	34										
	36										PP = 4 tsf; PID = 0 ppm
	37.5–39 (38)		D8	5 9 14 N=23	78			Same as above except sandy, very stiff. [FILL]			PID: organic vapor meter readings with a Photovac 2020ComboPRO Portable Photoionization Meter having a 10.6eV UV lamp. Resumed drilling from 37.5ft bgs at 10:30am on 4/22/13.
80	40										
	42										PP < 0.25 tsf at 42.8ft; PP = 3.5 tsf at 43.7ft; PID = 0 ppm
	42.5–			3 16				42.5' to 42.7' and 42.9 to 43.6': dark gray Lean CLAY, trace fine, subangular gravel, and fine tree branches, wet, very stiff; [FILL]			

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Log of Boring U-16-13

Elevation feet	Depth, feet	Sample Type	Sample Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	44		D9	18 N=34	100			42.7' to 42.9 43.6 to 44": Dark gray lean CLAY, moist, very stiff. [FILL]			
75	46						CL				
	48		D10	10 12 18 N=30	100			Brown Lean CLAY, trace fine, subrounded gravel, moist, very stiff. 48.5 ft ▼			PP = 4 tsf; PID = 0 ppm
70	50										
	52		D11	8 10 23 N=33	100			Same as above.			PP = 2.5 to 3 tsf
65	54, 56										
	58		D12	5 8 14 N=22	100			Same as above except very stiff.			PP = 2.5 tsf
60	60						CH				
	62		D13	0 0 4 N=4	100			Gray Fat CLAY, moist to wet, medium stiff.			PP = 0.5 tsf
55	64, 66										

URS

Elevation feet	Depth, feet	Samples: Type	Samples: Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	68		D14	0 0 5 N=5	100			Same as above.			PP = 0.25 tsf
50	70										
	72		D15	0 0 4 N=4	100			Same as above except 73.5' to 74' moist, medium stiff.			PP = 0.25 tsf at 73.6ft; PP = 2.5 tsf at 73.8ft
45	74										
	75						CL				Driller noted gravelly at 75ft bgs.
	76										
	78		D16	0 9 25 N=34	100			Gray Lean CLAY with some fine, angular gravel, moist, very stiff to hard.			PP = 3.5 tsf
40	80										
	82		D17	0 7 10 N=17	100			Gray Lean CLAY, trace fine, angular gravel, moist, very stiff.			PP = 2.25 tsf
35	84										
	86										
	88		D18	12 27 50 N=77	100			Same as above except hard.			PP > 4.5 tsf
30	90							Bottom of boring at 89 ft below ground surface (bgs) on 4/22/13. Measured groundwater at 48.5 ft bgs at 8:00am, on 4/23/2013. Backfilled with bentonite grout up to 3 ft bgs, bentonite chips 0.5			

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	90							ft to 3 ft bgs, and on-site soil 0.5 ft to ground surface.			
	92										
	94										
25											
	96										
	98										
20											
	100										
	102										
	104										
15											
	106										
	108										
10											
	110										
	112										

Project: Crude Rail Unloading Facility East, Shell PSR Project Location: Anacortes, WA Project Number: 33764104	Log of Boring U-17-13 Sheet 1 of 4

Date(s) Drilled	5/1, 5/2/2013	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	Hollow-Stem Auger (HSA)	Drill Bit Size/Type	HSA, 4.25-inch I.D.	Total Depth of Borehole	83.4 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	Environmental Drilling, Inc.	Surface Elevation	125.6 feet
Borehole Backfill	Bentonite Grout, On-Site Soil	Sampling Method(s)	SPT/Shelby Tube	Hammer Data	140-lb, 30-inch auto hammer
Location	Fill Stockpile appro. 250 ft east of D St, 400 ft South of N Texas Rd, N12849, E11541 (Shell Datum)				

Elevation feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows/ 6in.	SAMPLES Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
125	0						CL	Dark brown Lean CLAY, trace fine, angular gravel, moist, stiff. [FILL]			
	2.5–4		D1	5 7 16 N=23	89			2.5' to 3.5': Brown Lean CLAY, trace fine to coarse, subangular gravel, moist, stiff to very stiff; 3.5' to 4': Brown Silty SAND, fine to medium, trace fine, subangular gravel, moist, medium dense. [FILL]			PP = 1.5 tsf
120	6										
	7.5–9		D2	3 3 3 N=6	100			Gray to brown Lean CLAY, trace grass roots, organics, and fine to coarse, angular to subrounded sand & gravel, moist, medium stiff. [FILL]			PP = 0.5 tsf
	9.5						SM	Dark gray Silty SAND with fine to coarse, subangular gravel, moist, loose. [FILL]			PP = 1.5 tsf
115	10–12	S	S3		33						Tube push pressure is 400 psi.
	12.5–14		D4	2 2 4 N=6	56			Same as above but trace angular gravel.			
110	15						CL				
	17.5–19		D5	0 2 3 N=5	56			Gray to dark gray Lean CLAY, trace fine to coarse, subangular gravel, moist, medium stiff. [FILL]			PP = 1.25 tsf Driller noted gravelly at 18ft bgs.
	20										

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
105	20										Driller reported GW at 20.2ft bgs.
	22		D6	3 14 12 N=26	100			Same as above except trace organics, grass roots, and fine, angular gravel, moist to wet, stiff to very stiff. [FILL]			PP = 1.25 to 3 tsf
100	24–26	S	S7		48			Brown Lean CLAY, trace fine, subangular gravel, moist, stiff to very stiff. [FILL]. Bottom of Shelby tube deformed due to gravel.			PP = 3 tsf Tube push pressure is 800 psi.
	28		D8	2 2 3 N=5	100			Gray to brown Lean CLAY, trace fine to coarse, subangular gravel, moist to wet, medium stiff. [FILL]			PP = 0.25 tsf
95	30										
	32–34		D9	3 3 3 N=6	100			32.5' to 33' and 33.2 to 34': Gray to dark gray Lean CLAY, trace organics, grass roots, fine sand & fine, subangular gravel, moist to wet, medium stiff; 33' to 33.2': Dark PEAT, wet, medium stiff. [FILL] 33 ft ▼			PP = 0.75 tsf
90	36										
	38		D10	2 3 4 N=7	100			37.5' to 38': Dark wood pieces; 38' to 38.8': Gray to dark gray Lean CLAY, trace organics, grass roots, fine sand & fine, subangular gravel, moist to wet, medium stiff; [FILL]			PP = 0.5 tsf
							CL	38.8' to 39': Brown Lean CLAY, trace fine, angular gravel, moist, medium stiff.			PP = 2.5 tsf
85	40										
	42			5 10				Same as above except very stiff.			PP = 3.5 tsf

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Project: Crude Rail Unloading Facility East, Shell PSR	Log of Boring U-17-13
Project Location: Anacortes, WA	Sheet 3 of 4
Project Number: 33764104	

Elevation feet	Depth, feet	Sample Type	Sample Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	44		D11	17 N=27	100						
80	46										
	48		D12	7 9 17 N=26	100			Same as above except very stiff.			PP = 2.5 tsf
75	50						CH				
	52										
	54		D13	2 4 7 N=11	100			Gray Fat CLAY, moist to wet, stiff.			PP = 0.75 tsf Stop drilling at 54ft at 4:20pm on 5/1/13; resumed drilling at 7:20am on 5/2/13.
70	56										
	58		D14	3 5 8 N=13	100			Same as above.			PP = 0.5 tsf
65	60										
	62										
	64		D15	0 4 6 N=10	100			Same as above.			PP = 0.25 tsf
60	66	S	S16		55			Same as above but maybe trace fine gravel. Bottom of Shelby tube slightly deformed due to possibl gravel.			PP = 1.5 tsf Tube push pressure is 220 psi.

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Log of Boring U-17-13

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
		S									
	68		D17	2 4 7 N=11	100			Same as above but trace fine, subangular gravel.			PP = 0.75 tsf
	70										
55											
	72		D18	4 7 9 N=16	56			Same as above but very stiff.			PP = 1.75 tsf
	74										
50							ML				Driller noted stiff at 75ft bgs.
	76										
	78		D19	15 19 20 N=39	89			Gray SILT trace fine to coarse, subangular gravel, moist, hard.			PP > 4.5 tsf
	80						SM				
45											
	82		D20	36 50/5" N>50	100			Gray Silty SAND, fine to medium, trace fine, subrounded gravel, moist, very dense.			
	84							Bottom of boring at 83.4 ft below ground surface (bgs) at 10:15am on 5/2/2013. Couldn't measure groundwater level due to mud in the hole at 10:35am on same day. Backfilled with bentonite grout up to 2 ft bgs, bentonite chips 1 ft to 2 ft bgs, and on-site soil 1 ft bgs up to ground surface.			
40	86										
	88										
	90										

Log of Boring U-18-13

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Date(s) Drilled	4/25, 4/29/2013	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	Hollow-Stem Auger (HSA)	Drill Bit Size/Type	HSA, 4.25-inch I.D.	Total Depth of Borehole	89 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	Environmental Drilling, Inc.	Surface Elevation	120.1 feet
Borehole Backfill	Bentonite Grout, On-Site Soil	Sampling Method(s)	SPT	Hammer Data	140-lb, 30-inch auto hammer
Location	Fill Stockpile appro. 350 ft east of D St, 250 ft South of N Texas Rd, N13002, E11719 (Shell Datum)				

Elevation feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows/ 6in.	SAMPLES Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
120	0						CL	Gray Lean CLAY with sand, gravel, and occasionally cobble, fine to coarse, angular to rounded, dry to moist, stiff. [FILL]			
	2		D1	3 2 2 N=4	56			Brown Lean CLAY, trace fine, angular gravel, moist, medium stiff. [FILL]			PP = 1.25 tsf
	4										
115	6										
	8		D2	6 6 6 N=12	100			Same as above except gray to dark gray, trace fine, angular gravel and organics, stiff.			PP = 1.25 tsf
110	10										
	12		D3	3 4 6 N=10	100			Same as above except mostly brown, small part gray, no gravel and organics.			PP = 1.5 tsf
	14										
105	16										
	18		D4	40 10 15 N=25	78			Same as above except a cobble broken into fine to coarse, angular gravels, stiff to very stiff.			PP = 2 to 4.5 tsf
	20										

Project: Crude Rail Unloading Facility East, Shell PSR	Log of Boring U-18-13
Project Location: Anacortes, WA	Sheet 2 of 5
Project Number: 33764104	

Elevation feet	Depth, feet	Samples Type	Samples Number	Samples Blows/ 6in.	Samples Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
100	20										
	22										
	22.5–24		D5	2 3 5 N=8	100			Dark gray to gray Lean CLAY, trace fine to coarse, subangular gravel, organics and wood pieces, moist, medium stiff. [FILL]			PP = 1.25 tsf
95	24–26										
	27.5–29		D6	0 3 7 N=10	100			27.5' to 28.2': same as above; 28.2' to 28.4': Brown silty SAND with coarse, angular gravel, moist, loose; 28.4' to 29': Brown to gray Lean CLAY, moist, stiff. [FILL]			PP = 1.25 tsf at 28'; PP = 2.5 tsf at 28.8'
90	30										
	32.5–34		D7	3 4 7 N=11	100			Brown to gray Lean CLAY, trace fine, angular gravel, moist, stiff. [FILL]			PP = 1.25 tsf
85	35							35 ft			
	36										
	37.5–39		D8	4 2 4N=6	100			37.5' to 38': Same as above; 38' to 39': 3" gray, then 3" dark gray Lean CLAY, trace fine, angular gravel and organics, moist, medium stiff. [FILL]			PP = 4 tsf PP = 1 tsf
80	40										Driller noted GW at 42' bgs.
	42						CL	Brown Lean CLAY, trace fine, subrounded gravel, moist, very stiff.			PP = 4.5 tsf
	42.5			7 6							

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Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	44		D9	15 N=21	100						
75	46										
	48		D10	6 6 14 N=20	100			Same as above except trace fine, subangular gravel.			PP = 3.5 tsf
70	50										Stop drilling at 49ft at 4:45pm 4/25/13. 8:00am 4/29/13 measured GW at 39' bgs, then resumed drilling.
	52										
	54		D11	6 8 12 N=20	100			Same as above except no gravel.			PP = 3 tsf
65	56										
	58		D12	0 3 4 N=7	100		CH	Gray Fat CLAY, moist to wet, medium stiff.			PP = 0.5 tsf
60	60										
	62										
	64		D13	0 3 6 N=9	100			Same as above.			PP = 0.25 tsf
55	66										

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Log of Boring U-18-13

Elevation, feet	Depth, feet	Samples: Type	Samples: Number	Samples: Blows/ 6in.	Samples: Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	68		D14	0 4 6 N=10	100			Same as above.			PP = 0.5 tsf
50	70										
	72–74		D15	0 3 5 N=8	100			Same as above except trace fine, subangular gravel.			PP = 0.5 tsf
45	76										
	78		D16	0 4 7 N=11	100			77.5' to 78.4 & 78.6' to 79": Same as above; 78.4' to 78.6': Same as above but wet, very soft.			PP = 0.25 tsf at 77.8'; PP < 0.25 tsf at 78.5' Driller noted slightly stiff at 79' bgs.
40	80										
	82–84		D17	11 7 10 N=17	100			82.5' to 83.8': Gray Fat CLAY, trace fine, subangular gravel, moist, medium stiff to stiff; 83.8' to 84': Gray Lean CLAY, trace fine, subangular gravel, moist, very stiff.			PP = 0.5 tsf at 83'; PP = 4 tsf at 83.9'
35	84–86						CL				
	88		D18	10 11 14 N=25	100			Gray Lean CLAY, trace fine, subangular gravel, moist, very stiff.			PP = 1.75 tsf
	90							Bottom of boring at 89 ft below ground surface (bgs) on 4/25/13. No groundwater at 35 ft bgs after 15 minutes of stabilization time at 3:10pm, on 4/29/2013. Backfilled with bentonite grout up to 2 ft			

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
30	90							bgs, bentonite chips 0.5 ft to 2 ft bgs, and on-site soil 0.5 ft to ground surface.			
	92										
	94										
25											
	96										
	98										
20	100										
	102										
	104										
15											
	106										
	108										
10	110										
	112										

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Log of Boring U-19-13

Date(s) Drilled	**4/29-30/13**	Logged By	**K. Yang**	Checked By	**M. Walbaum**
Drilling Method	**Hollow-Stem Auger (HSA)**	Drill Bit Size/Type	**HSA, 4.25-inch I.D.**	Total Depth of Borehole	**84.0 feet**
Drill Rig Type	**Mobile B-61**	Drilling Contractor	**Environmental Drilling, Inc.**	Approximate Surface Elevation	**125.1**
Groundwater Level	**32 feet**	Sampling Method(s)	**SPT/Shelby Tube**	Hammer Data	**140-lb, 30-inch auto hammer**
Borehole Completion	**Monitoring Well**	Location	**Stockpile, 200' E D St, 200' S N Texas Rd, N13021, E11494 (Shell Datum)**		

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	Fines Content (% <#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
125	0						CL					
	2											PP = 0.5 tsf
	2.5–4		D1	1 2 3 N=5	4			Brown to dark brown Lean CLAY, trace fine to coarse, subangular gravel, moist, medium stiff. [FILL]				
120	5											
	6											
	7.5–9		D2	2 1 2 N=3	33			Same as above except brown to dark gray, soft. [FILL]				PP = 0.25 tsf
115	10											
	12.5–14		D3	2 2 2 N=4	4			Same as above except trace fine to coarse sand and gravel, subangular, medium stiff. [FILL]				PP = 0.5 tsf
110	15											
	16											
	17.5–19		D4	1 4 6 N=10	89			Dark gray Lean CLAY, trace grass roots, organics, and fine, subrounded gravel, moist, stiff. [FILL]				PP = 0.75 tsf
	20											

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
105	20											
	22											PP = 0.75 tsf; PID = 0 ppm
			D5	1 2 4 N=6	89			Same as above except trace grass, fine to medium sand, and fine, subangular gravel, subangular, medium stiff. [FILL]				
	24											Stopped at 24' at 4:45pm on 4/29/13. Resumed drilling at 7:45am on 4/30/13.
100	26											Driller noted GW at 28ft bgs.
	28		D6	0 2 5 N=7	89			27.5' to 28.8': gray silty SAND, fine to medium, wet, loose; [FILL]				
							CL	28.8' to 29': Brown Lean CLAY, trace fine, subrounded gravel, moist, medium stiff.				PP = 1.5 tsf
95	30	S	S7		96			Brown Lean CLAY, moist, very stiff.				PP = 3.5 tsf Shelby tube push pressure 900 psi.
	32								32 ft ATD			PP = 3 tsf
			D8	2 3 8 N=11	100			Same as above except trace fine to coarse sand, and fine gravel, subrounded, stiff.				
	34											
90	36											PP = 2.75 tsf; PID = 0.3 ppm
	38		D9	10 11 18 N=29	100			Same as above except very stiff.				
85	40											
	42			7 10				Same as above.				PP = 2.75 tsf

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	44		D10	16 N=26	100							
80	46											
	48		D11	7 7 15 N=22	100			Same as above except trace fine to coarse, subangular gravel, very stiff.				PP = 1.75 tsf
75	50						CH					Driller noted soft soil at 50ft bgs.
	52		D12	0 0 4 N=4	100			Gray Fat CLAY, moist to wet, medium stiff.				PP = 0.5 tsf
70	54											
	56											
	58		D13	0 0 5 N=5	100			Same as above.				PP = 0.5 tsf
65	60											
	62		D14	0 2 4 N=6	100			Same as above except trace fine, subangular gravel.				PP = 0.25 tsf
60	64											
	66											

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

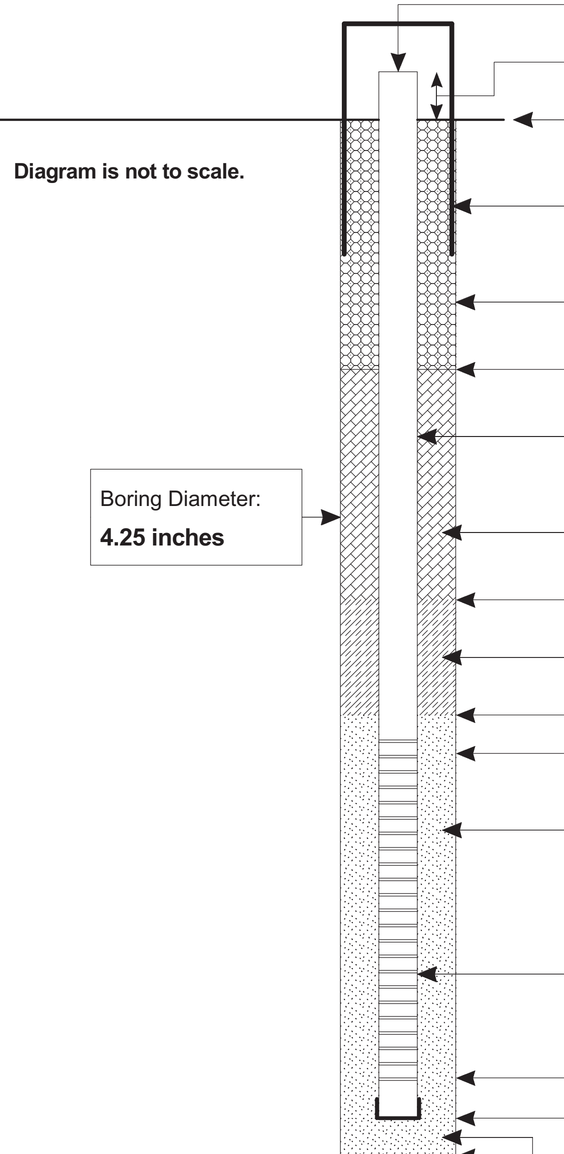
Log of Boring U-19-13

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	68		D15	0 0 3 N=3	100			Same as above except soft.				PP = 0.25 tsf
55	70											
	72		D16	0 3 7 N=10	100			Same as above except trace fine to coarse sand and gravel, subangular, moist, stiff.				PP = 1 tsf
50	74											
	76						CL					
	78		D17	8 14 17 N=31	100			Gray Lean CLAY, trace fine, angular to subangular gravel, moist, hard.				PP = 2 tsf
45	80											
	82		D18	10 15 26 N=41	100			Same as above.				PP = 3.75 tsf
	84							Bottom of boring at 84 ft below ground surface (bgs) at 12:20pm on 4/30/2013. Measured groundwater at 32 ft bgs at 15:20pm, on 4/30/2013. Installed 2-inch diameter PVC diameter well as follows: Backfilled with medium sand and caving up to 78 ft bgs; bentonite chips 50 to 78 ft bgs, 2-inch diameter, PVC SCH40 screen with 0.010" slots from 35ft to 45ft; medium filter sand from 31.6ft to 50ft; bentonite chips from 30 to 31.6 ft bgs; bentonite grout 0.5ft to 30ft; on-site soil and quickcrete 0.5 ft to ground surface. 2-inch diameter solid PVC pipe from 35ft bgs up to 2.5ft above ground surface (ags); 5.5-inch diameter protective steel casing from 2.3ft bgs up to 2.7ft ags; medium filter sand from ground surface up to 2.6ft ags between 2-inch diameter PVC pipe and 5.5-inch-diameter, 5ft long steel casing. Washington Department of Ecology Unique Well # BHE 486.				
40	86											
	88											
	90											

Elevation feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows/ 6in.	SAMPLES Recovery, %	SAMPLES Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
35	90							GW observations: 7:30am on 5/1/2013 measured GW at 29.2ft bgs; 4:30pm on 5/1/2013 measured GW level 29.4ft bgs; 7:15am on 5/2/2013 measured GW at 31ft bgs; 4:20pm on 5/2/2013 measured the GW level 31ft bgs; 6:00pm, 9/25/2013 measured GW at 34.8ft bgs; 3:25pm, 10/10/2013 measured GW at 34.7ft bgs; 3:25pm on 11/13/2013 measured GW 34.7 ft bgs.				
	92											
	94											
30	96											
	98											
25	100											
	102											
	104											
20	106											
	108											
15	110											
	112											

Project: Crude Rail Unloading Facility East, Shell PSR **Project Location: Anacortes, WA** **Project Number: 33764104**	**MONITORING WELL CONSTRUCTION LOG FOR WELL U-19-13**

Well Location	**Stockpile, 200' E D St, 200' S N Texas Rd, N13021, E11494**	Date(s) Installed	**4/30/2013**	Time	**2:00pm**
Installed By	**EDI**	Observed By	**K. Yang**	Total Depth	**84 feet**
Method of Installation	**manually**				
Screened Interval	**35-45**	Completion Zone			
Remarks	**WA Department of Ecology Well # BHE 486. Top of 5-ft long Steel casing Elev. 127.8 ft. (Shell PSR Datum)**				



Elevation of Top of Riser Pipe: **127.6** ft

Height of Riser Above Ground: **2.5 ft**

Ground Elevation: **125.1 ft**

ID/Type of Surface Casing: **5.5" dia. stick-up steel**

Type of Surface Seal: **Quickcrete**

Depth of Surface Seal: **0.5 ft**

ID/Type of Riser Pipe: **2-inch PVC Pipe**

Type of Backfill: **Bentonite Chips**

Depth of Seal: **30 ft**

Type of Seal: **Bentonite Grout**

Depth of Top of Filter Pack: **31.6 ft**

Depth of Top of Screen: **35 ft**

Type of Filter Pack: **Medium Sand**

ID/Type of Screen: **2-inch PVC SCH40**
Screen Slot Size: **0.010"**

Depth of Bottom of Screen: **45 ft**

Depth of Bottom of Plugged Blank Casing: **45 ft**

Type/Depth of Backfill/Seal Below Well: **Bentonite Chips**

Total Depth of Boring: **84 ft**

NOTE: DIAGRAM IS NOT TO SCALE

Project: Crude Rail Unloading Facility East, Shell PSR Project Location: Anacortes, WA Project Number: 33764104	Log of Boring U-20-13 Sheet 1 of 5

Date(s) Drilled	4/24, 4/25/2013	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	Hollow-Stem Auger (HSA)	Drill Bit Size/Type	HSA, 4.25-inch I.D.	Total Depth of Borehole	89 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	Environmental Drilling, Inc.	Surface Elevation	118.7 feet
Borehole Backfill	Bentonite Grout, On-Site Soil	Sampling Method(s)	SPT/Shelby Tube	Hammer Data	140-lb, 30-inch auto hammer
Location	Fill Stockpile appro. 550 ft east of D St, 220 ft South of N Texas Rd, N12964, E11877 (Shell Datum)				

Elevation feet	Depth, feet	Samples: Type	Samples: Number	Samples: Blows/ 6in.	Samples: Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	0						CL				
	2.5–4	SPT	D1	4 4 15 N=19	100			Brown to gray Lean CLAY, trace organics, fine to coarse, angular sand and gravel, moist, very stiff. [FILL]			PP = 0.75 tsf
115											
	6						SM				
	7.5–9	SPT	D2	2 2 2 N=4	67			Dark gray Silty SAND, trace fine, subrounded gravel, sand fine to coarse, moist, loose. [FILL]			
110											
	10						CL				
	12.5–14	SPT	D3	3 3 3 N=6	83			Dark gray to gray Lean CLAY, trace fine, subangular gravel, moist, medium stiff. [FILL]			PP = 0.5 tsf
105											
	17.5–19	SPT	D4	2 3 4 N=7	100			Same as above except bluish gray to dark gray, trace fine to coarse sand, fine gravel, subangular.			PP = 0.5 tsf
100	20										

GEO_SEA3D J:\PROJECTS\S\SHELL\SHELL ANACORTES\CRUDE UNLOAD EAST, PHASE 2\11 BORING LOGS\GINT 33764104.GPJ URSSEA3B.GLB URSSEA3.GDT 12/13/13

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	20										
	22										
95	23–24		D5	5 6 5 N=11	100			Brown to gray Lean CLAY, trace fine to coarse, subangular gravel, moist, stiff. [FILL]			PP = 1 to 3 tsf
	26							26 ft ▼			
90	28		D6	3 4 3 N=7	100			Same as above except brown to dark gray. [FILL]			PP = 1.5 tsf
	30										
	32										
85	33–34		D7	2 4 7 N=11	100			32.5' to 32.7': gray Silty SAND, trace fine, subangular gravel, moist, medium dense; [FILL] 32.7' to 34': Gray Lean CLAY, trace organics and fine, subangular gravel, moist, stiff. [FILL]			PP = 2 tsf at 33'; PID = 0 ppm
	36										
80	38		D8	0 3 5 N=8	83			D8A: 37.5' to 38': same as 32.5' to 32.7' except loose; [FILL] D8B: 38' to 39': same as 32.7' to 34'. [FILL]			PP = 1.5 tsf at 38.5'; PID = 0 ppm Driller noted GW at 38' bgs.
	40										
	42			2 3				D9A: 42.5' to 43.5': gray to dark sandy Lean CLAY, trace organics and wood, wet, soft; [FILL]			PP < 0.25 tsf at 43'; PP = 3 tsf at 43.8'; PID = 0 ppm

Project: Crude Rail Unloading Facility East, Shell PSR	**Log of Boring U-20-13**
Project Location: Anacortes, WA	Sheet 3 of 5
Project Number: 33764104	

Elevation feet	Depth, feet	Samples: Type	Samples: Number	Samples: Blows/ 6in.	Samples: Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
75	44		D9	5 N=8	100		CL	D9B: 43.5' to 44': Yellowish brown mixed with gray Lean CLAY, trace sand, wood, and fine to coarse, subangular gravel, moist, stiff.			Driller noted stiff from 43.5' bgs.
	46										
70	48		D10	6 10 14 N=24	100			Brown Lean CLAY, moist, very stiff.			PP = 4 tsf
	50										
	52										
65	54		D11	5 10 13 N=23	100			Same as above.			PP = 3.5 tsf
	56										
60	58		D12	3 5 8 N=13	100			Same as above except trace fine, angular gravel, stiff.			PP = 3 tsf
	60						CH				
	62										
55	64		D13	0 2 4 N=6	100			Dark gray Fat CLAY, moist to wet, medium stiff.			PP < 0.25 tsf
	66	S	S14		100			Same as above.			PP = 1.25 tsf Shelby tube push pressure 300 to 500 psi.

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Log of Boring U-20-13

Elevation feet	Depth, feet	Sample Type	Sample Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
		S									
50	68		D15	4 5 6 N=11	100			Same as above except but stiff.			PP = 1.5 tsf
	70										
45	72–74		D16	0 0 0 N=0	100			Same as above except very soft to soft.			PP = 0.5 tsf
	74										Stop drilling at 4:45pm 4/24/13. 7:45am 4/25/13 measured GW at 26' (?) bgs with mud, then resumed drilling.
	76										
40	78		D17	0 3 6 N=9	100			Same as above except medium stiff.			PP = 0.75 tsf
	79						ML				Driller noted hard at 79' bgs.
	80										
35	82–84		D18	4 15 18 N=33	100			Dark gray SILT, trace fine to coarse, subrounded gravel, moist, very stiff to hard.			PP = 2.5 tsf
	86										
30	88		D19	5 14 15 N=29	100			Same as above except no gravel.			PP = 4 tsf
	89–90							Bottom of boring at 89 ft below ground surface (bgs) on 4/24/13. Measured groundwater at 38 ft bgs during drilling on 4/24/2013. Backfilled with bentonite grout up to 2 ft bgs, bentonite chips 0.5			

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content, %	REMARKS AND OTHER TESTS
	90							ft to 2 ft bgs, and on-site soil 0.5 ft to ground surface.			
	92										
25	94										
	96										
	98										
20	100										
	102										
15	104										
	106										
	108										
10	110										
	112										

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Log of Boring U-22-14

Date(s) Drilled	5/16/2014	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	Hollow-Stem Auger (HSA)	Drill Bit Size/Type	HSA, 4.25-inch I.D.	Total Depth of Borehole	41.5 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	Environmental Drilling, Inc.	Surface Elevation	116.4
Borehole Backfill	Bentonite Grout, On-Site Soil	Sampling Method(s)	SPT	Hammer Data	140-lb, 30-inch auto hammer
Location	Clean Soils Pile, 780' E of D St, 350' S of N Texas Rd, N12795, E12104 (Shell Datum)				

Elevation feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows/ 6in.	SAMPLES Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0		D1	4 3 3 N=6	89		CL	Brown Sandy Lean CLAY, trace fine, subangular gravel, moist, stiff to very stiff. [FILL] (Sample ID: U-22-14_0)		9.2	PP > 4.5 tsf; PID = 0 ppm
115											
	5										
110											
	10		D2	0 5 5 N=10	78		CL/ SM	Dark gray Sandy Lean CLAY to clayey SAND, trace fine, subangular gravel, moist, stiff to medium dense. [FILL] (Sample ID: U-22-14_10)		10.5	PP = 3 tsf; PID = 0 ppm
105											
	15										
100											
	20		D3	3 4 6 N=10	44		ML	Dark brown Sandy SILT, trace fine, subangular gravel, moist, medium stiff to stiff. [FILL] (Sample ID: U-22-14_20)		10.4	PP = 2 tsf; PID = 0 ppm
95											
	25										

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
90	25										Driller: GW 30ft ATD.
85	30		D4	0 1 3 N=4	100		CL	30 ft ▼ Dark gray to dark gray Lean CLAY to sandy Lean CLAY, trace fine, subrounded to rounded gravel, moist to wet, soft. [FILL] (Sample ID: U-22-14_30)		19.5	PP = 0.25 tsf; PID = 0 ppm
80	35										Driller: stiffer from 34ft.
75	40		D5	7 6 8 N=14	56			40' to 40.4': Same as above. [FILL] (Sample ID: U-22-14_40)			PP = 3.25 tsf; PID = 0 ppm
							CL	40.4' to 41.5': Dark brown Lean CLAY, trace organics and fine, subangular gravel, moist, stiff. [NATIVE]		15.8	
								Bottom of boring at 41.5 ft below ground surface (bgs) on 5/16/2014. Measured groundwater level 38ft bgs 20 minutes following end of drilling. Backfilled with bentonite grout up to 2 ft bgs, bentonite chips 1 ft to 2 ft bgs, and 0 to 1ft with on-site sandy fill. PID measurements as obtained with an Industrial Scientific Model MX6 iBrid Multigas Monitor with a 10.6eV Lamp.			
70	45										
65	50										

Project: Crude Rail Unloading Facility East, Shell PSR	Log of Boring U-23-14
Project Location: Anacortes, WA	Sheet 1 of 2
Project Number: 33764104	

Date(s) Drilled	5/16/2014	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	Hollow-Stem Auger (HSA)	Drill Bit Size/Type	HSA, 4.25-inch I.D.	Total Depth of Borehole	41.5 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	Environmental Drilling, Inc.	Surface Elevation	119.0
Borehole Backfill	Bentonite Grout, On-Site Soil	Sampling Method(s)	SPT	Hammer Data	140-lb, 30-inch auto hammer
Location	Clean Soils Pile, 700' E of D St, 400' S of N Texas Rd, N12763, E11986 (Shell Datum)				

Elevation feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows/ 6in.	SAMPLES Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0		D1	6 7 8 N=15	83		CL	Brown Sandy Lean CLAY with fine, subangular gravel, dry to moist, very stiff. [FILL] (Sample ID: U-23-14_0)		12.8	PP > 4.5 tsf; PID = 0 ppm
115	5										
110	10		D2	1 1 2 N=3	89		CL/ ML	Brown to drak gray Sandy Lean CLAY to SILT, trace fine, subangular gravel, moist, soft. [FILL] (Sample ID: U-23-14_10)		15.1	PP = 0.5 tsf; PID = 0 ppm
105	15										
100	20		D3	1 1 2 N=3	100		CL/ SM	20 to 20.3ft & 21.3 to 21.5ft: Brown to dark gray Lean CLAY to sandy Lean CLAY, moist, medium stiff; 20.3 to 21.3ft: Dark gray to brownish gray Silty SAND, trace fine, subangular gravel and grass, sand fine to medium, moist, loose. [FILL]. (Sample ID: U-23-14_20)		16.6	PP = 1.25 tsf; PID = 2 ppm
95	25										

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Log of Boring U-23-14

Elevation feet	Depth, feet	Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	25										
90											PP = 1.5 tsf; PID = 1.5 ppm
	30		D4	5 5 5 N=10	100		CL	Brown to greenish gray Lean CLAY, trace fine, subangular gravel, moist, stiff. [FILL] (Sample ID: U-23-14_30)		16.5	
											Driller: sticky at 32ft, poured a little water into the hole.
85	35										
								37.5 ft ▼			
											Driller: gravelly at 38.5ft.
80							CL				PP > 4.5 tsf; PID = 0 ppm
	40		D5	7 18 23 N=41	56			Dark gray Lean CLAY, trace fine, subangular gravel and wood pieces, 40 to 40.7ft wet, soft; 40.7 to 41.5ft: moist, hard. [NATIVE] (Sample ID: U-23-14_40)		19.2	
								Bottom of boring at 41.5 ft below ground surface (bgs) on 5/16/2014. Measured groundwater 37.5ft bgs 20 minutes following end of drilling. Backfilled with bentonite grout up to 2 ft bgs, bentonite chips 1 ft to 2 ft bgs, and 0 to 1ft with on-site sandy fill. PID measurements as obtained with an Industrial Scientific Model MX6 iBrid Multigas Monitor with a 10.6eV Lamp.			
75	45										
70	50										
65											

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Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Log of Boring U-24-14

Date(s) Drilled	5/19/2014	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	Hollow-Stem Auger (HSA)	Drill Bit Size/Type	HSA, 4.25-inch I.D.	Total Depth of Borehole	51.5 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	Environmental Drilling, Inc.	Surface Elevation	120.6
Borehole Backfill	Bentonite Grout, On-Site Soil	Sampling Method(s)	SPT	Hammer Data	140-lb, 30-inch auto hammer
Location	Clean Soils Pile, 620' E of D St, 320' S of N Texas Rd, N12881, E11961 (Shell Datum)				

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows/ 6in.	SAMPLES Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
120	0		D1	2 4 10 N=14	87		CL	Brown Lean CLAY with fine to coarse sand and fine, angular gravel, dry to moist, stiff. [FILL] (Sample ID: U-24-14_0)		13.5	PP = 2.75 tsf; PID = 0 ppm
115	5										
110	10		D2	4 3 3 N=6	78			Same as above but dark brown to drak gray, also trace organics, medium stiff. [FILL] (Sample ID: U-24-14_10)		14.8	PP = 1.5 tsf; PID = 0.4 ppm
105	15										
100	20		D3	2 2 7 N=9	100			Brown to gray Lean CLAY, trace sand and gravel, sand fine to coarse, gravel fine, angular to subrounded, moist, medium stiff to stiff. [FILL]. (Sample ID: U-24-14_20)		15.0	PP = 0.5 to 2 tsf; PID = 0 ppm
	25										

Elevation feet	Depth, feet	Sample Type	Sample Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
95	25										
90	30		D4	3 4 7 N=11	100			Same as above but gray, trace fine, rounded gravel and grass, stiff. [FILL] (Sample ID: U-24-14_30)		18.3	PP = 1.5 tsf; PID = 0 ppm
85	35										
80	40		D5	2 5 9 N=14	100			Dark gray to greenish gray Lean CLAY, trace gravel, wood and organics, gravel fine, angular, moist, medium stiff to stiff. [FILL]. (Sample ID: U-24-14_40)		12.8	PP = 0.75 to 4 tsf; PID = 1.5 ppm
							CL				Driller: gravelly at 44ft.
75	45										
70	50		D6	8 12 20 N=32	100			Brown Lean CLAY, trace fine, subangular gravel, moist, hard. [NATIVE]			PP > 4.5 tsf; PID = 0 ppm
								Bottom of boring at 51.5 ft below ground surface (bgs) on 5/16/2014. Measured no groundwater in the hole 20 minutes following end of drilling. Backfilled with bentonite grout up to 7 ft bgs, bentonite chips 2 ft to 7 ft bgs, and 0 to 2ft with on-site clayey fill.			

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
								PID measurements as obtained with an Industrial Scientific Model MX6 iBrid Multigas Monitor with a 10.6eV Lamp.			
	55										
65											
	60										
60											
	65										
55											
	70										
50											
	75										
45											
	80										
40											

Project: Crude Rail Unloading Facility East, Shell PSR	**Log of Boring U-25-14**
Project Location: Anacortes, WA	Sheet 1 of 3
Project Number: 33764104	

Date(s) Drilled	5/19/2014	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	Hollow-Stem Auger (HSA)	Drill Bit Size/Type	HSA, 4.25-inch I.D.	Total Depth of Borehole	51.5 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	Environmental Drilling, Inc.	Surface Elevation	118.3
Borehole Backfill	Bentonite Grout, On-Site Soil	Sampling Method(s)	SPT	Hammer Data	140-lb, 30-inch auto hammer
Location	Clean Soils Pile, 520' E of D St, 300' S of N Texas Rd, N12857, E11849 (Shell Datum)				

Elevation feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows/ 6in.	SAMPLES Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0		D1	9 6 5 N=11	78		CL	Brown Lean CLAY, trace fine to coarse sand and fine gravel, angular to subrounded, moist, stiff. [FILL] (Sample ID: U-25-14_0)		17.3	PP = 3.25 tsf; PID = 0 ppm
115											
	5										
110											
	10		D2	12 12 14 N=26	56			Same as above but brown to dark gray, no trace gravel, very stiff. [FILL] (Sample ID: U-25-14_10)		15.4	PP > 4.5 tsf; PID = 0 ppm
105											
	15										
100											
	20		D3	3 5 9 N=14	89			Dark gray Lean CLAY, trace organics and gravel, gravel fine, subangular, moist, stiff. [FILL]. (Sample ID: U-25-14_20)		20.2	PP = 1.25 tsf; PID = 0 ppm
95											
	25										

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Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	25										
90											
	30		D4	2 3 10 N=13	100		CL/ SM	30 to 30.3ft: gray silty SAND, fine to medium, moist, medium dense; 30.3 to 31.5ft: Gray lean CLAY, trace fine, angular to subrounded gravel, moist, stiff. [FILL] (Sample ID: U-25-14_30)		16.5	PP = 1.5 to 2.75 tsf; PID = 0 ppm Driller: Encountered a rock at 31ft.
85											
	35										
80											
	40		D5	4 5 6 N=11	100			40 to 40.3ft & 41.3 to 41.5ft: Gray to dark gray Lean CLAY, moist, stiff; 40.3 to 41.3ft: Dark gray ORGANICS with wood pieces, moist, stiff. [FILL] (Sample ID: U-25-14_40) 41ft ▼		24.7	PP = 2 tsf; PID = 32 ppm Driller: GW 41ft ATD.
75							CL				
	45										
70											
	50		D6	7 6 12 N=18	100			Brown Lean CLAY, moist, very stiff. [NATIVE]			PP > 4.5 tsf; PID = 0 ppm
								Bottom of boring at 51.5 ft below ground surface (bgs) on 5/16/2014. Measured groundwater 46.4ft bgs 20 minutes following end of drilling. Backfilled with bentonite grout up to 7 ft bgs, bentonite chips 2 ft to 7 ft bgs, and 0 to 2ft with on-site soil.			
65											

Project: Crude Rail Unloading Facility East, Shell PSR Project Location: Anacortes, WA Project Number: 33764104	**Log of Boring U-25-14** Sheet 3 of 3

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	55							PID measurements as obtained with an Industrial Scientific Model MX6 iBrid Multigas Monitor with a 10.6eV Lamp.			
60											
	60										
55											
	65										
50											
	70										
45											
	75										
40											
	80										
35											

Project: Crude Rail Unloading Facility East, Shell PSR	Log of Boring U-26-14
Project Location: Anacortes, WA	Sheet 1 of 2
Project Number: 33764104	

Date(s) Drilled	5/20/2014	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	Hollow-Stem Auger (HSA)	Drill Bit Size/Type	HSA, 4.25-inch I.D.	Total Depth of Borehole	41.5 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	Environmental Drilling, Inc.	Surface Elevation	116.3
Borehole Backfill	Bentonite Grout, On-Site Soil	Sampling Method(s)	SPT	Hammer Data	140-lb, 30-inch auto hammer
Location	Clean Soils Pile, 430' E of D St, 300' S of N Texas Rd, N12934, E11724 (Shell Datum)				

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0		D1	28 23 10 N=33	89		SC	Brown to dark gray Clayey SAND, trace fine, angular gravel, sand fine to coarse, dry to moist, dense. [FILL] (Sample ID: U-26-14_0)		5.8	PID = 0 ppm
115							CL				
	5										
110											
	10		D2	6 6 8 N=14	89			Dark gray to greenish gray Lean CLAY, trace fine, angular gravel and organics, moist, stiff. [FILL] (Sample ID: U-26-14_10)		11.8	PP = 1 tsf; PID = 0 ppm
105											
	15										
100											
	20		D3	2 3 8 N=11	56			Greenish gray Lean CLAY, trace fine to coarse, subangular gravel, moist, stiff. [FILL] (Sample ID: U-26-14_20)		18.6	PP = 2 tsf; PID = 1.4 ppm
95											
	25										

Project: Crude Rail Unloading Facility East, Shell PSR	Log of Boring U-26-14
Project Location: Anacortes, WA	
Project Number: 33764104	Sheet 2 of 2

Elevation feet	Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
90	25										
85	30		D4	1 3 11 N=14	100			Brown to gray Lean CLAY, moist, medium stiff to stiff. [FILL] (Sample ID: U-26-14_30) 31 ft ▼		12.6	PP = 1.5 to 4 tsf; PID = 0 ppm
80	35						CL				Driller: Gravelly at 38ft. Driller: GW 39ft ATD.
75	40		D5	7 11 14 N=25	78			Brown Lean CLAY, moist, very stiff. [NATIVE]			PP > 4.5 tsf; PID = 0 ppm
70	45							Bottom of boring at 41.5 ft below ground surface (bgs) on 5/16/2014. Measured groundwater level 31ft bgs 20 minutes following end of drilling. Backfilled with bentonite grout up to 7 ft bgs, bentonite chips 2 ft to 7 ft bgs, and 0 to 2 ft with on-site soil. PID measurements as obtained with an Industrial Scientific Model MX6 iBrid Multigas Monitor with a 10.6eV Lamp.			
65	50										

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Project: Crude Rail Unloading Facility East, Shell PSR	Log of Boring U-27-14
Project Location: Anacortes, WA	Sheet 1 of 2
Project Number: 33764104	

Date(s) Drilled	5/20/2014	Logged By	K. Yang	Checked By	M. Walbaum
Drilling Method	Hollow-Stem Auger (HSA)	Drill Bit Size/Type	HSA, 4.25-inch I.D.	Total Depth of Borehole	41.5 feet
Drill Rig Type	Mobile B-61	Drilling Contractor	Environmental Drilling, Inc.	Surface Elevation	120.9
Borehole Backfill	Bentonite Grout, On-Site Soil	Sampling Method(s)	SPT	Hammer Data	140-lb, 30-inch auto hammer
Location	Clean Soils Pile, 240' E of D St, 260' S of N Texas Rd, N12949, E11569 (Shell Datum)				

Elevation feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows/ 6in.	SAMPLES Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	0										
120			D1	16 7 5 N=12	67		SC	Gray Clayey SAND, trace fine to coarse, angular gravel, sand fine to coarse, dry, medium dense. [FILL] (Sample ID: U-27-14_0)		4.5	PP = 3.25 tsf; PID = 0 ppm
							CL				
	5										
115											
	10										PP = 1.25 tsf; PID = 0.8 ppm
110			D2	4 5 4 N=9	67			Brown gray to dark gray Lean CLAY, trace fine, angular gravel and wood pieces, moist, stiff. [FILL] (Sample ID: U-27-14_10)		13.0	
	15										
105											
	20										PP = 2.25 tsf; PID = 1.5 ppm
100			D3	4 5 9 N=14	100		CL/ SM	20 to 20.8ft & 21.4 to 21.5ft: Brown Lean CLAY, trace fine, subangular gravel, moist, stiff; 20.8 to 21.4ft: Gray silty SAND, trace fine, angular gravel, moist, medium dense. [FILL] (Sample ID: U-27-14_20)		16.5	
	25										

URS

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Log of Boring U-27-14

Elevation feet	Depth, feet	Samples: Type	Samples: Number	Samples: Blows/ 6in.	Samples: Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Moisture Content	REMARKS AND OTHER TESTS
	25										
95											
	30		D4	3 5 8 N=13	89			Brown to gray Lean CLAY, trace fine, subangular gravel and grass, and 0.5-inch thick gray silty SAND, moist to wet, stiff to soft. [FILL] (Sample ID: U-27-14_30) (Groundwater Sample ID: U-27-14_31) — 31 ft ▼		16.2	PP = 0.5 to 4 tsf; PID = 1.7 ppm GW Sample collected with disposable bailer.
90											
							CL				Driller: Stiff at 34ft.
	35										
85											Driller: GW 38ft ATD.
	40		D5	7 9 16 N=25	100			Brown Lean CLAY, moist, very stiff. [NATIVE]			PP = 3.75 tsf; PID = 0 ppm
80											
								Bottom of boring at 41.5 ft below ground surface (bgs) on 5/20/2014. Measured groundwater level 31ft bgs 20 minutes following end of drilling. Backfilled with bentonite grout up to 7 ft bgs, bentonite chips 1 ft to 7 ft bgs, and 0 to 1 ft with on-site soil. PID measurements as obtained with an Industrial Scientific Model MX6 iBrid Multigas Monitor with a 10.6eV Lamp.			
	45										
75											
	50										
70											

APPENDIX B.6

TEST PIT AND BORING LOCATION PLAN AND LOGS FROM
UNIT 20 TANK FARM – PLT PROJECT (AECOM 2016)

D R A F T   R E P O R T

SHELL REFINERY
ANACORTES, WASHINGTON

GEOTECHNICAL REPORT
UNIT 20 TANK FARM - PLT PROJECT
AECOM PROJECT NO. 60513864

Prepared for

Shell Puget Sound Refinery

8505 S. Texas Road

Anacortes, Washington 98221

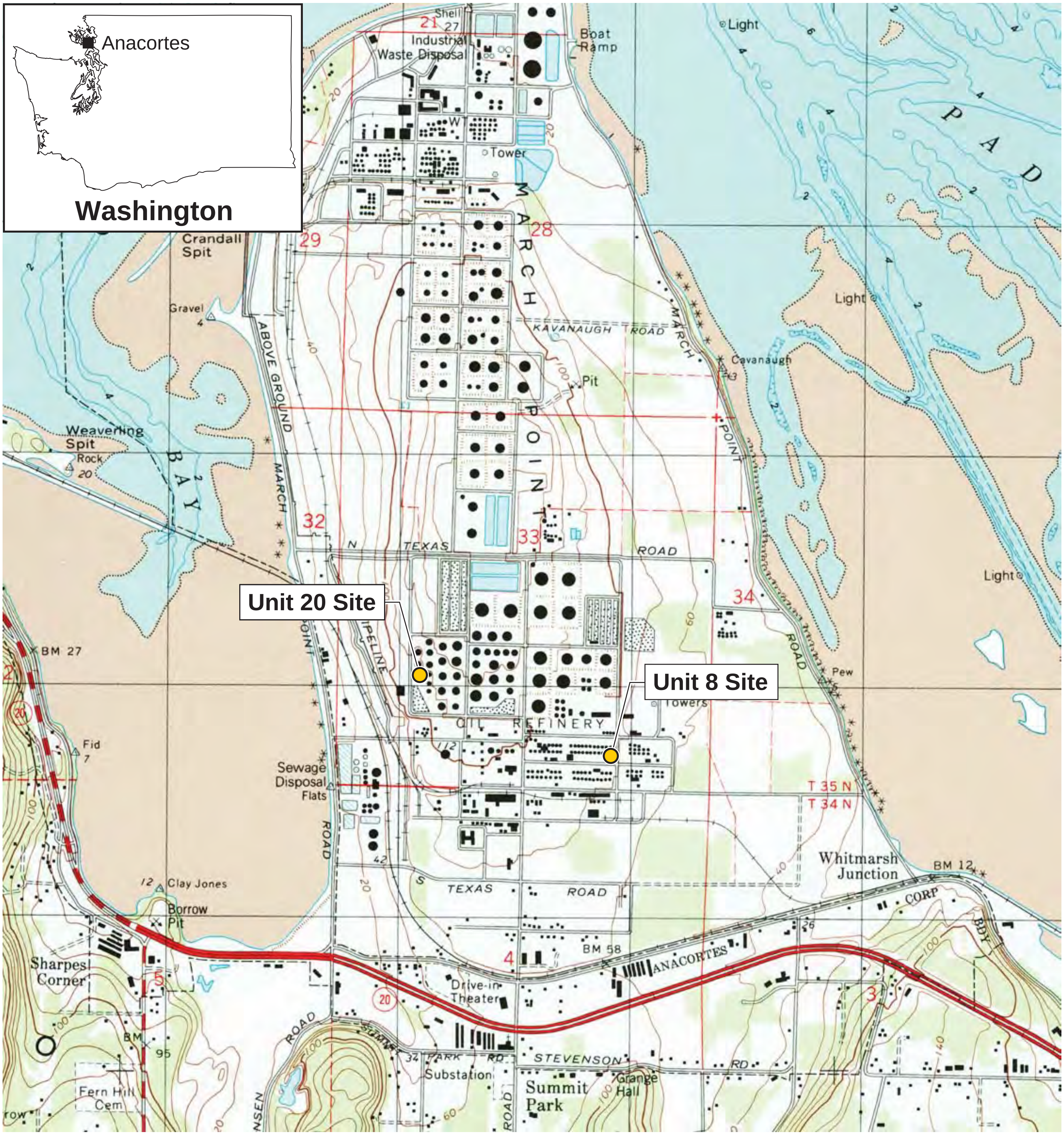
August 5, 2016

AECOM

1111 Third Avenue, Suite 1600

Seattle, Washington 98101-1616

J:\DCS\Projects\Legacy_URS\S\Shell\Shell Anacortes\PLT-Nonene & Tetramer Production\60513864 GRFX\60513864_01.ai



Source: USGS 7.5-minute topographic quadrangle, Anacortes South, Washington, 1998

0 2,000 4,000

Scale in Feet

Figure 1

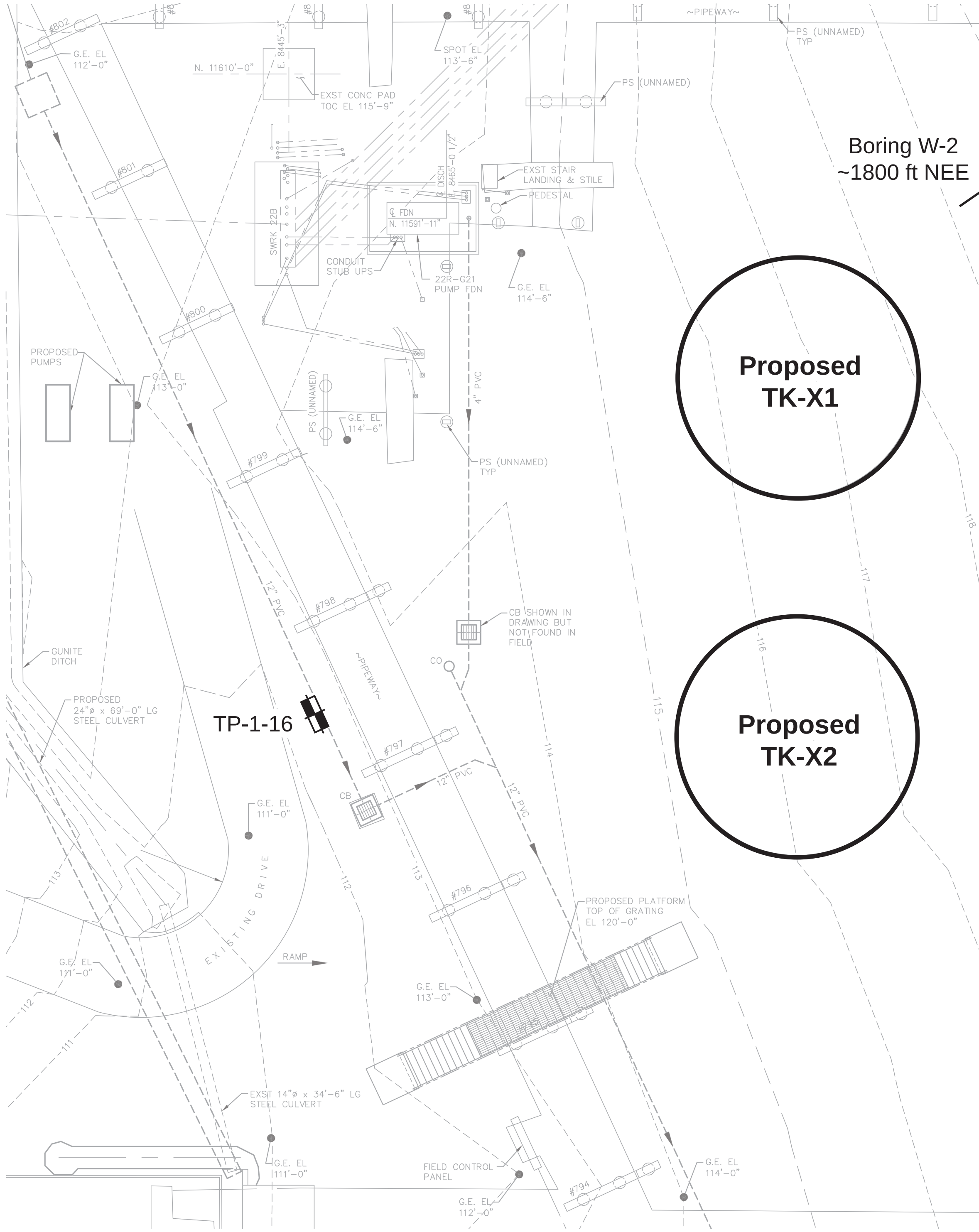
Site Location

Job No. 60513864

AECOM

PLT – Increse Nonene and Petramer Production
Shell Puget Sound Refinery
Anacortes, Washington

J:\DCS\Projects\Legacy_URS\S\Shell\Shell Anacortes\PLT-Nonene & Tetramer Production\60513864 GRFX\60513864_02.ai



Source: ANVIL, Shell Oil Products, Print Project Unit 20 – Tankage Underground Composite, March 2016

Legend

TP-1-16 AECOM test pit number and location

0 30 60

Scale in Feet

N

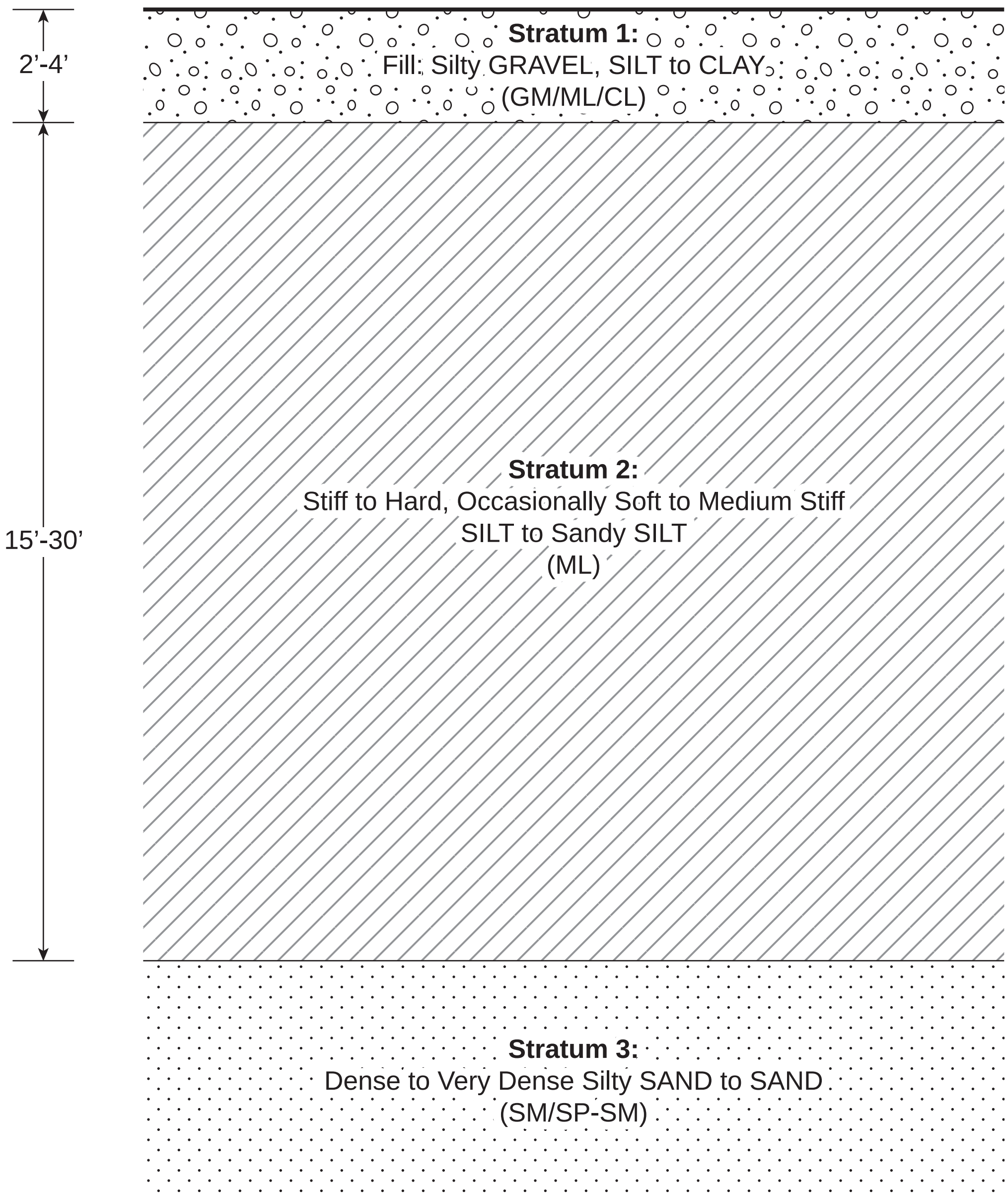
Figure 2

Site Plan – Unit 20

Job No. 60513864

AECOM

PLT – Increse Nonene and Petramer Production
Shell Puget Sound Refinery
Anacortes, Washington



Note:

Based on test pits and borings at site and in vicinity.

Job No. 60513864

Figure 3

Idealized Soil Profile – Unit 20

PLT – Increse Nonene and Petramer Production
Shell Puget Sound Refinery
Anacortes, Washington

Project: Shell - PLT - Increase Nonene & Tetramer Production
Project Location: Anacortes, Washington
Project Number: 60513864

Key to Log of Boring

Elevation feet	Depth, feet	SAMPLES Type	Number	11475	Recovery, %	Graphic Log	USCS	MATERIAL DESCRIPTION					REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9		10			12

COLUMN DESCRIPTIONS

1 **Elevation:** Elevation in feet referenced to mean sea level (MSL) or site datum.

2 **Depth:** Depth in feet below the ground surface.

3 **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

4 **Sample Number:** Sample identification number.

5 **Blows/ 6in.** Number of blows required to advance driven sampler 12 inches beyond first 6-inch interval, or distance noted, using a 300-lb or 140-lb hammer with a 30-inch drop.

6 **Recovery, %** Sample Recovery, expressed as a percentage

7 **Graphic Log:** Graphic depiction of subsurface material encountered; typical symbols are explained below.

8 **USCS:** Graphic depiction of subsurface material encountered; typical symbols are explained below.

9 **Material Description:** Description of material encountered; may include color, moisture, grain size, and density/consistency.

Well Completion Schematic: Graphic depiction of subsurface material encountered; typical symbols are shown below

10 **Fines Content:** Fines content of soil sample passing a #200 sieve measured in laboratory, expressed as a percentage.

Dry Unit Weight: The degree of compaction of a soil measured in a laboratory, expresed as pounds per cubic-foot

Moisture Content: Water content of soil sample measured in laboratory, expressed as percentage of dry weight of specimen.

12 **Remarks and Other Tests:** Comments and observations regarding drilling or sampling made by driller or field personnel. Other field and laboratory test results, using the following abbreviations:

Trace	0 - 10%	Little	10 - 20%
Some	20 - 35%	And	35 - 50%

Descriptions and stratum lines are interpretive; field descriptions may have been modified to reflect lab test results. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times.

Unified Soil Classification System

Major Divisions			Symbols: Letter	Typical Descriptions
Coarse Grained Soils More than 50% of No. 200 Sieve Size	**Gravels** More than 50% of Coarse Fraction Retained in No. 4 Sieve	**Clean Gravels** (little or no fines)	GW	Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
			GP	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
		Gravels with Fines (appreciable amount of fines)	GM	Silty Gravels, Gravel-Sand-Silt Mixtures
			GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	Sands More than 50% of Coarse Fraction Passing through No. 4 Sieve	**Clean Sand** (little or no fines)	SW	Well-Graded Sands, Gravelly Sands, Little or no Fines
			SP	Poorly Graded Sands, Gravelly Sands, Little or no Fines
		Sands with Fines (appreciable amount of fines)	SM	Silty Sands, Sand-Clay Mixtures
			SC	Clayey Sands, Sand-Clay Mixtures
Fine Grained Soils More than 50% of Material is Smaller than No. 200 Sieve Size	**Silts and Clays**	Liquid Limit Less than 50%	ML	Inorganic Silts and very Fine 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 Silty Clays of Low Plasticity
	Silts and Clays	Liquid Limit Greater than 50%	MH	Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils
			CH	Inorganic Clays of High Plasticity, Fat Clays
			OH	Organic Clays of Medium to High Plasticity, Organic Silts
Highly Organic Soils			PT	Peat, Humus, Swamp Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Dames & Moore Sampler
- Relatively Undisturbed Sample
- Disturbed Sample
- Standard Penetration Test
- No Recovery
- Grab Sample

TYPICAL WELL GRAPHIC SYMBOLS

- One pipe in bentonite pellets
- One pipe in filter pack
- One slotted pipe in filter pack
- Bentonite Seal

Figure

AECOM

Project: Shell - PLT - Increase Nonene & Tetramer Production **Project Location: Anacortes, Washington** **Project Number: 60513864**	**Log of Test Pit TP-1-16** Sheet 1 of 1

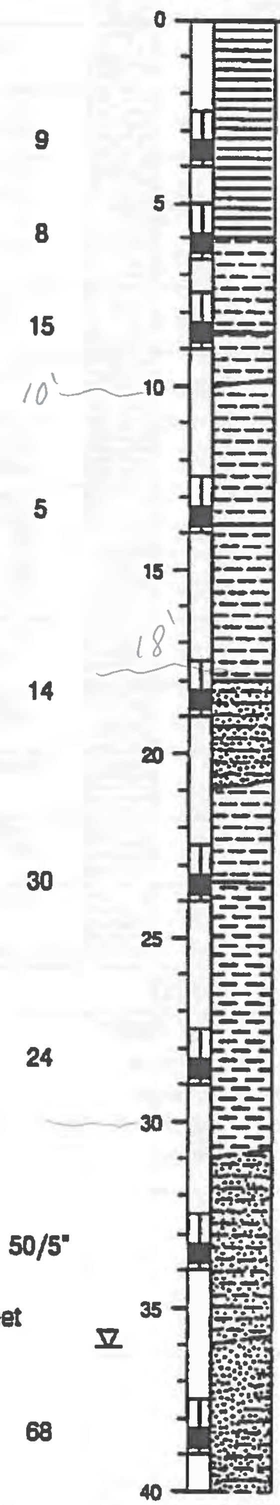
Date(s) Excavated	**7/20/2016**	Logged By	**K. Yang**	Checked By	**M. Martin**
Excavation Equipment	**Backhoe Excavated**	Excavation Contractor	**Lake Erie Trucking**	Total Depth of Test Pit	**11 feet**
Excavation Dimensions	**3ft x 10ft**	Pit Alignment	**S-N**	Ground Surface Elevation	**111.50**
Groundwater Level	**N/A**	Sampling Method(s)	**Grab**		
Coordinates	**Northing 10616 Easting 8539**	Location	**580 ft S of 8th St & A St, then 90 ft E in the refinery**		

Elevation feet	Depth, feet	Type	Number	Graphic Log	USCS	MATERIAL DESCRIPTION	Fines Content (%<#200 Sieve)	Dry Unit Weight, pcf	Moisture Content, %	REMARKS AND OTHER TESTS
	0				GP/GM	Gray to light gray poorly-graded fine to coare GRAVEL with fine to coarse sand and silt, dry. [FILL]				
110					GM	Dark brown silty fine to coarse GRAVEL with sand, moist, medium dense. [FILL]				
		Grab	D1		CL	Gray gravely Lean CLAY, gravel fine, angular, moist, stiff. [FILL]				PP = 1.5 tsf
					CL	Brown, locally gray Lean CLAY, trace fine, subrounded gravel, moist, stiff to very stiff.				
		Grab	D2							PP = 2.5 to 3.5 tsf
	5									
105										PP = 4.5 tsf
		Grab	D3			Same as above but hard.	78.2		22	
						Same as above but trace fine to coarse, subrounded to rounded gravel, occasionally with cobbles, moist, hard.				
	10	Grab	D4			Grades to sandy Lean CLAY, trace fine to coarse, subangular to rounded gravel, moist, hard.	46.5		11.9	PP > 4.5 tsf
100						End of test pit at 11 ft below ground surface. No groundwater encountered in the test pit during excavation. Backfilled and compacted with onsite soil by tamping the granular backfill with the backhoe bucket.				
	15									
95										
	20									
90										
	25									
85										
	30									

Equipment B-61

Land Surface Elevation 98 feet * Date 10/22/90

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	18.7	100	9
MD	17.5	106	8
TxS	24.8	102	15
			5
MD	14.7	121	14
MD	21.9	108	30
			24
			50/5"
			68



BROWN SILTY CLAY (CL) medium stiff, moist; some sand and wood debris, trace gravel (Fill).

GRAY BROWN SANDY SILT (ML) medium stiff, moist; occasional gravel (Fill).

BROWN SILT (ML) medium stiff to stiff, moist to wet; some organics, trace gravel (Fill).

RED BROWN SANDY SILT (ML) soft, moist to wet; occasional organics (Fill).

GRAY CLAYEY SILT (ML) soft, wet (Fill).

Charcoal fragment noted at approximately 18 feet.
GRAY SILTY SAND (SM) medium dense, wet; fine to medium grained, trace gravel.

BLUE GRAY SANDY SILT (ML) very stiff to hard, moist; with trace gravel.

GRAY BROWN CLAYEY SILT (MH) hard, moist to wet; trace gravel.

GRAY SILTY SAND (SM) very dense, moist; very fine grained, trace gravel.

GRAY SAND (SP-SM) very dense, saturated; fine to medium grained.

*Datum: assumed elevation 100 feet at base of power pole #3 on west side of "A" Street.

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Log of Boring 1 (0-40')

Anvil/Propane Tanks-Texaco Puget Sound Plant
Anacortes, Washington

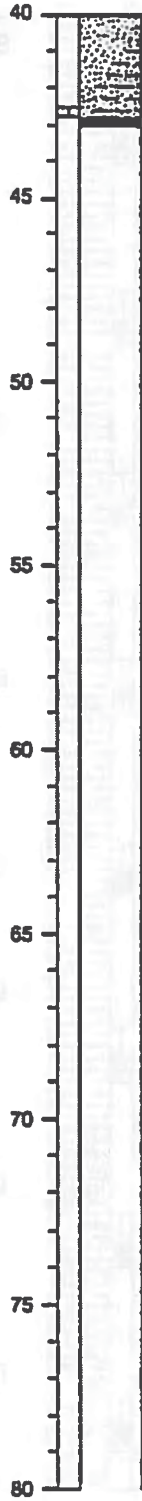
PLATE **2**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,116.011	SES	GHS	13 November 90		

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot	Depth (feet)	Sample
			50/3"		

Equipment: B-61

Land Surface Elevation: 98 feet   Date: 10/22/90



Groundwater encountered at approximately 36 feet during drilling.

Hole filled with bentonite concrete grout during auger withdrawal: concrete patch at surface.

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Log of Boring 1 (40-43')

Anvil/Propane Tanks-Texaco Puget Sound Plant
Anacortes, Washington

PLATE **3**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,116.011	SES	G/ts	13 November 90		

Equipment: B-61

Land Surface Elevation: 95 feet

Date: 10/22/90

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	24.5	96	10
MD	22.9	95	6
			31
MD	19.3	96	22
			23
			29
MD	12.4	137	50/6"
			48

Depth (feet): 0, 5, 10, 15, 20, 25, 30, 35, 40

BROWN CLAYEY SILT (ML) medium stiff to stiff, moist to wet; trace sand, some organics (Fill).

5'

GRAY TO DARK BROWN SANDY SILT (ML) stiff, moist; some gravel, large wood debris (Fill).

Becomes medium stiff.

With pockets of sand and wood debris at 23 feet.

BLUE GRAY SANDY SILT (ML) hard, moist; trace gravel.

GRAY SILTY SAND (SM) very dense, moist; very fine grained, trace gravel

GRAY SAND (SP) dense, saturate; fine to medium grained.

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Log of Boring 2 (0-40')

Anvil/Propane Tanks-Texaco Puget Sound Plant
Anacortes, Washington

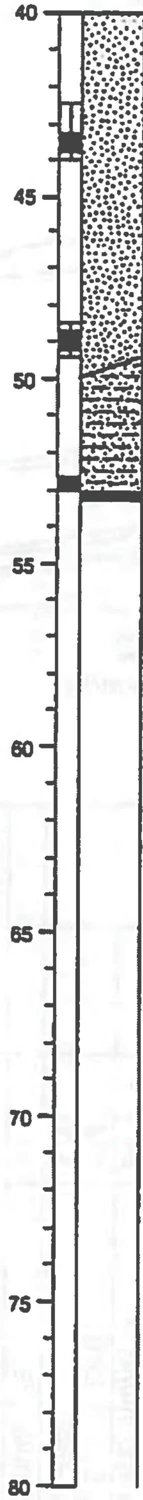
PLATE 4

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,116.011	SES	GHS	13 November 90		

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot	Depth (feet)	Sample
			80		
			50/6"		
			50/4"		

Equipment B-61

Land Surface Elevation 95 feet Date 10/22/90



Becomes very dense, very fine to fine grained; with trace to some silt and occasional gravel.

GRAY SILTY SAND (SM) very dense, moist; fine grained, trace gravel.

Groundwater encountered at 36 feet during drilling.

Hole filled with bentonite concrete grout during auger withdrawal: concrete patch at surface.

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Geology & Hydrogeology

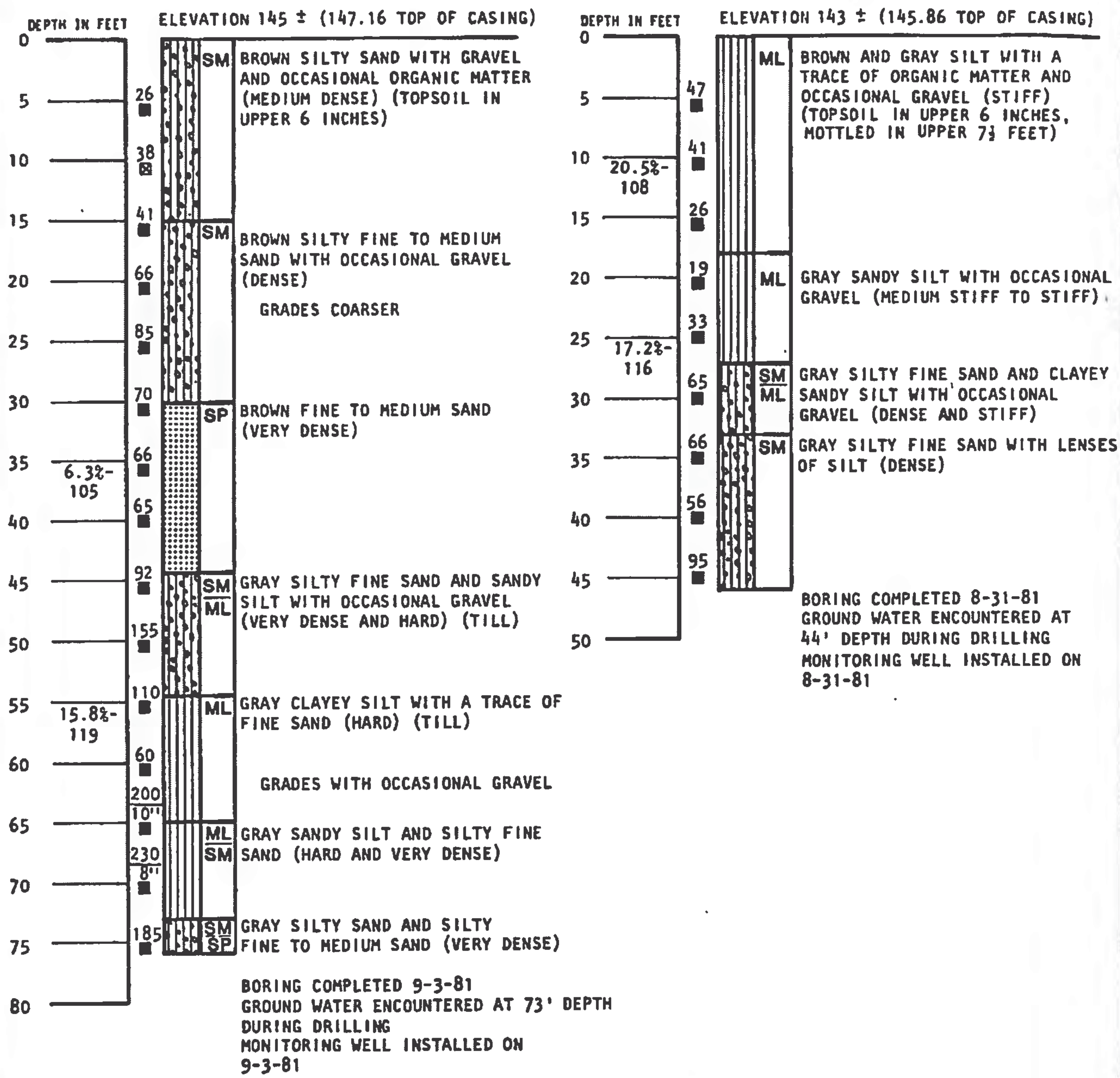
Log of Boring 2 (40-53')

Anvil/Propane Tanks-Texaco Puget Sound Plant
Anacortes, Washington

PLATE **5**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,116.011	SES	GHS	13 November 90		

Boring W-1 / Boring W-2



Key:

MOISTURE CONTENT 6.3%-105 DRY DENSITY IN PCF

65 BLOWS REQUIRED TO DRIVE DAMES & MOORE SAMPLER ONE FOOT WITH A HAMMER WEIGHT OF 350 LBS. AND A STROKE OF 24 INCHES.

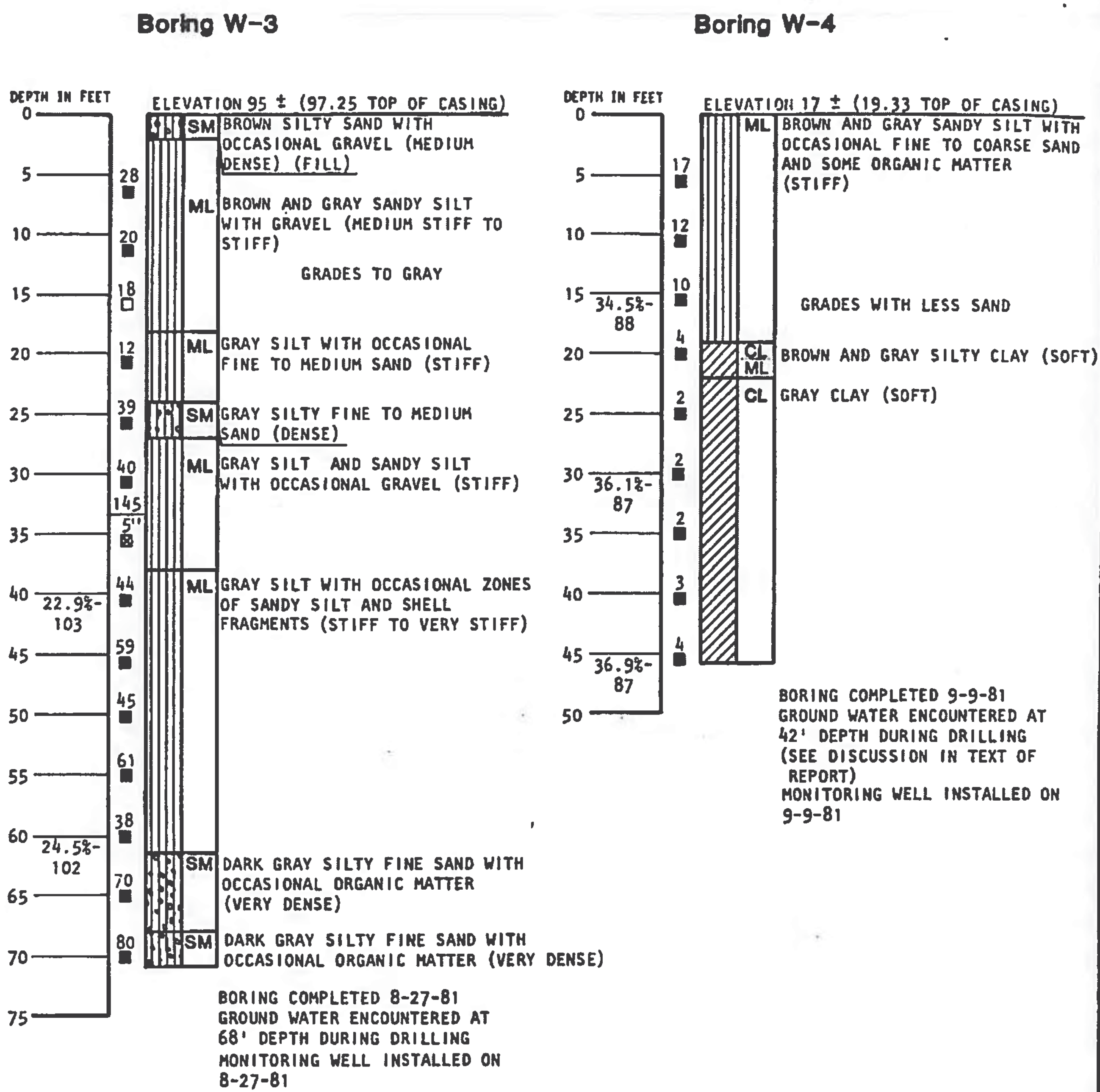
■ INDICATES DEPTH AT WHICH UNDISTURBED DAMES & MOORE SAMPLE WAS EXTRACTED.

⊠ INDICATES DEPTH AT WHICH DISTURBED DAMES & MOORE SAMPLE WAS EXTRACTED.

Note:

THE DISCUSSION IN THE TEXT OF THIS REPORT IS NECESSARY FOR A PROPER UNDERSTANDING OF THE NATURE OF THE SUBSURFACE MATERIALS ENCOUNTERED AND AS-BUILT DETAILS OF THE GROUND WATER MONITORING WELL INSTALLATIONS.

LOG OF BORINGS



LOG OF BORINGS

APPENDIX C

GEOTECHNICAL LABORATORY TESTING

APPENDIX C

GEOTECHNICAL LABORATORY TESTING

C.1.1 Introduction

Selected standard penetration test (SPT) (“disturbed”) samples collected from the borings drilled and test pits excavated at the RP&S Tanks Site and from the previous borings drilled at the Clean Soils Pile (CSP) were tested to determine the basic index properties and the engineering characteristics of the subsurface soils. AECOM performed this testing in the AECOM Geotechnical Laboratory in Seattle, Washington. The results of the tests performed are summarized in Tables C.1 (RP&S Tanks Site) and C.2 (CSP) .

C.1.2 Visual Classification

Each of the soil samples recovered from the explorations was visually reclassified in our laboratory using a system based on the ASTM Designation D 2488 “Standard Recommended Practice for Description of Soils (Visual-Manual Procedure).” These ASTM standards use the Unified Soil Classification System (USCS) described in Figure A.1 of Appendix A. The visual classification made using this system allows for convenient and consistent comparison of soils from widespread geographic areas. The sample classifications have been incorporated into the soil descriptions on the boring and test pit logs presented in Appendix A.

C.1.3 Index Tests

C.1.3.1 Water Content

The natural water content of 23 representative soil samples recovered from the Site field explorations was determined in general accordance with ASTM Designation D 2216, “Standard Method of Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.” In addition, 28 soil samples recovered from the 2014 environmental borings at the Clean Soils Pile were tested in May 2014. Comparison of natural water content of a soil with its index properties can be useful in characterizing soil unit weight, consistency, compressibility, and strength. Water content is included on the exploration logs presented in Appendix A.

C.1.3.2 Grain Size Distribution

Grain size distribution analyses on five samples from the Site and three samples from the Clean Soils Pile were performed in general accordance with ASTM Designations D 422, “Standard Method for Particle-Size Analysis of Soils” and D 1140, “Standard Test Methods for Amount of Material in Soils Finer than the No. 200 (75-µm) Sieve.” The general procedures to determine the grain size distribution of a soil sample include sieve analysis, hydrometer analysis, and combined analysis. For this study, only sieve and No. 200 wash gradation analyses were performed.

Grain size distributions were used to assist in classifying soils and evaluating soil behavior when excavated, and to provide correlation with other soil properties, including permeability, capillary action, and sensitivity to moisture. Results of the grain size analyses are plotted on the Grain Size Distribution figures presented in this appendix. Along with each grain size distribution curve on these figures is a tabulated summary of the sample description, percentages of gravel, percentage of sand, and percentage of silt and clay (fines passing the No. 200 sieve), the Atterberg Limits (if applicable), and other parameters frequently used in geotechnical calculations. The percent fines is also included on the boring logs in Appendix A.

C.1.3.3 Atterberg Limits

Atterberg Limits testing was performed on four samples of cohesive soils from the Site and on two samples from the Clean Soils Pile in general accordance with ASTM Designation D 4318-00, “Standard Test

Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.” Results of the Atterberg Limits testing are plotted on the Atterberg Limits Results figures presented in this appendix.

TABLE C.1
SUMMARY OF SOIL LABORATORY DATA

Sample Information						Sieve/Hydrometer				Atterberg Limits			Laboratory Compaction			
Exploration Number	Depth, feet	Elevation, feet	USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	Gravel, %	Sand, %	<#200, %	<2μ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %	Compaction Test Method	Other Laboratory Tests
RPS-1-17	2.5	176.5	ML	28.2						38	33	5				
RPS-1-17	5	174.0	SC/CL	27.1												
RPS-1-17	7.5	171.5	CL	21.5						37	24	13				
RPS-1-17	35	144.0	CL	17.9												
RPS-1-17	40	139.0	ML-CL	22.2						44	27	17				
RPS-2-17	2.5	175.5	CL	36.3												
RPS-3-17(PZ)	2.5	176.5	ML	32.6												
RPS-3-17(PZ)	7.5	171.5	SP-SM	6.6		0	89	11								
RPS-4-17	2.5	174.5	SM	21.2		9	53	38								
RPS-5-17	2.5	155.5	SM	20.6		9	59	32								
RPS-6-17	2.5	157.5	CL	32.6												
RPS-6-17	5	155.0	CL	20.8												
RPS-6-17	10	150.0	CL	24.3												
RPS-6-17	17.5	142.5	SM	28.0		1	67	31								
RPS-7-17	2.5	150.5	CL	26.3												
RPS-7-17	5	148.0	CL	21.6												
RPS-7-17	7.5	145.5	CL-CH	21.8						50	30	20				
RPS-7-17	15	138.0	CL	16.1												
RPS-8-17	5	138.0	SM	12.0		1	81	17								
TP-1-17	2	173.0	CL	25.7												
TP-2-17	4	162.0	CL	30.6												
TP-3-17	4	148.0	CL	18.5												
TP-4-17	1	148.0	CL	26.5												

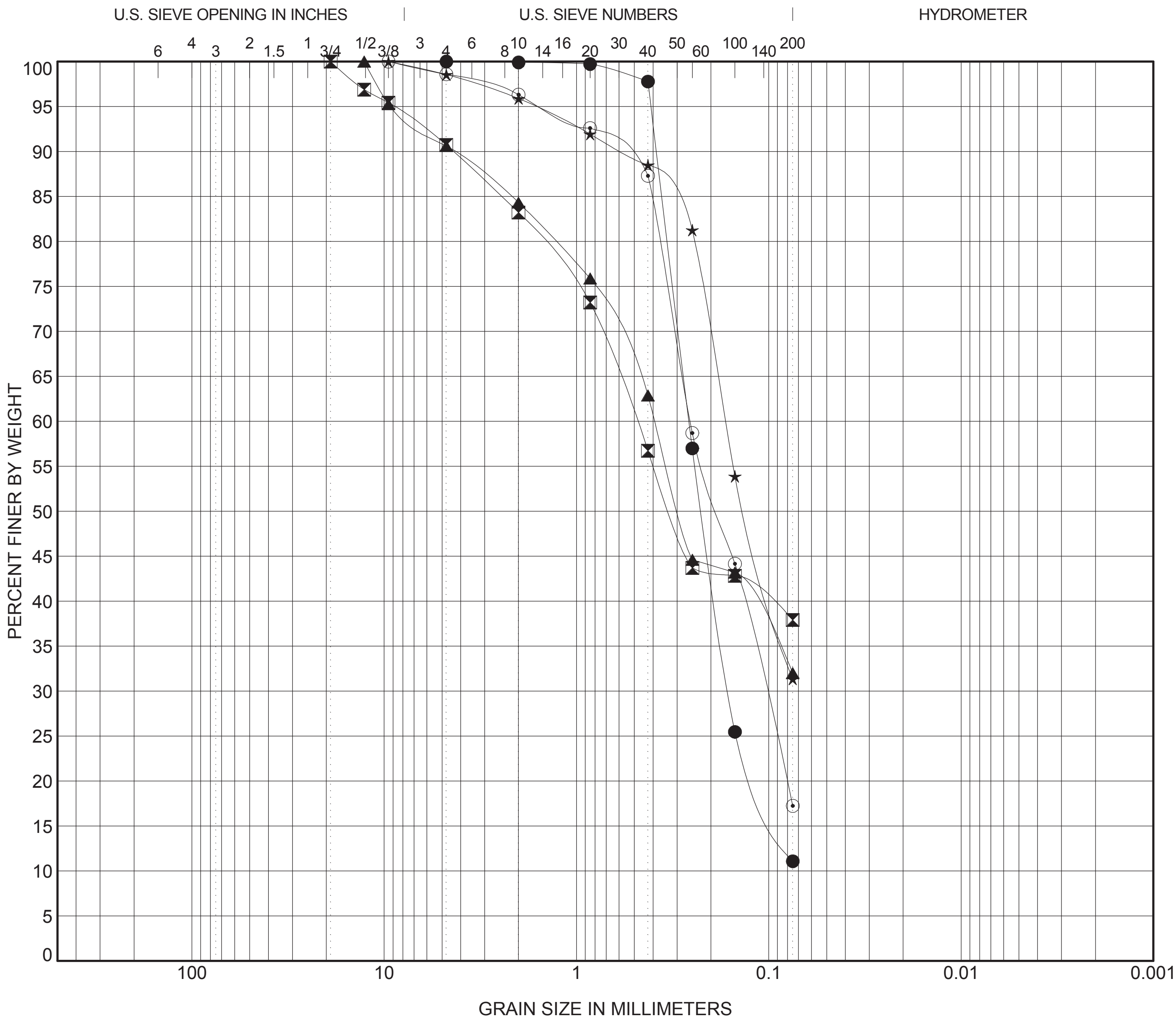
TABLE C.2
SUMMARY OF SOIL LABORATORY DATA

Sample Information			USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	Sieve/Hydrometer				Atterberg Limits			Laboratory Compaction			Other Laboratory Tests
Exploration Number	Depth, feet	Elevation, feet				Gravel, %	Sand, %	<#200, %	<2μ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %	Compaction Test Method	
U-16-13	2.5	117.1	SM			15	42	43								
U-16-13	7.5	112.1	CL-ML							24	17	7				
U-17-13	12.5	113.1	GM-SM			52	34	14								
U-18-13	2.5	117.6	CL							34	22	12				
U-18-13	7.5	112.6	CL					50								
U-22-14	0.5	115.9	CL	9.2												
U-22-14	10	106.4	CL	10.5												
U-22-14	20	96.4	ML	10.4												
U-22-14	30	86.4	CL	19.5												
U-22-14	40	76.4	CL	15.8												
U-23-14	0.5	118.5	CL	12.8												
U-23-14	10	109.0	CL/ML	15.1												
U-23-14	20	99.0	CL/SM	16.6												
U-23-14	30	89.0	CL	16.5												
U-23-14	40	79.0	CL	19.2												
U-24-14	0.5	120.1	CL	13.5												
U-24-14	10	110.6	CL	14.8												
U-24-14	20	100.6	CL	15.0												
U-24-14	30	90.6	CL	18.3												
U-24-14	40	80.6	CL	12.8												
U-25-14	0.5	117.8	CL	17.3												
U-25-14	10	108.3	CL	15.4												
U-25-14	20	98.3	CL	20.2												
U-25-14	30	88.3	CL/SM	16.5												
U-25-14	40	78.3	CL	24.7												
U-26-14	0.5	115.8	SC	5.8												
U-26-14	10	106.3	CL	11.8												
U-26-14	20	96.3	CL	18.6												

TABLE C.2
SUMMARY OF SOIL LABORATORY DATA

Sample Information			USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	Sieve/Hydrometer				Atterberg Limits			Laboratory Compaction			Other Laboratory Tests
Exploration Number	Depth, feet	Elevation, feet				Gravel, %	Sand, %	<#200, %	<2μ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %	Compaction Test Method	
U-26-14	30	86.3	CL	12.6												
U-27-14	0.5	120.4	SC	4.5												
U-27-14	10	110.9	CL	13.0												
U-27-14	20	100.9	CL	16.5												
U-27-14	30	90.9	CL	16.2												

*Notes: 1. Gradation size and Atterberg Limits testing on samples from Borings U-16-13, U-17-13, and U-18-13 were performed in June 2017.
2. Water content of samples from "U-" series borings was tested by Fremont Analytical in May 2014.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	**RPS-3-17(PZ)**	**7.5 ft.**	**Brown Poorly-graded Fine SAND with Silt**				**1.41**	**3.65**
⧗	**RPS-4-17**	**2.5 ft.**	**Dark gray silty SAND**					
▲	**RPS-5-17**	**2.5 ft.**	**Dark Brown Silty Fine to Coarse SAND, SM**					
★	**RPS-6-17**	**17.5 ft.**	**Brown silty SAND**					
⊙	**RPS-8-17**	**5.0 ft.**	**Brown Silty Fine SAND, SM**					

Specimen Identification			D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RPS-3-17(PZ)**	**7.5 ft.**	**4.75**	**0.223**	**0.161**		**0.0**	**88.9**	**11.1**	
⧗	**RPS-4-17**	**2.5 ft.**	**19**	**0.323**			**9.3**	**52.8**	**37.9**	
▲	**RPS-5-17**	**2.5 ft.**	**12.7**	**0.292**			**9.4**	**58.6**	**32.0**	
★	**RPS-6-17**	**17.5 ft.**	**9.51**	**0.133**			**1.4**	**67.2**	**31.4**	
⊙	**RPS-8-17**	**5.0 ft.**	**9.5**	**0.184**	**0.104**		**1.4**	**81.3**	**17.2**	

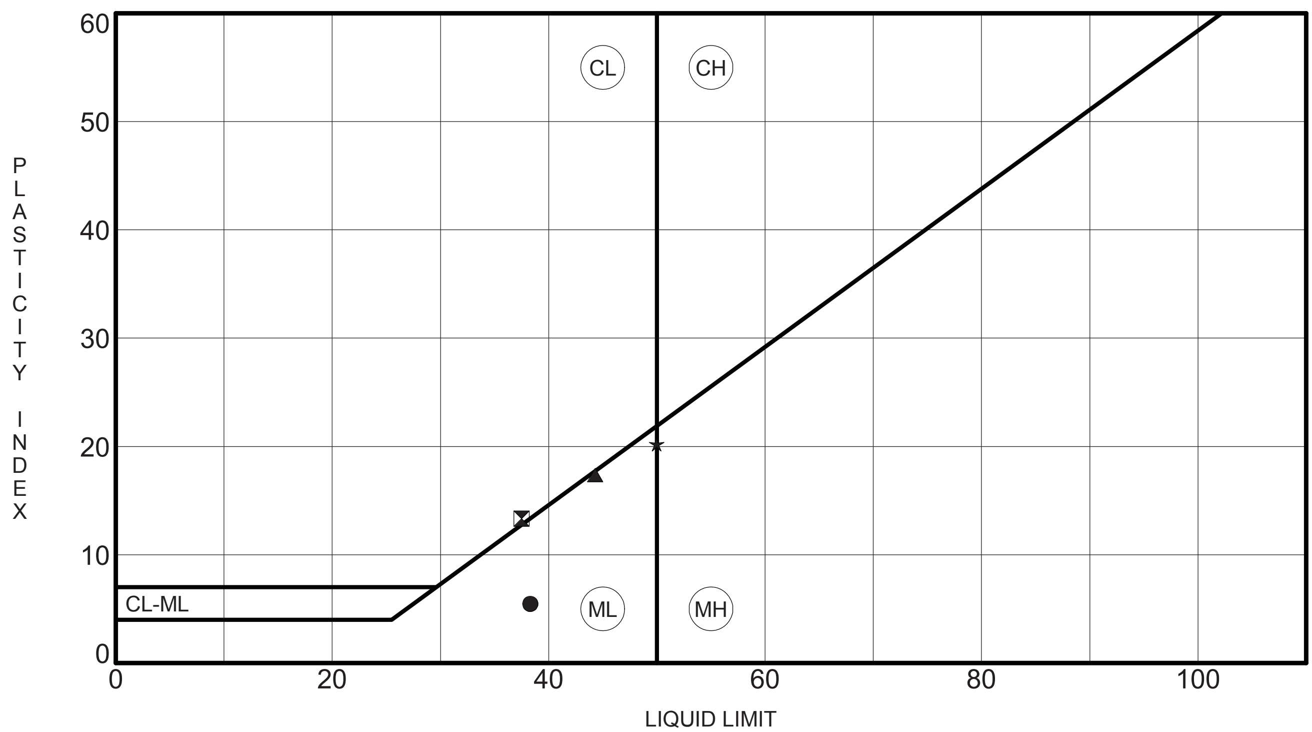
GRAIN SIZE DISTRIBUTION

Project: RP&S New Crude Tank and Product Tanks Projects
Project Location: Shell Puget Sound Refinery, Anacortes, WA
Project Number: 60544813

Figure C.1

AECOM

US_GRAIN_SIZE J:\DCS\PROJECTS\WTR\60544813_SHELL_RP&S_TANKS\400-TECHNICAL\440-FIELD AND LAB DATA\442-GINT_BORING LOGS\60544813 SHELL RPS CRUDE TANK.GPJ URSSEA3R.GLB URSSEA3.GDT 7/27/17



	Specimen Identification		LL	PL	PI	Moisture	Classification
●	**RPS-1-17**	**2.5 ft**	**38**	**33**	**5**	**28.2**	**Brown SILT**
⧗	**RPS-1-17**	**7.5 ft**	**37**	**24**	**13**	**21.5**	**Brown Lean CLAY**
▲	**RPS-1-17**	**40.0 ft**	**44**	**27**	**17**	**22.2**	**Gray SILT to Lean CLAY**
★	**RPS-7-17**	**7.5 ft**	**50**	**30**	**20**	**21.8**	**Brown Lean CLAY to Fat CLAY**

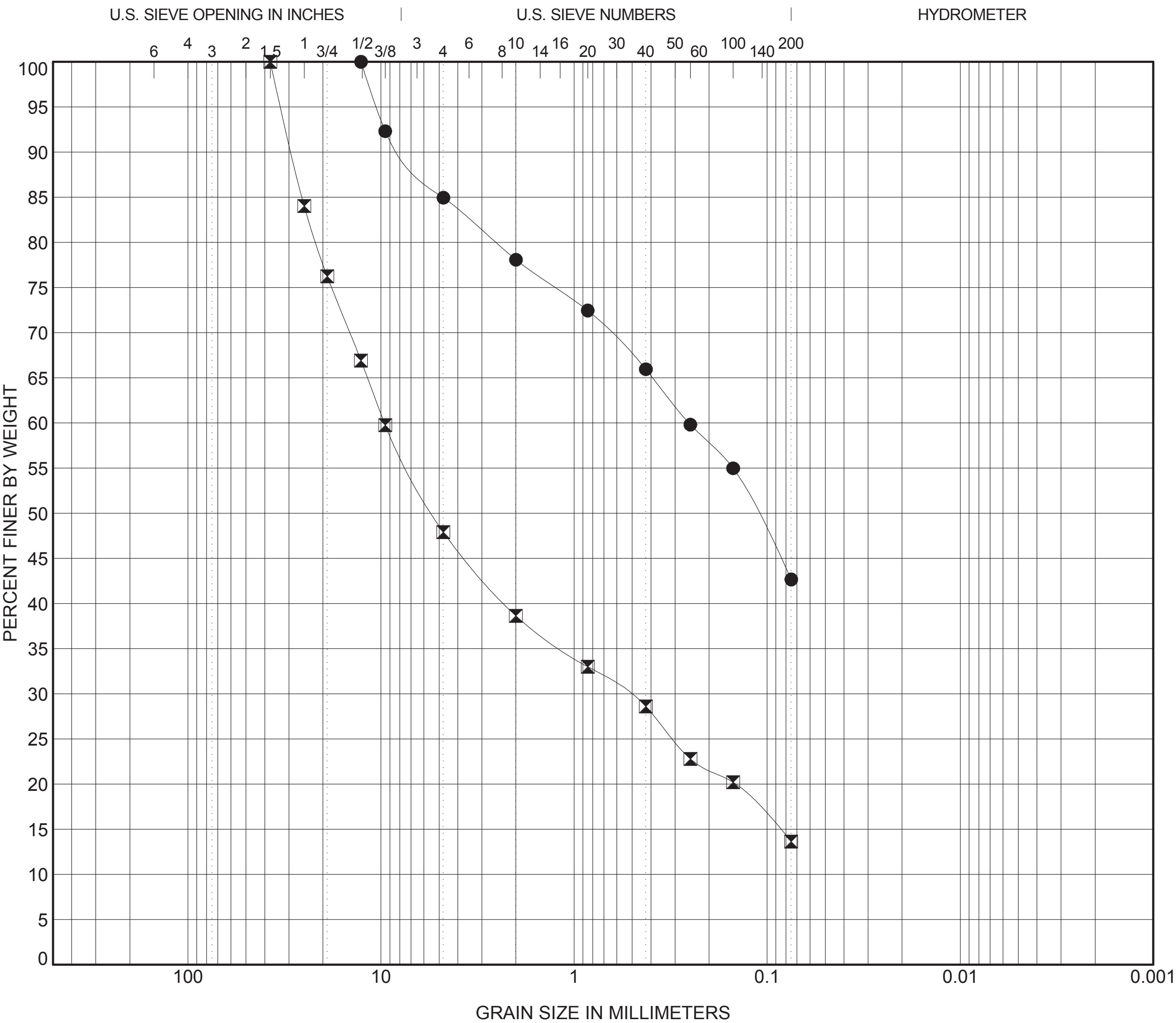
ATTERBERG LIMITS RESULTS

Project: RP&S New Crude Tank and Product Tanks Projects
Project Location: Shell Puget Sound Refinery, Anacortes, WA
Project Number: 60544813

AECOM

Figure C.2

US_ATTERBERG_LIMITS J:\DCS\PROJECTS\WTR\60544813_SHELL_RP&S_TANKS\400-TECHNICAL\440-FIELD AND LAB DATA\442-GINT_BORING LOGS\60544813 SHELL RPS CRUDE TANK.GPJ URSSEA3B.GLB URSSEA3.GDT 7/27/17



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	U-16-13	2.5 ft.	**Brown Silty Sand with Gravel**					
⧗	U-17-13	12.5 ft.	**Dark gray silty GRAVEL with sand**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	U-16-13	2.5 ft.	12.7	0.254			15.1	42.3	42.7	
⧗	U-17-13	12.5 ft.	37.5	9.602	0.53		52.1	34.3	13.6	

GRAIN SIZE DISTRIBUTION

Project: Crude Rail Unloading Facility East, Shell PSR

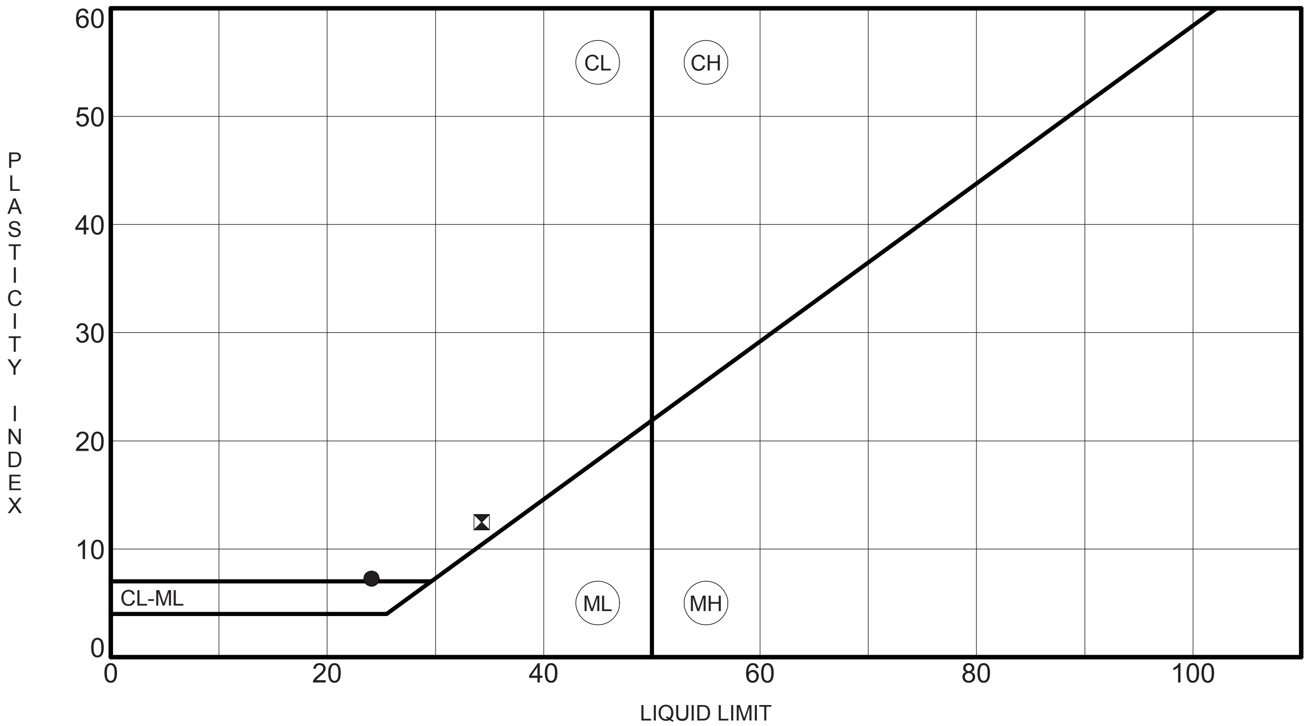
Project Location: Anacortes, WA

Project Number: 33764104

Figure C.3

AECOM

US_GRAIN_SIZE J:\DCS\PROJECTS\LEGACY_URS\SHELL\SHELL ANACORTES\CRUDE UNLOAD EAST, PHASE 2\11 BORING LOGS_PLAN\GINT 33764104.GPJ URSSFEA3B.GLB URSSFEA3.GDT 6/26/17



	Specimen Identification		LL	PL	PI	Moisture	Classification
●	**U-16-13**	**7.5 ft**	**24**	**17**	**7**		**Dark brown Lean CLAY - SILT**
⧗	**U-18-13**	**3.5 ft**	**34**	**22**	**12**		**Brown Lean CLAY**

ATTERBERG LIMITS RESULTS

Project: Crude Rail Unloading Facility East, Shell PSR
Project Location: Anacortes, WA
Project Number: 33764104

Figure C.4

AECOM

APPENDIX D

CORROSIVITY TESTING RESULTS

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

AECOM
Markus Walbaum
1111 3rd Avenue Suite 1600
Seattle, WA 98101

RE: Shell Tank
Work Order Number: 1706116

June 16, 2017

Attention Markus Walbaum:

Fremont Analytical, Inc. received 2 sample(s) on 6/9/2017 for the analyses presented in the following report.

Conductivity by SM 2510B
Ion Chromatography by EPA Method 300.0
pH by EPA Method 9045
Sample Moisture (Percent Moisture)

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Mike Ridgeway
Laboratory Director

DoD/ELAP Certification #L2371, ISO/IEC 17025:2005
ORELAP Certification: WA 100009-007 (NELAP Recognized)

CLIENT:	AECOM
Project:	Shell Tank
Work Order:	1706116

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1706116-001	RPS-2-6	06/07/2017 8:40 AM	06/09/2017 2:27 PM
1706116-002	TP-4-2	06/09/2017 8:00 AM	06/09/2017 2:27 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Case Narrative

WO#: **1706116**

Date: **6/16/2017**

CLIENT: AECOM

Project: Shell Tank

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Fremont Analytical

Analytical Report

Work Order: **1706116**
Date Reported: **6/16/2017**

Client: AECOM
Project: Shell Tank
Lab ID: 1706116-001
Client Sample ID: **RPS-2-6**

Collection Date: 6/7/2017 8:40:00 AM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 17359		Analyst: KT
Chloride	51.9	2.46	D	mg/Kg-dry	2	6/14/2017 8:48:00 AM
Sulfate	5.81	3.69		mg/Kg-dry	1	6/14/2017 1:58:00 AM
Sample Moisture (Percent Moisture)				Batch ID: R36796		Analyst: BB
Percent Moisture	20.2	0.500		wt%	1	6/14/2017 8:32:25 AM
Conductivity by SM 2510B				Batch ID: R36851		Analyst: KT
Specific Conductance (Conductivity)	201	1.00		µS/cm	1	6/15/2017 2:45:00 PM
pH by EPA Method 9045				Batch ID: R36852		Analyst: KT
Hydrogen Ion (pH)	6.30			pH	1	6/15/2017 2:45:00 PM

Analytical Report

Work Order: **1706116**
Date Reported: **6/16/2017**

Client: AECOM
Project: Shell Tank
Lab ID: 1706116-002
Client Sample ID: **TP-4-2**

Collection Date: 6/9/2017 8:00:00 AM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 17359		Analyst: KT
Chloride	6.90	1.19		mg/Kg-dry	1	6/14/2017 2:19:00 AM
Sulfate	77.2	3.58		mg/Kg-dry	1	6/14/2017 2:19:00 AM
Sample Moisture (Percent Moisture)				Batch ID: R36811		Analyst: BB
Percent Moisture	18.2	0.500		wt%	1	6/14/2017 1:21:18 PM
Conductivity by SM 2510B				Batch ID: R36851		Analyst: KT
Specific Conductance (Conductivity)	275	1.00		µS/cm	1	6/15/2017 2:45:00 PM
pH by EPA Method 9045				Batch ID: R36852		Analyst: KT
Hydrogen Ion (pH)	7.45			pH	1	6/15/2017 2:45:00 PM

Fremont Analytical

Date: *6/16/2017*

Work Order: 1706116
CLIENT: AECOM
Project: Shell Tank

QC SUMMARY REPORT

Conductivity by SM 2510B

Sample ID: **MB-R36851** SampType: **MBLK** Units: **µS/cm** Prep Date: **6/15/2017** RunNo: **36851**
Client ID: **MBLKS** Batch ID: **R36851** Analysis Date: **6/15/2017** SeqNo: **707570**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance (Conductivity)	ND	1.00									

Sample ID: **LCS-R36851** SampType: **LCS** Units: **µS/cm** Prep Date: **6/15/2017** RunNo: **36851**
Client ID: **LCSS** Batch ID: **R36851** Analysis Date: **6/15/2017** SeqNo: **707571**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance (Conductivity)	942	1.00	1,000	0	94.2	85	135				

Sample ID: **1706116-001ADUP** SampType: **DUP** Units: **µS/cm** Prep Date: **6/15/2017** RunNo: **36851**
Client ID: **RPS-2-6** Batch ID: **R36851** Analysis Date: **6/15/2017** SeqNo: **707573**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance (Conductivity)	212	1.00						201.0	5.33	30	

Date: *6/16/2017*

Work Order: 1706116
CLIENT: AECOM
Project: Shell Tank

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **MB-17359** SampType: **MBLK** Units: **mg/Kg** Prep Date: **6/13/2017** RunNo: **36816**
Client ID: **MBLKS** Batch ID: **17359** Analysis Date: **6/13/2017** SeqNo: **706882**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	1.00									
Sulfate	ND	3.00									

Sample ID: **LCS-17359** SampType: **LCS** Units: **mg/Kg** Prep Date: **6/13/2017** RunNo: **36816**
Client ID: **LCSS** Batch ID: **17359** Analysis Date: **6/13/2017** SeqNo: **706883**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	7.66	1.00	7.500	0	102	90	110				
Sulfate	38.6	3.00	37.50	0	103	90	110				

Sample ID: **1706091-001ADUP** SampType: **DUP** Units: **mg/Kg-dry** Prep Date: **6/13/2017** RunNo: **36816**
Client ID: **BATCH** Batch ID: **17359** Analysis Date: **6/13/2017** SeqNo: **706885**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	777	23.0						879.7	12.4	30	DE
Sulfate	4,770	69.0						6,493	30.7	30	DER

NOTES:
R - High RPD due to high sulfate concentration. In this range, high RPD's may be expected.
E - Estimated value. The amount exceeds the linear working range of the instrument.
Diluted due to matrix.

Sample ID: **1706091-001AMS** SampType: **MS** Units: **mg/Kg-dry** Prep Date: **6/13/2017** RunNo: **36816**
Client ID: **BATCH** Batch ID: **17359** Analysis Date: **6/13/2017** SeqNo: **706954**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	769	23.0	17.27	879.7	-639	80	120				DS
Sulfate	5,630	69.1	86.35	6,493	-1,000	80	120				DS

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Fremont Analytical

Date: *6/16/2017*

Work Order: 1706116
CLIENT: AECOM
Project: Shell Tank

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **1706091-001AMSD** SampType: **MSD** Units: **mg/Kg-dry** Prep Date: **6/13/2017** RunNo: **36816**

Client ID: **BATCH** Batch ID: **17359** Analysis Date: **6/13/2017** SeqNo: **706955**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	784	22.9	17.20	879.7	-555	80	120	769.3	1.93	30	DS
Sulfate	5,320	68.8	86.02	6,493	-1,360	80	120	5,629	5.57	30	DS

NOTES:

S - Analyte concentration was too high for accurate spike recovery(ies).

Fremont Analytical

Date: *6/16/2017*

Work Order: 1706116
CLIENT: AECOM
Project: Shell Tank

QC SUMMARY REPORT

pH by EPA Method 9045

Sample ID: **MB-R36852** SampType: **MBLK** Units: **pH** Prep Date: **6/15/2017** RunNo: **36852**
Client ID: **MBLKS** Batch ID: **R36852** Analysis Date: **6/15/2017** SeqNo: **707575**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hydrogen Ion (pH)	6.86										

Sample ID: **LCS-R36852** SampType: **LCS** Units: **pH** Prep Date: **6/15/2017** RunNo: **36852**
Client ID: **LCSS** Batch ID: **R36852** Analysis Date: **6/15/2017** SeqNo: **707576**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hydrogen Ion (pH)	7.04		7.000	0	101	95	105				

Sample ID: **1706116-001ADUP** SampType: **DUP** Units: **pH** Prep Date: **6/15/2017** RunNo: **36852**
Client ID: **RPS-2-6** Batch ID: **R36852** Analysis Date: **6/15/2017** SeqNo: **707578**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hydrogen Ion (pH)	6.28							6.300	0.318	10	

Date: *6/16/2017*

Work Order: 1706116
CLIENT: AECOM
Project: Shell Tank

QC SUMMARY REPORT

Sample Moisture (Percent Moisture)

Sample ID: **1706122-002ADUP** SampType: **DUP** Units: **wt%** Prep Date: **6/14/2017** RunNo: **36811**
Client ID: **BATCH** Batch ID: **R36811** Analysis Date: **6/14/2017** SeqNo: **706793**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Percent Moisture	21.1	0.500						20.02	5.13	20	

Sample ID: **1706122-022ADUP** SampType: **DUP** Units: **wt%** Prep Date: **6/14/2017** RunNo: **36811**
Client ID: **BATCH** Batch ID: **R36811** Analysis Date: **6/14/2017** SeqNo: **706814**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Percent Moisture	33.5	0.500						35.50	5.80	20	

Date: *6/16/2017*

Work Order: 1706116
CLIENT: AECOM
Project: Shell Tank

QC SUMMARY REPORT
Sample Moisture (Percent Moisture)

Sample ID: **1706150-013ADUP** SampType: **DUP** Units: **wt%** Prep Date: **6/14/2017** RunNo: **36796**
Client ID: **BATCH** Batch ID: **R36796** Analysis Date: **6/14/2017** SeqNo: **706499**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Percent Moisture	8.35	0.500						9.225	9.97	20	

Sample ID: **1706120-006ADUP** SampType: **DUP** Units: **wt%** Prep Date: **6/14/2017** RunNo: **36796**
Client ID: **BATCH** Batch ID: **R36796** Analysis Date: **6/14/2017** SeqNo: **706508**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Percent Moisture	14.6	0.500						14.19	2.74	20	

Sample Log-In Check List

Client Name:	**URS**	Work Order Number:	**1706116**
Logged by:	**Erica Silva**	Date Received:	**6/9/2017 2:27:00 PM**

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Required ☑
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
7.	Were all items received at a temperature of >0°C to 10.0°C*	Yes ☑	No ☐	NA ☐
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

18.	Was client notified of all discrepancies with this order?	Yes ☑	No ☐	NA ☐

Person Notified:	Markus Walbaum	Date:	6/9/2017
By Whom:	Erica Silva	Via:	☑ eMail ☑ Phone ☐ Fax ☐ In Person
Regarding:	Analytical request / Sulfate clarification on 6/13/17		
Client Instructions:	See edits on COC / EPA 300.0		

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler	3.3
Sample	7.9
Temp Blank	3.2

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Original

Fremont Analytical

3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790
Fax: 206-352-7178

Chain of Custody Record & Laboratory Services Agreement

Date: 6/9/'17 Page: 1 of: 1

Laboratory Project No (internal): 1706116

Special Remarks: edits per M. Walbaum 6/9/17 ZS

Client: AECOM

Address: 1111 3rd Ave Ste 1600

City, State, Zip: Seattle, WA, 98101

Telephone: 206-390-0074

Fax:

Project Name: Shell Tank

Project No: 60544813

Collected by: K. Yang

Location: Shell Anacortes, WA

Report To (PM): Markus Walbaum

PM Email: markus.walbaum@aecom.com

Sample Disposal: ☐ Return to client ☒ Disposal by lab (after 30 days)

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	VOCs (EPA 8260 / 624)	GX/BTEX	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8)	Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)	% moisture	pH	Specific Conductance		Comments
1	RPS-2-6	6/7/17	0840	S												X		X	X	X		Soil
2	TP-4_2	6/9/17	0800	S												X		X	X	X		Soil
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:

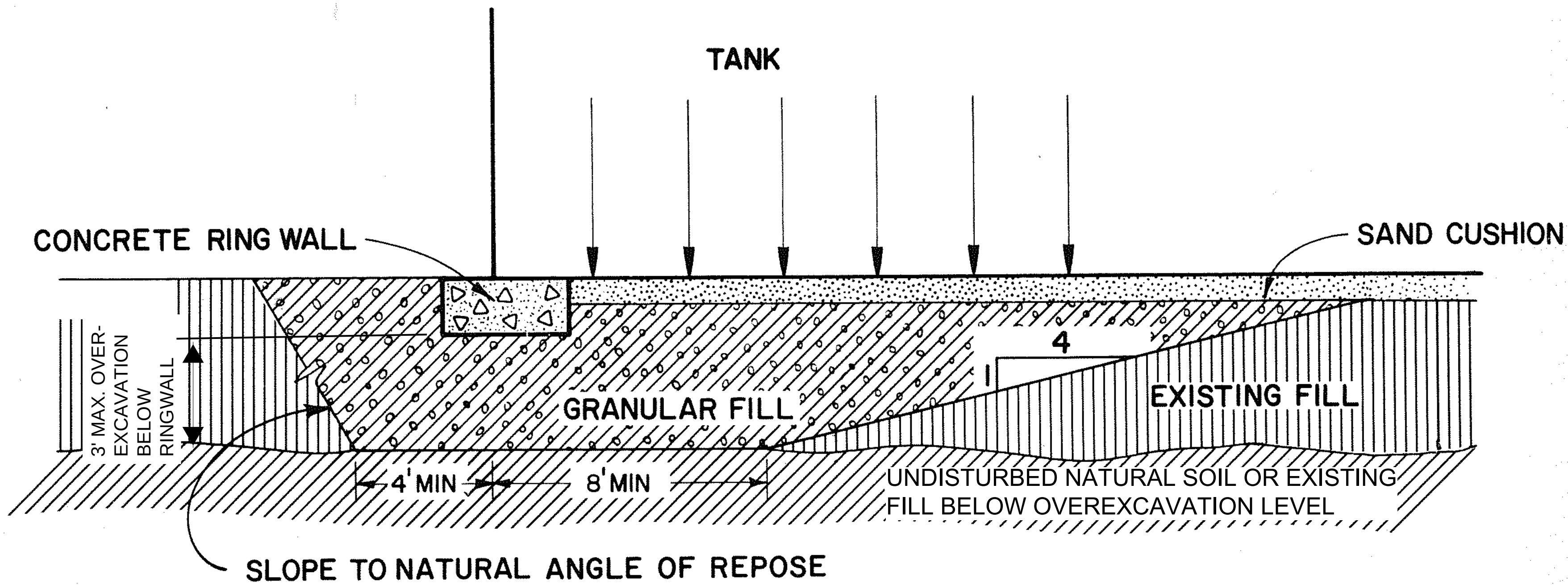
☒ Standard
☐ 3 Day
☐ 2 Day
☐ Next Day
Same Day ______ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above and that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished	Date/Time	Received	Date/Time
x Ken Yang	6/9/'17 14:27	x [signature]	6/9/2017 1427
x		x	

APPENDIX E

RINGWALL DETAIL



SCHEMATIC OF FILL REPLACEMENT

PROPOSED STORAGE TANK

NOT TO SCALE

Figure E.1

* * * END OF REPORT * * *

APPENDIX C

Hydrogeologic Report

Final Report

HYDROGEOLOGIC INVESTIGATION
TEXACO PUGET SOUND PLANT

Prepared for

Texaco Refining and Marketing Inc.
P.O. Box 622
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Prepared by

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June 17, 1988

LANDAU ASSOCIATES, INC.
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June 17, 1988

Texaco Refining and Marketing, Inc.
P.O. Box 622
Anacortes, Washington 98221

Attention: Mr. Ken Brown

RE: HYDROGEOLOGIC INVESTIGATION REPORT

The final report of the hydrogeologic investigation conducted at the Texaco Plant site is attached. The report addresses all the requirements of the State of Washington Department of Ecology Order No. DE 87-292 (dated 30 September 1987). Most significantly, the report presents the hydrogeologic characterization for the land treatment facilities and identifies the ground water monitoring systems for both the east and west land treatment facilities.

We appreciate the opportunity to assist you on this project. Please contact me if you have any questions.

Very truly yours,

LANDAU ASSOCIATES, INC.

By:

Henry G. Landau

Henry G. Landau, Ph.D., P.E.

HGL/BFB:ss
No. 27-06.01
attachment

LANDAU ASSOCIATES, INC.
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August 23, 1988

Texaco Refining & Marketing, Inc.
P.O. Box 622
Anacortes, WA 98221

Attention: Mr. Ken Brown

RE: ADDENDUM TO THE HYDROGEOLOGIC INVESTIGATION
REPORT (JUNE 17, 1988)

Gentlemen:

Hydrogeologic data, requested by Department of Ecology personnel during their July 21, 1988 site visit, are included in the attached addendum to the investigation report. Replacement pages for corrections to the report are also included.

Please contact me if you have any questions.

Respectfully submitted,

LANDAU ASSOCIATES, INC.

By: Brian F. Butler

Brian F. Butler

BFB/sg
No. 27-Ø6.Ø1
attachments

The addendum to the Hydrogeologic Investigation Report revises existing sections to include data sheets requested by agency personnel. The pages listed below replace existing pages.

- Appendix C (complete Appendix) — Pages C-1 to C-7
Tables C-1 and C-2
Figure C-1
Data Sheets (47 pages)
- Appendix D — Page D-2
Data Sheets (2 pages)

The following text pages, tables, and figures are provided as corrected replacement pages for the Hydrogeologic Investigation Report. Please remove existing pages and insert the corresponding replacement pages.

Page 3-14
Page 3-26

Table 3-3
Table 3-4
Table 3-5
Table 3-6
Table A-1

Figure A-7
Figure A-14

All reference to Freeze and Cherry, 1978, should read Freeze and Cherry, 1979.

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This report presents the results of the hydrogeologic investigation conducted from January through April 1988 at the Texaco Refining & Marketing, Inc.'s (Texaco) Puget Sound Plant. Interpretations and conclusions presented in this report were developed from data collected during the 1988 hydrogeologic investigation and previously reported hydrogeologic data.

The primary objectives of this report are to:

- Address specific concerns identified by the State of Washington Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) within the timeframe allowed by Ecology Order No. DE 87-292,
- Provide additional characterization of hydrogeologic conditions in the vicinity of the East and West Land Treatment Facilities (ELTF and WLTF), and
- Identify the ground water monitoring networks for the ELTF and WLTF.

Field activities conducted during the hydrogeologic investigation included:

- Installation of 6 monitoring wells (Wells W-41 through W-46) and 15 piezometers (P-1Ø through P-16),
- Drilling of 5 soil borings (no wells or piezometers installed),
- Geotechnical and chemical analyses of soil samples collected during drilling,
- A pumping test at Well W-1 monitored by seven observation wells,

- Two intersecting backhoe trench explorations in the vicinity of the west side seeps,
- An electrical resistivity survey in the vicinity of the WLTF, and
- Permeability tests of all new wells and piezometers to estimate hydraulic conductivities.

Specific technical issues associated with the ground water monitoring system were identified in the Order. The activities used to investigate these issues and the results are presented in this report.

The investigation has focused on characterization of hydrogeology in the vicinity of each LTF, including analyses of zones that are relatively permeable and transmit water (water-bearing zones) and zones that impede the flow of water (aquitards). Models of the hydrogeology were developed to estimate ground water flow rates, flow paths, and times of travel to downgradient receptors.

Three hydrologic zones have been identified beneath the ELTF. Zones E-1 and E-3 are water-bearing zones separated by an aquitard, Zone E-2. Geotechnical analyses and piezometric head data indicate that saturated conditions are present in all zones and that a vertical (downward) gradient is present from Zone E-1 to Zone E-3. Times of travel estimated along flow lines derived from a flow net prepared for the ELTF, indicate that water percolating through the ELTF will reach downgradient wells approximately 15 times faster in the shallow zone (E-1) than in the deeper zone (E-3). Times of travel indicate that the shallow water-bearing zone (E-1) is preferred for detection monitoring. Contours of ground water elevations in hydrologic Zone E-1 indicate that ground water flow is easterly.

The ELTF ground water monitoring system will consist of wells in the upper water-bearing zone (Zone E-1). Wells W-21, W-22, W-23, and W-42 will provide downgradient water quality data. Wells W-2 and W-41 will provide background water quality data.

Five hydrogeologic zones were identified in the vicinity of the WLTF. Zone W-1 is comprised of permeable material although it is generally unsaturated. Zones W-2 and W-4 are aquitards. Zones W-3 and W-5 are water-bearing zones. Saturated conditions exist from near the base of Zone W-3 through Zone W-5. Unsaturated conditions are present in the upper portion of Zone W-3. Piezometric head data indicate that an upward gradient may be present from (confined) Zone W-5 to W-3. A flow path diagram was prepared for the WLTF from field and laboratory hydraulic conductivity and piezometric head data to show possible ground water seepage routes from the ground surface to the monitoring wells. Times of travel estimated in Zones W-3 and W-5, along routes identified in the flow path diagram, indicate that water percolating through the WLTF will reach monitoring wells approximately five times sooner in Zone W-3 than in Zone W-5. Times of travel estimated along flow paths suggest that Zone W-3 is the preferred zone for detection monitoring. Within Zone W-3, contours of the upper surface of the Zone W-4 aquitard indicate preferential seepage channels. Ground water contours in Zone W-3 indicate that ground water flow is to the west-southwest.

The WLTF ground water monitoring system will consist of wells in the uppermost water-bearing zone. Wells W-24, W-43, W-44, W-45, and W-46 (all in Zone W-3) will provide downgradient water quality data. Since Zone W-3 (and geologic Unit C) was not detected east of the WLTF, background Wells W-2 and W-31 are located in Zone W-5, the uppermost water-bearing zone to the east of the WLTF.

This investigation report responds to the general and specific issues addressed in the Order. The extensive field and laboratory studies conducted during this investigation provide data necessary to complete hydrogeologic characterization of the site, and allow the final ground water monitoring networks to be identified.

SECTION 1

1.0 INTRODUCTION

This report presents the results of the hydrogeologic investigation conducted from January through April 1988 at Texaco Refining & Marketing Inc.'s (Texaco) Puget Sound Plant, near Anacortes, Washington (Figures 1-1 and 1-2). Interpretations and conclusions in this report were developed from data collected during the 1988 hydrogeologic investigation and the substantial volume of information from previous investigations.

1.1 BACKGROUND AND PURPOSE OF STUDY

The State of Washington Department of Ecology (Ecology) Order No. DE 87-292 (the Order) required that a hydrogeologic investigation be conducted to address deficiencies in the site hydrogeologic characterization and monitoring well network. Specific tasks to accomplish the general requirements of the Order were identified during meetings between Texaco, Ecology, and the U.S. Environmental Protection Agency (EPA representatives) on 15 October 1987, 14 January 1988, and 22 February 1988.

During the 15 October 1987 meeting, it was agreed that the intent of Order No. DE 87-292 was to provide specific additional hydrogeologic data needed to supplement the substantial volume of information from previous investigations in order to complete hydrogeologic characterization at the site. This determination provided the basis for the development of the Hydrogeologic Investigation Plan (Landau Associates, Inc. 1987) and subsequent plan revisions in response to agency meetings and written comments.

Ecology's technical comments, which were included in the Order, identified both general concerns such as site characterization, and specific deficiencies with respect to the ground water monitoring system. The deficiencies identified in the technical comments include "inappropriate screening intervals (W-15, W-17), unknown well construction (W-1, W-2, W-3), potentially broken casing (W-16), wells contaminated with grout sealant (W-11, W-12, W-13, and W-14), and inadequate well spacing."

The Order further specified that this report of investigation results include:

- o Hydrogeologic profiles (cross-sections) that show the subsurface relationship of hydrogeologic units, monitoring well and soil boring locations used to prepare the profiles, monitoring well construction details, water levels, facility features and other appropriate information.
- o Water-table contour maps and potentiometric maps for each monitorable water-bearing zone.
- o Well logs, soil boring logs, and as-built drawings for all monitoring wells.
- o Hydraulic conductivity, transmissivity, storage coefficient, and specific yield test results and methods.
- o Laboratory test results and methods for hydraulic conductivity, (effective) porosity, grain size analysis, organic content, and other appropriate tests.
- o All backup data collected during the hydrogeologic investigation used to support report conclusions.

These requirements are addressed in the report text and appendices.

1.1.1 Investigation Report Scope

The primary goals of this investigation report are to:

- Address the general and specific concerns identified by the State of Washington Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) within the timeframe allowed by Ecology Order No. DE 87-292,
- Provide additional characterization of hydrogeologic conditions in the vicinity of the East and West Land Treatment Facilities (ELTF and WLTF), and
- Identify the ground water monitoring network for the ELTF and WLTF.

The organization of Section 2.0 of this report reflects the specific objectives presented in the Hydrogeologic Investigation Plan (Landau Associates, Inc., 1987) as modified by written comments and meetings with agency personnel. The activities conducted in support of agency requirements are summarized in Section 2.0. Conclusions concerning specific technical issues are reported in Section 4.0, and further described in the appendices to this report.

The data collected during this investigation, combined with data from previous studies, made it possible to complete the hydrogeologic characterization at the site. This characterization is presented in Section 3.0. The elements used in the discussion of hydrogeologic characterization are:

- o A definition of hydrologic zones,
- o Horizontal and vertical hydraulic conductivities of the hydrologic zones,
- o Relative saturation and porosity of each hydrologic zone, and an assessment of the hydraulic interconnection between these zones,
- o Hydraulic head relationships including vertical and horizontal gradients, and seasonal fluctuations in water levels, and
- o Ground water flow rates and directions including the ground water flow paths, seepage velocities and times of travel to downgradient receptors.

The Order specified that a plan for installation (or designation) of a monitoring well network be submitted at the same time as the investigation report. The extensive field and laboratory studies conducted during this investigation not only provide the data necessary to the complete hydrogeologic characterization of the site, but also allow the final ground water monitoring networks to be identified. Section 4.0 identifies the preferred zones for detection monitoring and the wells recommended to comprise the ground water monitoring systems. This identification of monitoring systems addresses Section 4 of the Order. The requirement for additional monitoring wells is not anticipated; therefore, an additional monitoring well installation plan is not needed. Appendices to this report present specific monitoring well installation and method data required by the Order. Section 4.0 presents recommendations on the future use of wells and piezometers not included in the monitoring network.

1.2 SITE DESCRIPTION

1.2.1 Site Location

The Texaco plant is situated on the southern portion of March Point, a peninsula extending into Padilla Bay, approximately 2 miles east of Anacortes, Skagit County, Washington (Figure 1-1). The petroleum refining facilities occupy the central portion of the property. As shown on Figure 1-2, two water reservoirs are located in the north-central portion of the property. Land treatment areas are located east and west of the reservoirs, and are designated as the ELTF and WLTF, respectively. The WLTF is composed of a northern section, which is a hazardous waste management unit, and a southern section, which is used for nonhazardous waste.

1.2.2 Site Topography

The general topography of the March Point peninsula is characterized by a north-south oriented ridge through the central portion of the site, Figures 1-1 and 1-2. The highest point on the Texaco property, approximately 193 feet in elevation (MLLW)[a] is located above the northern property boundary near the northwest corner of the reservoirs (Figure 1-2). From this

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(a) All elevations are referenced to Mean Lower Low Water (The Texaco Plant Datum).

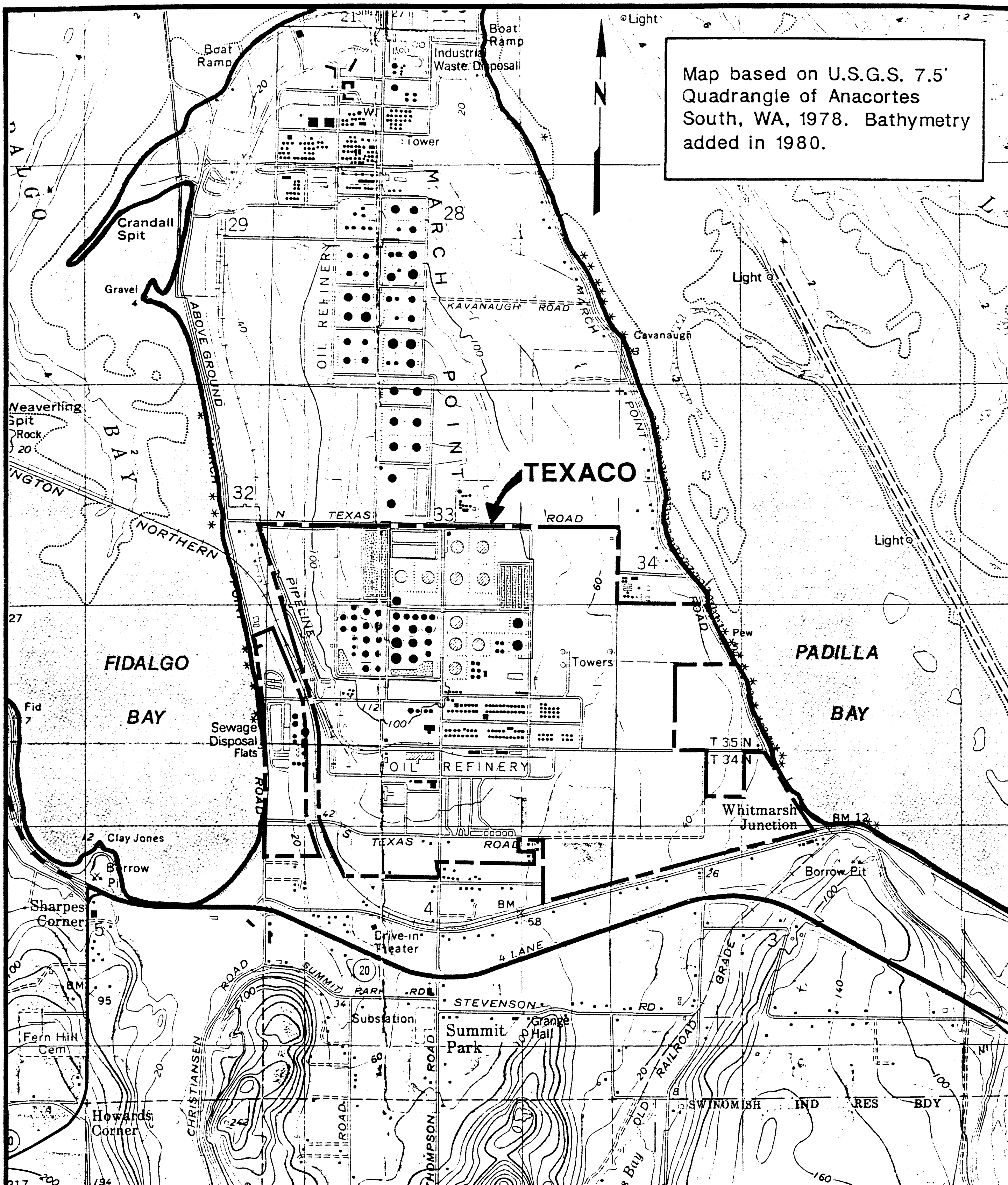
location, the ground surface slopes to the east at a gradient of about 200 feet per mile, and to the west at about 440 feet per mile. The ground surface also slopes south at a gradient of about 100 feet per mile.

The original topography of the site has been modified since site development began in 1957. As a result of site grading, topographical benches have replaced the original smooth slopes and containment berms have been developed around the oil storage tanks and reservoirs. The ELTF and WLTF consist of a series of cut-and-fill benches aligned in a north-south direction.

1.2.3 Climate

The Texaco plant is located at the eastern end of the Strait of Juan de Fuca and west of the Cascade Mountain range. In this area, there is a generally eastward movement of moist air, with the direction of flow modified by Vancouver Island to the northwest and the Olympic Mountains to the southwest. The resulting climate is predominantly a West Coast marine type, with cool summers and mild winters. A distinct dry season occurs from about April through September and is typically followed by a rainy season from October through March. The plant is located about 40 miles northeast of the Olympic Mountains, outside of the area where the Olympic rain shadow has its full effect. The Olympic rain, however, does influence rainfall at the plant.

Climatological data collected at Anacortes, approximately 2.5 miles northwest of the Texaco plant, are representative of climatic conditions at the site. Annual precipitation at the site is approximately 26 inches. More than 70 percent of the annual rainfall typically occurs from October through March. July and August are normally the driest months of the year.



KEY

Property Line

0 2000 4000

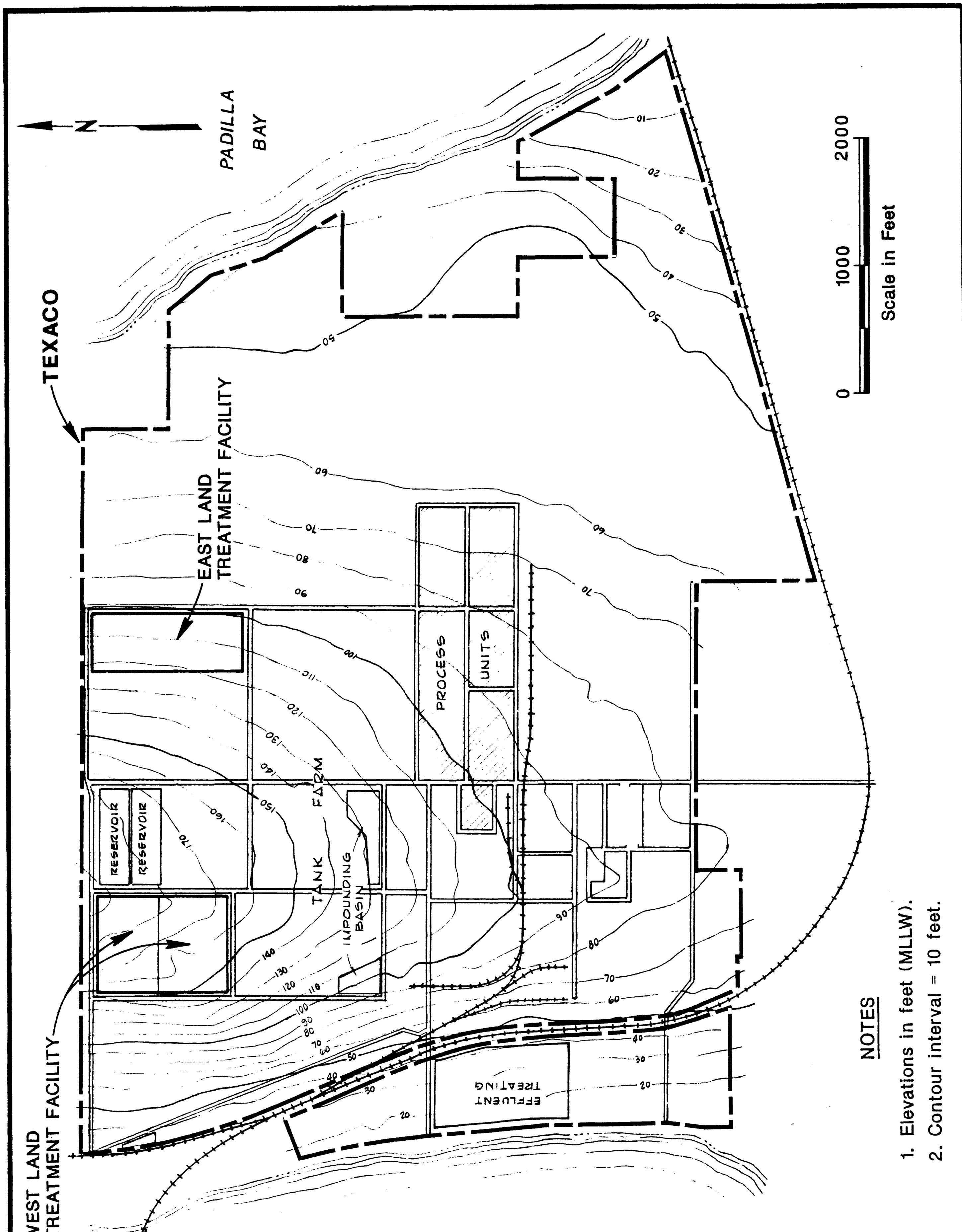
Scale in Feet

NOTES

1. Contour interval = 20 feet.
2. Mean Lower Low Water Datum.

DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Vicinity Map

Figure 1-1



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Site Topographic Map

Figure 1-2

SECTION 2

2.0 SITE INVESTIGATION

2.1 PREVIOUS INVESTIGATIONS

Prior to the 1988 investigation, hydrogeologic investigations were conducted in 1981, 1984, 1985, and 1986. Results of these investigations are presented in the RCRA Part B Applications prepared by Texaco and submitted to Ecology on 1 October 1984, 8 November 1985 (Revision 1), and 15 December 1986 (Revision 2) (Texaco Refining and Marketing, Inc. 1984, 1985, and 1986, respectively). Hydrogeologic data from these documents were reviewed and incorporated as appropriate in preparing the interpretations and conclusions of this report.

2.2 HYDROGEOLOGIC INVESTIGATION SCOPE

The activities to address technical concerns identified in the Order and in meetings between Texaco and Agency representatives are listed below. The organization of this section follows that used in the Hydrogeologic Investigation Plan (Landau Associates, Inc., 1987). Throughout the discussion of the hydrogeologic investigation scope and this report in general, distinct hydrogeologic features will be referred to as "zones" and distinct geologic features, or soils, will be referred to as geologic "units."

Field activities conducted during this investigation included:

- Installation of 6 monitoring wells and 15 piezometers,
- Drilling of 5 soil borings (no instrumentation installed),

- Geotechnical analyses of soil samples collected during drilling (vertical permeability, Atterberg Limits, sieve analyses, moisture/density),
- Chemical analyses of soil samples for total organic carbon,
- A pumping test at Well W-1 monitored by seven observation wells,
- Two intersecting backhoe trench explorations in the vicinity of the west side seeps,
- An electrical resistivity survey in the vicinity of the WLTF, and
- Permeability tests of all new wells and piezometers to estimate hydraulic conductivities.

2.2.1 East Land Treatment Facility (ELTF)

Vertical Hydraulic Gradient:

Previous studies indicate that a steep vertical hydraulic gradient exists beneath the ELTF. Several factors could contribute to this condition including the possible presence of unsaturated zones and preferential seepage paths. The following activities were undertaken to address this issue:

- Two five-piezometer clusters (P-10 and P-12) were installed to provide depth-specific piezometric data (logs and installation diagrams in Appendix A);
- Two deep piezometers (P-11 and P-13) were installed. These piezometers could potentially be designated as monitoring wells if flow path determinations indicated that the lower water-bearing zone should be monitored;

- o Geotechnical analyses were conducted on soil samples from well and soil borings (P-10, P-11, P-12, P-13, and B-11) to provide data including vertical permeability and degree of saturation (Appendix B);
- o Field permeability tests, both in-situ (during drilling) and variable head tests (in installed wells), were conducted to provide estimates of hydraulic conductivity (Appendix C);
- o A pumping test was performed at Well W-1 to provide an independent test of continuous saturation and provide hydrogeologic data. Ground water levels were monitored continuously during the pumping test, using P-10(C),(D), and (E), W-12 and W-22 as observation wells (Appendix D);
- o A flow net was prepared for the ELTF to identify flow paths and guide calculations of time of travel to downgradient receptors (Appendix E); and
- o A water balance and mass balance analysis were conducted to provide an alternative method to assess the rate of ground water flow (Appendices C and F).

New Monitoring Wells:

Specific additional ground water monitoring well coverage was required at the ELTF. Two new monitoring wells (W-41 and W-42) were installed in the vicinity of the ELTF (Figure 2-1). A new upgradient well (W-41) was installed to the west of the ELTF adjacent to piezometer cluster P-10. A downgradient well (W-42) was installed to the east of the ELTF.

As agreed during meetings with agency representatives, a preliminary flow net was prepared to guide the depths of installation of new monitoring wells. Based on this flow net, the upper water-bearing zone (designated as E-1) was identified as the preferred monitoring zone. The conclusions from the preliminary flow net are supported by the final flow net presented in this report. Wells W-41 and W-42 were screened in the upper water-bearing zone.

Presence of Geologic Unit C Beneath the ELTF:

The Order suggested that the brown sand (geologic Unit C, identified beneath the WLTF) might be present beneath the ELTF. If present, Unit C could act as a preferential seepage path and additionally contribute to the strong downward gradient. This possibility was investigated by comparing stratigraphic data developed beneath the ELTF (Section 3.1.1, Appendix A) with data from the WLTF (Section 3.2.1).

Wells W-11 through W-14:

Wells W-11, W-12, W-13, and W-14 have experienced elevated pH conditions apparently associated with cement-bentonite grout in proximity of the well gravel pack or screen. The pH in one of these wells, Well W-13, has declined sufficiently to consider its use as a monitoring well. Conditions affecting the use of a well for water quality monitoring that at one time had (grout-related) elevated pH, but has since experienced stabilization of pH, was investigated (Appendix A).

2.2.2 West Land Treatment Facility (WLTF)

West Side Seeps and Shallow Zone:

The source of seeps to the west of the WLTF were explored using two intersecting backhoe trenches in the vicinity of the seeps (Figure 2-2). Appendix G presents data from the backhoe exploration. Ground water elevation contours for the WLTF include data from the temporary piezometer (TP-1) installed in the filled backhoe trench.

The inferred association of the seeps with ground water in near-surface deposits broadened the investigation to include installation of shallow Piezometers P-14 and P-16 and field reconnaissance of surficial deposits within and to the north of the Texaco site. Appendix A presents well logs of P-14 and P-16. Appendix G discusses the results of shallow zone reconnaissance.

Upper Water-Bearing Zone Contour-Related Seepage Paths:

The possibility that preferred ground water seepage paths, controlled by the shape of the underlying aquitard, exist in the upper water-bearing zone was investigated using:

- o An electrical resistivity survey in the vicinity of the WLTF (Appendix H) to attempt to identify low areas in the lower aquitard;
- o Soil Borings B-1 and B-1Ø (Appendix A);
- o Monitoring wells W-43, W-44, W-45, and W-46;
- o Contours of data derived from soil borings on the upper surface of the aquitard (Zone W-4) underlying the upper water-bearing zone (Zone W-3);

- o Geotechnical analyses of soil samples (Appendix B); and
- o Flow path diagram (Appendix E).

Lower Aquitard Characterization:

Activities used to provide additional characterization (thickness, permeability, and lateral continuity) of the aquitard (hydrogeologic Zone W-1) included:

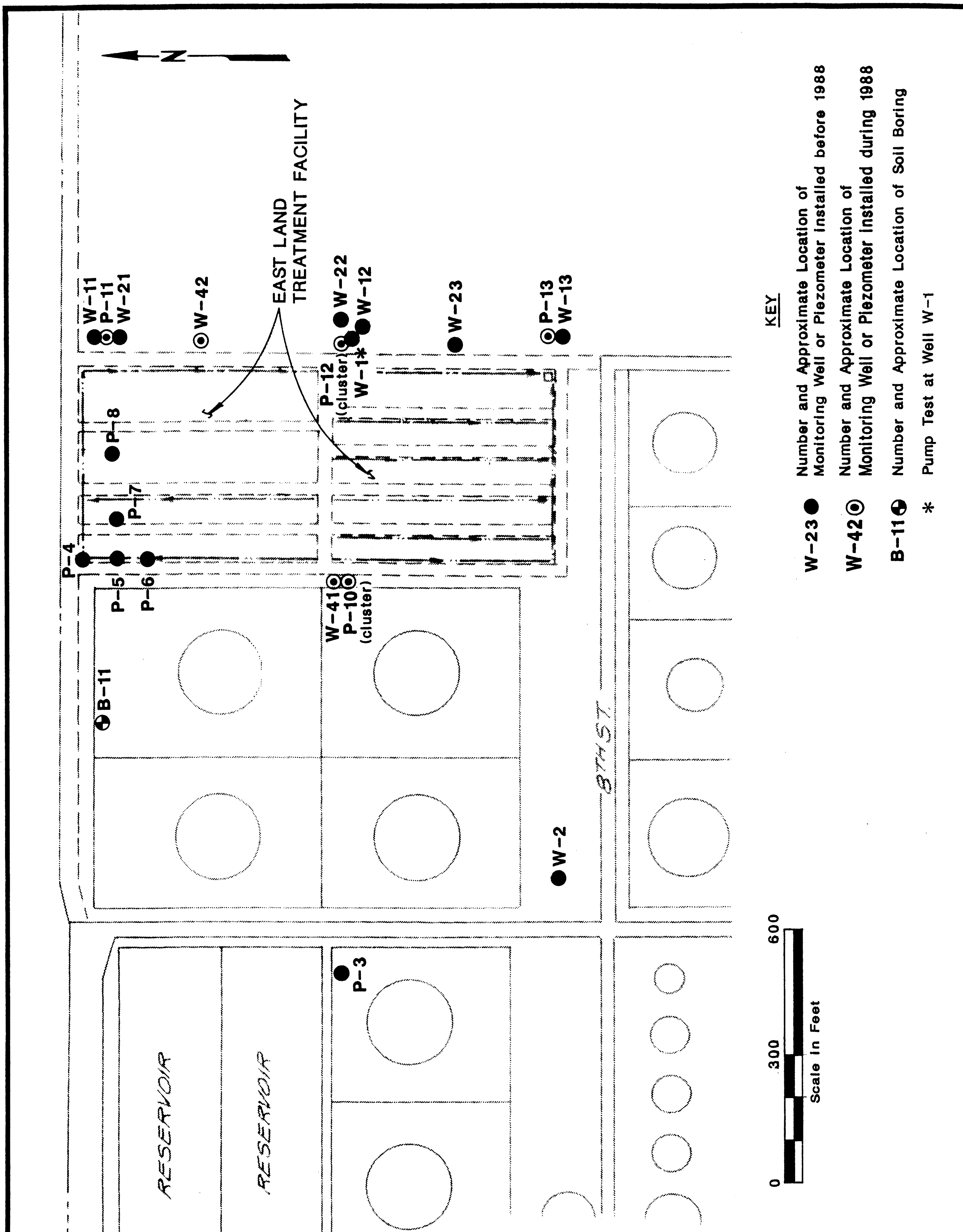
- o Evaluation of soil boring data (B-1 through B-10, Appendix A), and preparation of cross-sections;
- o Geotechnical analyses (Appendix B);
- o Contouring of the upper surface of the lower aquitard (Zone W-4) in conjunction with the seepage path investigation described above;
- o Electrical resistivity survey (Appendix H); and
- o Flow path diagram (Appendix E).

Installation Depths for Wells W-3, W-15, and W-17:

Questions concerning the depths of completion of Wells W-3, W-15, and W-17 arose following review of water level data from the WLTF wells. To address concerns related to completion depths, new monitoring wells were installed in the vicinity of existing Wells W-3, W-15, and W-17 (Figure 2-2). Wells W-43 and W-44 were installed adjacent to and at a shallower depth than Wells W-15 and W-3, respectively. Well W-46 was installed near existing Well W-17 and screened at a lower elevation. Appendix A presents well logs for W-43, W-44, and W-46.

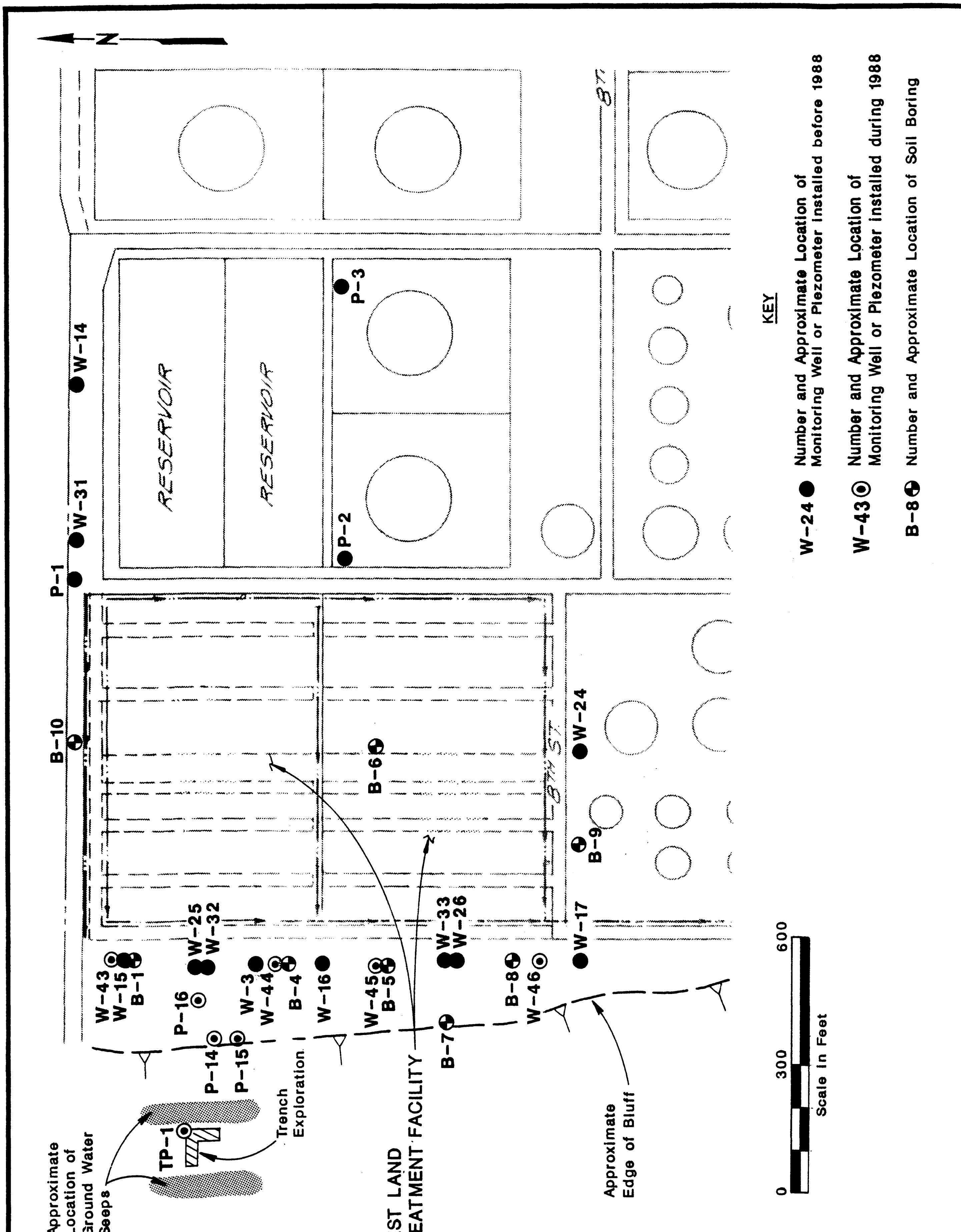
Sandpack Dimensions for W-1, W-2, W-3:

"As built" diagrams including features such as sandpack dimensions for Wells W-1 through W-3, installed in 1981, had not been presented previously. This information was needed to verify which water-bearing zone was sampled by the wells. Installation drawings, which display as-built information including the sand-pack dimensions, did not accompany the original well logs. Although information was recorded in accordance with standard field procedures at the time of installation, sandpack dimensions and other well installation data were not measured and recorded to the same precision as that used on subsequent and current installations. Because the length of the gravel pack adjacent to the screen is important in identifying what zone is sampled, installation drawings have been prepared (Figures A-20 to A-23, Appendix A) that reflect the maximum possible gravel pack length indicated by design data.



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Monitoring Wells, Piezometers, and Soil Borings East Land Treatment Facility

Figure 2-1



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Monitoring Wells, Piezometers, and Soil Borings West Land Treatment Facility

Figure 2-2

SECTION 3

3.0 HYDROGEOLOGY

This section presents a discussion of geologic and hydrologic data used to complete the site hydrogeologic characterization and to support the recommended final monitoring well system (Section 4.0). The focus of this discussion is to characterize the site hydrogeology, including analysis of zones that are relatively permeable and transmit water (water-bearing zones) and zones that impede the flow of water (aquitards). Hydraulic conductivity, saturation and porosity, and hydraulic head relationships (i.e. vertical gradients) within each hydrologic zone are reviewed. Once these zones were distinguished and the characteristics of each zone identified, these zones were analyzed based on their average hydrologic properties. These analyses were used to estimate ground water flow rates and directions.

Interpretation of data from soil borings (Appendix A), surface exposures, and trench explorations (Appendix G), define five geologic units. A general description and physical characteristics of these units are summarized in Table 3-1. Locations of wells, soil borings, and geologic cross-sections A-A' through G-G' are shown on Figure 3-1. Cross-sections A-A' through G-G', present interpretations of the subsurface distribution of soils (Figures 3-2 through 3-8).

Water-bearing zones and aquitards have been designated as hydrologic zones based on distinguishing (hydrogeologic) properties. These properties include soil type, secondary features such as weathering, hydraulic conductivity, porosity, saturation, and hydraulic head relationships. A general description of the hydrologic zones and a summary of physical characteristics is presented in Table 3-2.

The LTFs are located on either side of a ground water divide running approximately north-south along the crest of March Point. Consequently, the direction of shallow ground water flow is easterly beneath the ELTF and westerly beneath the WLTF. Although some geologic units are present beneath both LTFs, the hydrologic roles of corresponding geologic units differ. Therefore, the hydrologic units at each LTF are defined independently.

3.1 EAST LAND TREATMENT FACILITY

3.1.1 Geology

The ELTF is underlain by geologic Units B, D-2, and E. Geologic Unit C, which is present beneath the WLTF, was not identified beneath the ELTF. Descriptions of geologic units are presented in Table 3-1, and their distribution in the vicinity of the ELTF shown on Figures 3-2, 3-3, 3-7, and 3-8. The characteristics of each unit is discussed below.

Unit B: The diamicton (Unit B) is the uppermost unit identified in the vicinity of the ELTF. It is unstratified with a matrix of silt or clay supporting variable amounts of sand and gravel. Two geologic subunits (members) of Unit B (B-1 and B-2, Table 3-1) are identified, one or both of which may be present at any particular location. The overlying less dense gravelly clay (Unit B-1) is probably glacial marine in origin. The very dense gravelly sandy silt (Unit B-2) is probably a lodgment till. These two members were distinguished in soil borings by compositional and textural differences. Additionally, blow counts recorded during sampling activities supported this distinction. The undisturbed dry unit weight of Unit B-2 is greater than that of Unit B-1.

The uppermost 20 feet of the diamicton is characterized by secondary features that include a mottled tan to brown soil color, and iron-stained fractures and fissures. These features are interpreted to be weathering-related and result in a near-surface zone with distinctly higher permeability than the underlying, unweathered diamicton (see Section 3.1.2.1).

Unit D-2: Unit D-2 (a member of Unit D, Table 3-1) consists of laminated gray clayey silt and silty clay with shells, plant fragments, and worm burrows, and underlies the diamicton. Rarely, laminae with sparse fine sandy silt are noted. Distinctive features of this unit are common shells, bioturbation, and the absence of gravel. The level of consolidation in this unit commonly results in blow counts exceeding 100 per foot, indicating very dense soil. Unit weights (Appendix B) are lower than might be expected from the high blow counts, suggesting some sample disturbance. No sand interbeds were identified in Unit D-2 as were found within Unit D in the vicinity of the WLTF.

Unit E: Unit E consists of gray-brown clay and silt with discontinuous lenses of gray fine sand underlying Unit D-2. Mottling and fissures noted in the clay indicate subaerial exposure prior to deposition of Unit D-2. The different sand grain constituents, and different ground water elevations measured in P-10, P-11, P-12, and P-13, suggest that the gray fine sands within this lower clay unit may be laterally discontinuous. The methane gas accumulation encountered in P-13 attests to the low permeability of sediments that overlie the sand lenses.

3.1.2 Hydrology

The area beneath the ELTF is subdivided into three hydrologic zones (Table 3-2). These zones comprise the upper and lower water-bearing zones and an intermediate aquitard.

Zone E-1: Zone E-1 is designated as the upper water-bearing zone. Zone E-1 is in the permeable, saturated near-surface weathered portion of the diamicton, geologic Unit B. Weathering extends approximately 15 to 20 feet below the surface throughout the ELTF and is distinguished in boring logs by its mottled gray-brown appearance.

Zone E-2: Zone E-2 is the aquitard that separates the upper water-bearing zone and Zone E-3. Zone E-2 is a thick (50 to 70 feet) unweathered clay and silt sequence (geologic Units B and D-2) that underlies the ELTF.

Zone E-3: Zone E-3 is the lower water-bearing zone consisting of saturated interbedded clay, silt, and sand. Permeable sand units (geologic Unit E) within Zone E-3 may be present as laterally discontinuous individual lenses.

3.1.2.1 Hydraulic Conductivity

Table 3-3 summarizes hydraulic conductivity test data (presented in Appendix C). Horizontal hydraulic conductivities (K_h) were developed from field tests (Appendix C) while vertical hydraulic conductivities (K_v) were determined from laboratory permeability tests (Appendix B) performed on samples collected from soil borings. The laboratory (K_v) tests were performed on small samples, and, therefore, are less likely to measure macroscopic secondary features (such as fracturing and weathering) that enhance hydraulic conductivity. Therefore, laboratory tests may yield lower than actual K_v values. These secondary features are most important in fine-grained soils with primary hydrologic characteristics which impede ground water movement. Field tests (K_h) measure hydraulic conductivity which are more likely to include secondary features. Therefore, field K_h tests more closely approach actual K_h values.

An alternative method, a mass balance approach, can be used to determine hydraulic conductivity values. This method (Appendix C) is based on an estimated annual percolation of 3.2 inches of rain, a measured hydraulic gradient of Ø.Ø42, and a flow net to define the dimensions of the recharge area and dimensions of the path-bounded flow (flow tube). Table C-2 documents the results and the parameters used in this calculation.

The mass balance approach produces a uniformly greater value for hydraulic conductivity than variable head tests (Table 3-5) and, therefore, provides an upper-bound estimate of the hydraulic conductivity used to characterize the upper water-bearing zone, underlying aquitard, and lower water-bearing zone.

Figure 3-9 displays the range in K_h and K_v values (from Appendices B and C). Wells that are screened across the Zone E-1 - Zone E-2 boundary are plotted as Zone E-1.5 for K_h. The approximate log-normal distribution of K values permitted values to be averaged (Table 3-3) using the geometric mean as a measure of central tendency. Median values (included in Table 3-3 for comparison) show excellent agreement with geometric mean values.

K_h measurements made in Zone E-1 suggest that hydrogeologic conditions are relatively homogeneous as indicated by the cluster of data. K_v values in Zone E-1 show a relatively tight data cluster as well, but are appreciably less in magnitude than corresponding K_h values, indicating a high degree of anisotropy (K_h/K_v = 2000). As mentioned above, the actual degree of anisotropy is likely to be less, due to limitations in laboratory procedures in detecting secondary effects.

K_h values in Zones E-1.5 and E-2 also show tight data clusters, but are distributed at progressively lower values. The average K_h value in Zone E-1 (Table 3-3) is over two orders of magnitude greater than in Zone E-2. This contrast in permeability indicates that Zones E-1 and E-3 will transmit water relative to Zone E-2, which acts as an aquitard beneath the ELTF. The average K_h value in Zone E-2 is not appreciably different from the average K_v value (Table 3-3). This indicates that the aquitard does not display a high degree of anisotropy.

Average K_h and K_v values in Zone E-3 are greater than in Zone E-1 (Table 3-3). Zone E-3, however, also shows the largest spread in observed values (Figure 3-9). This numerical range in observations is related to measurements made in the sand, silt, and clay interbeds. Conditions that contribute to these results are reviewed in Appendix C.

3.1.2.2 Saturation and Porosity

Data from piezometer clusters P-10 and P-12 and laboratory analyses for unit weight and moisture content were reviewed to determine the degree of saturation of soils underlying the ELTF. The method is summarized in Appendix B.

Data from piezometer clusters indicate that saturated conditions are present in near-surface soils and appear continuous through Zone E-3. This includes the upper and lower water-bearing zones and the intervening aquitard. The only obvious exceptions are the Zone E-3 sands in Boring P-13, which were under positive (methane) gas pressure. This high gas pressure may have displaced water from the void spaces and, therefore, reduced the degree of saturation. Additionally, the presence of gas in Zone E-3 (P-13) underscores the very low permeability of soils in Zone E-2, which are capable of confining gas as well as restricting ground water flow.

The pumping test conducted at Well W-1 provides further evidence that the Zone E-2 aquitard is saturated and further evidence of the low hydraulic conductivity of Zone E-2. A description of the pumping test design and pump test data are presented in Appendix D. Pumping test wells are shown on Figure 3-10. Pumping test Well W-1 is set approximately at the Zone E-2 - Zone E-3 boundary. Seven observation wells situated near the pumping well were used to monitor response at various levels in Zones E-1 through E-3. Pumping at Well W-1 (top of sandpack set at approximately 40 feet MLLW) produced a measurable response in Piezometer P-12(C) (top of sandpack at approximately 50 ft MLLW), and P-12(D) (top of sandpack at approximately 39 ft MLLW). Appendix D and Figures D-5 and D-6 show ground water elevation curves for P-12(C) and P-12(D).

The base of Well W-1 and Piezometer P-12(E) are presumably both screened in Zone E-3. It was expected that pumping at Well W-1 would, therefore, cause drawdown in piezometric head at P-12(E); however, no drawdown was observed. Sands are logged in each boring at different elevations (W-1, 33-24 ft MLLW; P-12(E), 25-20 ft MLLW), though borings are located only 10 feet apart. In light of this result, it is possible that the sand observed at P-12(E) is isolated from the silty sand at Well W-1 by low permeability soils.

No response (within the duration of the pumping test) was noted at shallower observation Wells P-12(A), P-12(B), W-12, or W-22, which are screened in Zone E-1 and near the Zone E-1 - Zone E-2 boundary. This lack of response is not attributed to unsaturated conditions within the top of Zone E-2, but rather to the extremely low hydraulic conductivity of this zone and the contrasting relatively higher permeability of Zone E-1. This low hydraulic conductivity in the upper portion of Zone E-2 is demonstrated by the slow equilibration of P-12(B), which did not reach a static water level during the pumping test (Figure D-4). Zone E-1 soils have hydraulic conductivity values over two orders of magnitude greater than the Zone E-2 aquitard (Figure 3-9). The Theis equation (Freeze and Cherry, 1978), demonstrates that drawdown at a given distance from a pumping well is inversely proportional to hydraulic conductivity. It is, therefore, likely that the higher K values in Zone E-1 could mask any drawdown effects produced by the pumping well in Zone E-2.

The total porosity for each hydrologic zone was established from moisture content and dry density data. The method and results of calculations are presented in Appendix B. Porosity values (Table B-2) are used in Sections 3.1.2.4 and 3.2.2.4 to determine seepage velocity.

Drainable porosity values are listed in Table 3-2. The drainable porosity is estimated by subtracting the field capacity from the total porosity (Bear, 1979). Average field capacities were estimated to be approximately 0.30 for silts and clays (Zones E-1 and E-2) and approximately 0.10 for sands (Zone E-3) (Dunne and Leopold, 1978).

The range of total porosities calculated for Zones E-1 and E-2 (0.38 and 0.35, respectively) fall below the range of total porosities listed in Dunne and Leopold (1978) for silts and clays (0.40-0.55). Field and geotechnical data indicate that soils in Zones E-1 and E-2 have been consolidated by glacial processes, and would be expected to have lower total porosities than average unconsolidated sediments. The calculated porosities (Appendix B) fall within the range listed in Dunne and Leopold (1978) for glacial till (0.25-0.40). The average calculated total porosity for Zone E-3 is 0.41, which is within the range expected for a sand to sandy silt (Dunne and Leopold, 1978).

3.1.2.3 Hydraulic Head Relationships

Ground water elevation contours are plotted for Zone E-1 on Figure 3-11 from data presented in Table 3-4. This map of hydraulic head values includes only water level measurements from wells that have sandpack intervals within approximately 10 feet of the ground surface. Ground water flow in Zone E-1 is easterly in the vicinity of the ELTF, with slight southerly component of flow in the south section of the ELTF. The local deflection in ground water contours in the vicinity of Piezometer P-4 is associated with a french drain installed along the north western margin of the ELTF. The horizontal gradient for the piezometric surface in Zone E-1 is calculated to be approximately 0.042 (Table 3-5) over the ELTF.

Vertical hydraulic head relationships were examined in Zones E-1, E-2, and E-3 from the well and piezometer cluster at P-12 and the piezometer cluster at P-10. The elevations of well and piezometer screens (Appendix A) and water level measurements (Table 3-4) show that a vertical (downward) gradient continues from ground level through Zone E-2. The average estimated vertical gradient in Zone E-1 is approximately 0.14. In Zone E-2, the average estimated vertical gradient increases appreciably to approximately 1.1. Data are insufficient to determine an accurate downward gradient in Zone E-3.

Ground water levels between June 1984 and April 1988 are plotted for selected wells and piezometers in Zones E-1 and E-1.5 (screened across the Zone E-1 - Zone E-2 boundary) on Figure 3-12. Figure 3-12 shows a distinct seasonal pattern of water level fluctuations with maximum levels occurring in late winter to early spring, and minimum levels occurring in late summer and fall. These water level fluctuations lag approximately two months behind seasonal trends in monthly precipitation values

(Figure F-2), which also show strong seasonality. Seasonal fluctuations in Zone E-1 vary between approximately 2 and 5 feet, depending on the location, year, and month of measurement. Water balance calculations (Appendix F) estimate that approximately 3.2 inches of rainfall percolate through the ELTF to the ground water table. This percolation takes place predominantly during winter months, which corresponds with the maximum water level elevations on Figure 3-12.

Based on a drainable porosity of Ø.Ø8 and an annual percolation rate of 3.2 inches, the calculated water level rise in Zone E-1 would be approximately 3.3 feet. This result suggests that the observed range in water level fluctuations is plausible considering the likely spatial variation in porosity and field capacity and temporal variation in infiltration and field capacity. Given the close correlation of water level fluctuations with rainfall and the calculations presented above, it is likely Zone E-1 responds to recharge from rainfall.

Figure 3-13 shows seasonal water level fluctuations in Well W-1 (Zone E-3). Water levels do not show a tendency to fluctuate seasonally. This suggests that recharge to this aquifer is not from direct infiltration of rainfall. Recharge to this zone across an aquitard (such as Zone E-2) would restrict seasonal fluctuations. As discussed in Section 3.1.2.4, it is likely that some recharge to Zone E-3 is across the Zone E-2 aquitard.

Sufficient data are not available to plot seasonal ground water level fluctuations or ground water contours in Zone E-2.

3.1.2.4 Ground Water Flow Rate and Direction

A flow net (Figure 3-14) was prepared to represent a model of the hydrologic system beneath the ELTF. The model provides a framework for determining ground water flow rate and direction.

Construction of the flow net (Appendix E) requires the following simplifying assumptions:

- The hydrogeology beneath the ELTF can be separated into three hydrologic zones,
- Each zone is homogeneous, and
- The head drop within each zone is evenly distributed.

The flow net, Figure 3-14, provides a quantitative assessment of ground water flow beneath the ELTF. The flow net shows that flow within approximately the upper 20 feet of the surface is sub-horizontal. In Zone E-2, flow becomes approximately vertical until Zone E-3 where flow paths again become sub-horizontal.

Seepage velocities for each zone are listed in Table 3-5. The seepage velocity is calculated by the following formula (Fetter, 1980);

$$V_s = \frac{Ki}{n_e}$$

where: V_s = seepage velocity
K = hydraulic conductivity
i = hydraulic gradient
n_e = effective porosity

Average hydraulic conductivities from (Table 3-3) and the horizontal and vertical hydraulic gradients (Table 3-5) are used to calculate minimum seepage velocities. The average horizontal hydraulic conductivity is used in Zones E-1 and E-3 and the average vertical hydraulic conductivity is used in Zone E-2 for calculating seepage velocity. Hydraulic conductivity values from the mass balance analysis are used to calculate maximum seepage velocities.

Todd (1980) defines effective porosity (n_e) as "the amount of interconnected pore space available for fluid flow." Bear (1979) indicates that n_e is less than the total porosity (n). Todd (1980) states that "for unconsolidated porous media and many consolidated rocks, the porosities (n and n_e) are identical." The difference in n_e and n are expected to be minor compared to the possible variation in K or i. For the purposes of the seepage velocity calculation, average total porosity (Table B-2) was used for effective porosity.

Based on the seepage velocities (Table 3-5), the time of travel was estimated for water percolating through the ELTF to a monitoring well receptor directly east of "D" Street at the approximate location of Well W-1. The estimate of time of travel assumes that there is no unsaturated flow beneath the ELTF. Time of travel was estimated for the minimum flow path distance to a monitoring well screened in Zone E-1 (Flow Path 1) and a monitoring well screened in Zone E-3 (Flow Path 2). Travel distances were calculated along flow paths delineated on the flow net (Figure 3-14). A minimum and maximum time of travel was calculated for each flow path scenario based on seepage velocities calculated using mass balance and variable head tests (Table 3-5), respectively. These time of travel calculations are listed in Table 3-6. The maximum time of travel is about 320 years to a monitoring well in Zone E-3. The minimum time of travel is about 5 years to a monitoring well screened in Zone E-1. Also included in Table 3-6 is the time for a water particle to travel from the ELTF to Padilla Bay via Zone E-3. It is estimated that this would take between 410 and 1,900 years.

3.2 WEST LAND TREATMENT FACILITY (WLTF)

3.2.1 Geology

Soil Units A, B, C, and D are identified beneath the WLTF (Table 3-1). Distribution of geologic units in the vicinity of the WLTF are shown on Figures 3-2 through 3-6. The topography in the vicinity of the WLTF slopes moderately to the west, with elevations ranging from approximately 90 to 190 feet (MLLW).

Unit A: Unit A is comprised of thin fine native beach sand deposits and overlying silty fill soil. Fine sand with minor gravel is present at the surface near the crest of March Point. This deposit is up to 4 to 6 feet in thickness to the north of the site and thins to less than 1 foot to the west at elevations lower than 130 feet. Unit A, beneath the WLTF when present, is thin. Much of the beach sand, if present, has been removed during terracing and grading activities in the WLTF. The terrace to the west of the WLTF consists of a fill soil placed above the sand. Data from soil borings and field observations indicate that although Unit A is generally unsaturated, seasonally perched ground water may be present at the lower contact with Unit B.

Unit B: Fine-grained soils with sparse to abundant matrix-supported gravel, cobbles, and boulders underlie the WLTF and comprise the diamicton, geologic Unit B. Data from boring logs (Appendix A) and trench explorations (Appendix G) indicate that two members (Units B-1 and B-2) are present (Table 3-1). The diamicton units, B-1 and B-2, are not differentiated on geologic cross-sections in the vicinity of the WLTF. The lower contact of the diamicton is erosional and unconformably overlies Unit C. Unit B ranges from 10 to 15 feet in thickness; however, cutting and terracing in the WLTF has locally reduced the thickness of this unit.

Unit C: Fine to coarse brown sand (Unit C) underlies most of the WLTF. Soil boring and geophysical data indicate that the brown sand thins to the east and is absent near the crest of the ridge or present only as discontinuous erosional remnants. Exposures in the trench excavations (Appendix G) showed south-dipping foreset beds, an upper erosional contact, and sedimentary structure disturbance (oversteepening of foreset beds and small faults) probably associated with the overburden of glacial ice. Blow counts indicate that the sand is highly consolidated, probably also an artifact of being overridden by glacial ice. The lower contact of the brown sand is irregular in elevation and appears erosional into the underlying silts as shown on cross-section E-E' (Figure 3-6).

An electrical survey (Appendix H) was conducted to provide data on the contact between Unit C and the underlying aquitard, Unit D. Resistivity methods were most successful in delineating the contact between geologic units in the northwest portion of the WLTF. A comparison of boring logs and resistivity data in the eastern and southern portions of the WLTF showed that geologic contacts were not well defined using resistivity methods. Apparently, as the fine soil content or saturation changed, the electrical resistivity method detected units that were difficult to interpret without an adjacent soil boring. This reduced the confidence in using the resistivity data to draw conclusions resulting in only limited application of geophysical data.

Unit D: A sequence of interlayered gray silts, clays, and fine sands (Unit D) underlie the brown sand. Commonly, a silt or clay member of this unit underlies Unit C (Figures 3-4, 3-5, and 3-6) and acts as an aquitard (designated Unit D-1). Contours of the upper surface of this low permeability soil (or the base of the brown sand), prepared from linear interpolation of soil boring data, are shown in plan view (Figure 3-15). When a fine gray sand underlies Unit C, it is thin and apparently discontinuous.

Silt and clay layers of Unit D have features very similar to silt and clay observed in the vicinity of the ELTF (Unit D-2). These features include fine laminations, worm burrows, and shells. Although no interbedded sands were identified beneath the ELTF, the interbedded silts and sands in the vicinity of the WLTF and silts and clays (Unit D-2) beneath the ELTF are interpreted to be a lateral variation of the same geologic unit.

The older gray-brown clay (Unit E), present at elevations between 45 and 55 feet beneath the ELTF, was not encountered in soil borings extending to elevations of 55 to 65 feet beneath the WLTF.

3.2.2 Hydrology

The hydrogeology beneath the WLTF is subdivided into five hydrologic zones (Table 3-2).

Zone W-1: Zone W-1 corresponds to geologic Unit A. Zone W-1 is unsaturated except for seasonally perched water at the base. Zone W-1 is not continuous beneath the WLTF and has no significant influence on the hydrology.

Zone W-2: Zone W-2 corresponds to geologic Unit B and acts as an aquitard. Soil test pit logs and boring logs indicate that Zone W-2 is continuous beneath the WLTF. Geotechnical data indicate that the fine soils in Zone W-2 are commonly saturated or nearly saturated. Because Zone W-2 overlies the partially saturated Zone W-3, it is referred to as the upper aquitard Zone W-2.

Zone W-3: Zone W-3 corresponds to geologic Unit C and is saturated at the base over the lower 0 to 5 feet, depending on location. Zone W-3 is designated as the upper water-bearing zone. Seepage in this zone appears to be influenced in channel-like fashion by contours of the underlying low permeability soils of Zone W-4.

Zone W-4: Zone W-4 corresponds to the low permeability member Unit D-1 of geologic Unit D. Silts, clays, and subordinate silty sands comprise this unit. It is referred to as the lower aquitard. Although varying in thickness, its lateral continuity is inferred by confined conditions present in wells screened in the lower water-bearing zone.

Zone W-5: Zone W-5 is the lower water-bearing zone in the interlayered silts and sands of geologic Unit D. Confined conditions are observed in Zone W-5.

3.2.2.1 Hydraulic Conductivity

Table 3-3 summarizes hydraulic conductivity test data presented in Appendix C for the ELTF. Horizontal hydraulic conductivities (K_h) were developed from field tests while vertical hydraulic conductivities (K_v) were determined from laboratory permeability tests (Appendix B) of soil boring samples. As discussed in Section 3.1.2.1, K_v values in fine soils may underestimate the actual K_v.

Figure 3-16 displays the range in K_h values and K_v values, respectively. The approximately log-normal distribution of data allowed K values to be averaged using the geometric means as a measure of central tendency (Table 3-3). Median values are also included for comparison. The averages of K_h and K_v values in both Zones W-3 and W-5 all fall in the 10^{-4} cm/sec to 10^{-5} cm/sec range. In contrast, average K_v values from the aquitard zones, Zones W-2 and W-4, are 5.8×10^{-8} cm/sec and 1.5×10^{-7} cm/sec, respectively. This contrast in K values suggests that Zones W-3 and W-5 will transmit water relative to Zones W-2 and W-4, which impede the flow of water.

Median values correlate well with geometric mean averages except for K_v values in Zones W-1 and W-3. K_v values from Zone W-1 represent values from the sand at the base of this zone and from the overlying fill. This variation in soil type in Zone W-1 is reflected in the wide range of K values (Figure 3-16) and the discrepancy between the geometric mean and the median. Figure 3-16 shows two groupings of K_v values for Zone W-3 at 10^{-3} to 10^{-4} cm/sec and 10^{-5} to 10^{-6} cm/sec, respectively. The lower values represent laboratory permeability test values from Borings B-2, B-4, B-8, and B-10 from samples collected near the base of Zone W-3. These sample values appear to reflect the higher percentage of fine soils noted at the base of Zone W-3 at these locations. The high and low vertical permeability values have been averaged (Table 3-3) to represent K_v conditions in the thin saturated zone near the lower boundary of this zone, because both of these soil types would influence flow.

K_h values for Zone W-3 on Figure 3-16 show a data spread of over three orders of magnitude. Most of the wells in Zone W-3 have sandpack intervals that span the Zone W-3 - Zone W-4 boundary, which is a boundary between high and low permeability soils. Thus, conditions of both soil types influence variable head test results. Similarly, the wide data spread for K_h values in Zone W-5 represents data from wells that are screened in interlayered silts and sands, or silty sands of Zone W-5.

With the exception of a few outlier values, Figure 3-16 shows that K_v values in Zones W-2, W-4, and W-5 are relatively tightly clustered. The outlier values can be correlated with conditions such as weathering (Zone W-2) or samples obtained near zone boundaries. Additionally, these outlier values are not unexpected for Zone W-5 and, to a lesser extent, Zone W-4, since these zones are observed to consist of interbeds of relatively permeable and impermeable soil.

3.2.2.2 Saturation and Porosity

Laboratory tests for dry density and moisture content (Appendix B) were analyzed to determine the degree of saturation of hydrologic units underlying the WLTF. A description of the methods used to determine saturated, marginally saturated, and unsaturated conditions is presented in Appendix B. Given possible variability in the data, only gross saturation relationships are discussed.

Zone W-1 appears to be unsaturated (less than 70 percent saturation) except at the base where marginally saturated (70 to 85 percent saturation) to saturated (85 to 100 percent saturation) conditions persist in the thin film of beach sand deposits. Based on observations made during field reconnaissance, saturated conditions are probably seasonal.

Zone W-2 appears to be marginally saturated from the surface to the contact with Zone W-3 except where it is overlain by Zone W-1 where it is unsaturated. This is presumably due to interception of rainfall percolation by the thin film of beach sand deposits at the base of Zone W-1. Additionally, since the marginally saturated conditions do not extend laterally beneath Zone W-1, it suggests that ground water flow in the zone is more nearly vertical.

The Zone W-3 sand appears to be unsaturated with the exception of a thin saturated portion (up to 5 feet) at the base. The thickness of saturation in Zone W-3 appears to be influenced by the surface contours of the underlying aquitard Zone W-4. Where low points exist in the Zone W-4 surface, the sands are saturated up to approximately 5 feet. Where high points exist in the surface, at most only a thin layer of saturated to marginally saturated soil is present. Data suggest that ground water flow in the upper water-bearing zone takes place as channelized interflow (Figure 3-15) controlled by the contours of the contact between the geologic Units C and D-1. To the west of the WLTF, in the vicinity of the backhoe trench, data indicate that confined conditions exist in Zone W-3.

The Zone W-4 aquitard appears to be saturated throughout its entire thickness. Data indicates that Zone W-5 is also entirely saturated.

The porosity for each hydrologic zone was established from moisture content and density data. Appendix B lists the method, range, and average porosity values. The average porosity value for Zone W-1 is 0.42 (Table 3-2), which is in agreement with soils consisting of fill material and sand (Dunne and Leopold, 1978). The aquitard zones, W-2 and W-4, have calculated average total porosity values of 0.35 and 0.38, respectively; these values are low for unconsolidated silts and clays, but are representative of glacial tills (Dunne and Leopold, 1978). The average porosity values calculated for the water-bearing zones, W-3 and W-5, are 0.38 and 0.37, respectively. These values are representative of sands (Dunne and Leopold, 1978).

The drainable porosity, used in evaluating the relationship between percolation and water level changes, is calculated by subtracting the field capacity from the total porosity (Section 3.1.2.2). The field capacity for the permeable zones, W-1, W-3, and W-5, is estimated to be approximately 0.10. The field capacity of the less permeable zones, W-2 and W-4, is estimated to be 0.30 (Dunne and Leopold, 1978). Drainable porosities are 0.32 for Zone W-1, 0.05 for Zone W-2, 0.28 for Zone W-3, 0.08 for Zone W-4, and 0.27 for Zone W-5.

3.2.2.3 Hydraulic Head Relationships

Ground water contours are plotted for the upper and lower water-bearing zones under the WLTF on Figures 3-17 and 3-18, respectively. The direction of ground water flow in both water-bearing zones is approximately west-southwest from the higher elevation of March Point toward Fidalgo Bay. Ground water seeps located to the west of the WLTF reflect both seasonal seepage in near-surface weathered diamicton soils and upward migration from Zone W-3. Observations concerning both seepage areas are presented with the backhoe trench investigation data (Appendix G). Ground water contour lines appear similar to topographic contours.

The horizontal ground water gradient for the upper water-bearing zone is calculated to be 0.093 under the WLTF. This gradient decreases directly west of the WLFT as the saturated thickness of Zone W-3 increases. The horizontal ground water gradient calculated for the lower water-bearing zone is 0.083, which is similar to the upper water-bearing zone.

Comparison of ground water elevations at Wells W-15 and W-43 in Zones W-5 and W-3 (respectively) at the northwestern edge of the WLTF shows an upward vertical gradient of approximately 0.15. Based on the contour maps, the vertical upward gradient is projected to exist along the western edge of the WLTF.

Figure 3-19 shows the seasonal fluctuations in piezometric head values in P-1, P-2, and P-3 located directly east of the WLTF. These piezometers have sandpacks that span the contact between Zones W-2 and W-5. Water levels reach a minimum in fall and a maximum in spring. This correlates with the seasonal fluctuations in rainfall and the expected percolation in January, February, and March, (Appendix F).

Assuming a drainable porosity (Table 3-2) for Zone W-5 of 0.27 and annual percolation of 3.2 inches per year (Appendix F), the calculated water level fluctuation would be about 1 foot (see Section 3.1.2.3). This average value (based on 30-year average rainfall) is much less than the average observed water level fluctuation for P-1 of 6 feet. P-1 is screened across the Zone W-2 - Zone W-5 boundary with a large amount of fine soil adjacent to the screen. Assuming a drainable porosity of 0.05 for Zone W-2, the calculated water level fluctuation would be about 5 feet, suggesting that P-1 is influenced both by conditions in Zones W-2 and W-5. The "immediate" seasonal response to precipitation noted on Figure 3-19 suggests that conditions allow for rapid recharge from rainfall. Piezometers P-2 and P-3 show a similar trend although the water level fluctuations are less than P-1 at, or very near, the surface to the north of the site allowing for direct recharge from rainfall. Piezometers P-2 and P-3 show less water level fluctuations than P-1.

Figure 3-20 shows seasonal water level fluctuations in Wells W-3 and W-15. The maximum recorded fluctuation is 1.2 feet and 2.2 feet, respectively. These wells are also screened in Zone W-5, like P-1, P-2, and P-3, and appear to be under confined conditions. The similar trends (Figures 3-19 and 3-2Ø), although lower in amplitude than P-1, reflect seasonal changes in precipitation and suggests that W-3, W-15, P-1, P-2, and P-3 are screened in connected levels of Zone W-5.

Figure 3-21 shows seasonal water level fluctuations in Zone W-3 for four wells. The patterns of fluctuations in these wells differ sharply from wells on Figures 3-19 and 3-2Ø. Of these four wells, W-24 shows a maximum seasonal water level fluctuation of Ø.7 feet. Given a drainable porosity for Zone W-3 of Ø.28 (Table 3-2) and an annual percolation of 3.2 inches (Appendix F), an average water level fluctuation of Ø.95 feet would be expected. The lack of seasonal response in water levels for wells screened in the upper water-bearing zone suggests that this zone does not receive direct recharge from rainfall. Recharge to the upper water-bearing zone may be from percolation through Zone W-2 and the unsaturated portion of Zone W-3. Additionally, some component of recharge may be from Zone W-5 across the Zone W-4 aquitard. These recharge pathways would presumably mitigate seasonal recharge effects.

3.2.2.4 Ground Water Flow Rate and Direction

The flow path diagram (Figure 3-22 and Appendix E) is a qualitative representation of ground water flow beneath the WLTF. The flow path construction includes lithologic characteristics, hydraulic conductivity values, hydraulic head relationships in water-bearing Zones W-3 and W-5, and saturation relationships. The underlying assumption of the flow path diagram, like the flow net, is that the hydrology beneath the WLTF can be modeled on the basis of average properties within a zone. Therefore, each zone is treated as a homogeneous medium.

The flow path diagram shows ground water movement beneath the WLTF in five distinct zones. The simplified representations of the interbedded silt, clay, and sand lithologies depicted in cross-sections C-C' and D-D' (Figures 3-4 and 3-5) are used to model the lower aquitard (Zone W-4) and lower water-bearing zone (Zone W-5) shown on Figure 3-22.

Four different flow paths are likely for water percolating through soils of the WLTF (Figure 3-21). Three of these paths describe ground water ultimately discharging to Zone W-3. The fourth shows ground water ultimately discharging to Zone W-5.

Table 3-5 presents seepage velocities for Zones W-2 through Zone W-5 beneath the WLTF. These calculations are based on variable head test data and the method presented in Section 3.1.2.4 for saturated flow and assumptions presented in Appendix I for unsaturated flow. A vertical gradient and average vertical hydraulic conductivity value is used for ground water flow in Zone W-4. A horizontal gradient and average horizontal hydraulic conductivity is used for ground water flow in Zones W-3 and W-5. The mass balance approach used to bound the ground water flow velocities for the ELTF relied on conditions established from the flow net. A mass balance approach of the same precision as the ELTF was not possible using available data, and was not prepared for the WLTF.

The hydraulic gradient and hydraulic conductivity values for marginally saturated conditions in Zone W-2 and unsaturated conditions in Zone W-3 can be estimated as presented in Appendix I. The values used to calculate seepage velocity in unsaturated soil are presented in Table I-1 and summarized in Table 3-5. Seepage velocity values (Table 3-5) are used to estimate the time of travel for a water particle moving (along paths specified on Figure 3-22) from the WLTF surface to downgradient monitoring wells. The time of travel for each path is presented in Table 3-6.

The time of travel from the WLTF surface to downgradient monitoring wells screened in Zone W-3 is about 11 years. The time of travel from the WLTF surface to downgradient monitoring wells screened in Zone W-5 would be approximately five times greater. The shortest time of travel from the WLTF to Fidalgo Bay via Zone W-3, if consistent hydrogeologic conditions were present, would be about 39 years. Time of travel from the WLTF to Fidalgo Bay via Zone W-5 would be about 190 years.

3.3 SUMMARY

3.3.1 East Land Treatment Facility

Data beneath the ELTF indicate that ground water flow beneath the ELTF can be modeled using three zones. Zones E-1 and E-3 are water-bearing zones separated by an aquitard, Zone E-2. Geotechnical analyses, piezometric head, and pumping test data indicate that saturated conditions are present in all zones and that a vertical (downward) gradient is present from Zones E-1 to E-3. Contours of ground water elevations in hydrologic Zone E-1 indicate that ground water flow is easterly beneath the ELTF. Times of travel, estimated along flow lines derived from the flow net prepared for the ELTF, indicate that water percolating through the ELTF will reach downgradient wells approximately 15 times faster in the shallow zone (E-1) than in the deeper zone (E-3). Times of travel indicate that the shallow water-bearing zone (E-1) is preferred for detection monitoring.

3.3.2 West Land Treatment Facility

Five hydrologic zones were identified in the vicinity of the WLTF. Zone W-1 is comprised of permeable material although it is generally unsaturated. Zones W-2 and W-4 are aquitards. Zones W-3 and W-5 are water-bearing zones. Hydraulic head and geotechnical data indicate that saturated conditions exist from near the bases of Zones W-3 through W-5. Piezometric head data indicate that an upward gradient may be present from Zones W-3 to W-5. Ground water contours in Zones W-3 and W-5 indicate that ground water flow is to the west-southwest. Flow in Zone W-3 appears to be channeled by "troughs" in the upper surface of the Zone W-4 aquitard. Times of travel estimated in Zones W-3 and W-5, along routes identified in the flow path diagram prepared for the WLTF, indicate that water percolating through the WLTF will reach monitoring wells approximately five times sooner in Zone W-3 than in Zone W-5. Times of travel suggest that Zone W-3 is the preferred zone for detection monitoring.

TABLE 3-1

PROPERTIES OF GEOLOGIC UNITS

Geologic Unit	General Description	Unified Soil Classification (a)	Appropriate Range of Thickness (ft) (b)	Approximate Range of Dry Density (pcf) (b)	Approximate Range of Moisture Content (Percent) (b)	Estimated Range of Permeability (K in cm/sec) (b)
West Land Treatment Facility						
(Unit A) Shallow fill soil and fine sand	Brown sandy silt fill with abundant wood debris and underlying fine sand and silty fine sand with sparse gravel, of possible beach deposit origin. Fine sand thins to west, not noted below elevation of ~ 130 feet (c). Shallow conditions have been altered by cutting and grading. Fill soil and sand are thickest to the west of the WLTF.	ML SP SM	0 - 15	65 - 95 (fill) 95 - 105 (sand)		10^{-4} - 10^{-7}
(Unit B) Diamicton	Unstratified fine soils containing variable amounts of matrix-supported gravel and sand, comprised of one or both of two subunits.	ML CL	4 - 15	100 - 135	10 - 20	10^{-6} - 10^{-8}
(B-1)	A gravelly silty clay of probable glacial marine origin.					
(B-2)	An underlying very dense gravelly sandy silt of lodgment origin. Near-surface soil (~ 20 feet) is tan-brown, mottled, with some desiccation fissures. Nondifferentiated on west side.					
(Unit C) Brown fine-coarse sand	Brown fine to coarse sand, minor gravelly sand, silty sand and subordinate sandy silt and silt. Distinctive rusty gray-brown color. Foreset bedding (observed in trench exploration) dips to south. Dry density and blow counts during drilling suggest subglacial consolidation.	SW SP Subordinate SM, ML	5 - 40	100 - 110	5 - 23	10^{-3} - 10^{-6}
(Unit D) Interlayered silt and fine sand	Laminated gray and greenish gray silts and clays, gravelly silts, and sandy silts interlayered with gray fine sand and silty sand. Laminated clays and silts contain sparse shells, worm burrows, and plant debris.	ML/CL SP SM	30+ - 50+	95 - 100	5 - 15	10^{-3} - 10^{-8}
(D-2)	The silt and clay layer that underlies brown sand unit and acts as an aquitard between Unit C and underlying saturated gray sands in Unit D.	ML CL Subordinate GM	5 - 50	95 - 105	20 - 30	10^{-6} - 10^{-8}

TABLE 3-1

PROPERTIES OF GEOLOGIC UNITS
(continued)

Geologic Unit	General Description	Unified Soil Classification (a)	Appropriate Range of Thickness (ft) (b)	Approximate Range of Dry Density (pcf) (b)	Approximate Range of Moisture Content (Percent) (b)	Estimated Range of Permeability (K in cm/sec) (b)
East Land Treatment Facility						
(Unit B) Diamicton	Unstratified gravelly sediments of low permeability, comprised of one or both of two subunits.	ML CL	25 - 60	100 - 135	13 - 75	10^{-5} - 10^{-8}
(B-1)	A gravelly silty clay of probable glacial marine origin.					
(B-2)	An underlying very dense gravelly sandy silt of lodgment origin. Near-surface 20 feet are brown, mottled, with desiccation fissures.					
(Unit D-2) Laminated silt and clay	Sequence of gray to greenish-gray silt, clay, clayey silts, and minor sandy silts. Much of sequence is finely laminated. Worm burrows or shells are common. Commonly very stiff to hard and brittle. No inter-bedded sands noted. Member of Unit D described.	ML CL	15 - 55	90 - 105	20 - 26	10^{-7} - 10^{-8}
(Unit E) Older clay with sand lenses	Brown clay (mottled at contact, indicates previous subaerial exposure). Dark gray-brown silt, and gray sands. Sand zones may not be laterally continuous. Peaty plant fragments in silts and clays. Sand in P-13 was methane-bearing and "dry" during drilling.	CL	>25	90 - 100	20 - 26	10^{-4} - 10^{-8} (sands)

(a) The Unified Soil Classification System is present on Figure A-1.
(b) Appendix B, Table B-1. Estimated ranges discount extreme values.
(c) Feet above Mean Lower Low Water (MLLW).

TABLE 3-2

HYDROLOGIC ZONES

Hydrologic Zone	General Description	Approximate Range of Thickness (ft)	Mean Horizontal (K_h) and Vertical (K_v) Hydraulic Conductivity (cm/sec)(a)	Average Porosity (percent)(b)	Estimated Drainable Porosity (percent)(c)
East Land Treatment Facility					
E-1	Upper water-bearing zone near-surface weathered portion of geologic Unit B.	15 - 20	K_h 2.4×10^{-5} K_v 1.2×10^{-8}	0.38	0.08
E-2	Aquitard, unweathered geologic Unit B and Unit D-2.	40 - 70	K_h 1.6×10^{-7} K_v 6.9×10^{-8}	0.35	0.05
E-3	Lower water-bearing zone, geologic Unit E.	>5 (lower boundary has not been penetrated, maximum depth drilled 25 feet)	K_h 5.9×10^{-5}(d) K_v 2.2×10^{-6}(d)	0.41	0.31
West Land Treatment Facility					
W-1	Unsaturated surficial soils (geologic Unit A)	0 - 15	K_h — K_v 5.0×10^{-6}	0.42	0.32
W-2	Aquitard (geologic Unit B)	10 - 20	K_h — K_v 5.8×10^{-8}	0.35	0.05
W-3	Upper water-bearing zone (geologic Unit C)	0 - 45	K_h 2.8×10^{-4} K_v 4.6×10^{-5}	0.38	0.28
W-4	Aquitard (D-1 member of geologic Unit D)	0 - >50	K_h — K_v 1.5×10^{-7}	0.38	0.08
W-5	Lower water-bearing zone (geologic Unit D)	>40	K_h 7.3×10^{-5}(d) K_v 7.5×10^{-5}(d)	0.37	0.27

(a) See Table 3-3.
(b) Appendix B.
(c) Estimated by subtracting field capacity from total porosity (average porosity)(Bear 1979). Field capacities for various soil types from Dunne & Leopold (1978).
(d) Data from sand layers in interbedded sand and clay unit.

TABLE 3-3

SUMMARY OF HYDRAULIC CONDUCTIVITY VALUES (cm/sec)

Hydrologic Zone[(a)]	Orientation	Number of Observations	Hydraulic Conductivity Average	Median	Maximum	Minimum
East Land Treatment Facility						
E-1	Horizontal	4	2.4×10^{-5}	2.3×10^{-5}	7.0×10^{-5}	9.8×10^{-6}
	Vertical	7	1.2×10^{-8}	1.0×10^{-8}	2.7×10^{-8}	7.2×10^{-9}
E-1.5	Horizontal	11	1.7×10^{-6}	1.5×10^{-6}	6.9×10^{-6}	5.2×10^{-7}
	Vertical	0	--	--	--	--
E-2	Horizontal	9	1.5×10^{-7}	1.5×10^{-7}	5.0×10^{-7}	6.3×10^{-8}
	Vertical	13	6.9×10^{-8}	5.7×10^{-8}	1.6×10^{-6}	1.5×10^{-8}
E-3	Horizontal	7	5.6×10^{-5}	3.5×10^{-5}	7.8×10^{-3}	1.8×10^{-7}
	Vertical	5	2.2×10^{-6}	1.5×10^{-6}	3.1×10^{-5}	3.6×10^{-7}
E-3.5	Horizontal	0	--	--	--	--
	Vertical	2	2.4×10^{-8}	--	4.8×10^{-8}	1.2×10^{-8}
West Land Treatment Facility						
W-1	Horizontal	0	--	--	--	--
	Vertical	5	5.0×10^{-6}	1.0×10^{-5}	2.2×10^{-4}	3.0×10^{-8}
W-2	Horizontal	0	--	--	--	--
	Vertical	9	5.8×10^{-8}	3.4×10^{-8}	1.1×10^{-6}	1.3×10^{-8}
W-3	Horizontal	13	2.6×10^{-4}	3.1×10^{-4}	1.8×10^{-2}	1.0×10^{-5}
	Vertical	14	4.6×10^{-5}	9.5×10^{-5}	4.3×10^{-4}	1.0×10^{-6}
W-4	Horizontal	0	--	--	--	--
	Vertical	13	1.5×10^{-7}	9.8×10^{-8}	2.0×10^{-5}	1.4×10^{-8}
W-5	Horizontal	4	6.0×10^{-5}	4.3×10^{-5}	2.5×10^{-3}	2.8×10^{-6}
	Vertical	6	7.5×10^{-5}	8.9×10^{-5}	3.2×10^{-4}	4.0×10^{-6}

(a) Zone E-1.5 refers to K_h values located at depths transitional between Zones E-1 and E-2. Zone E-3.5 refers to K_v data in silts and clays of Zone E-3.

TABLE 3-4

GROUND WATER ELEVATIONS[a]

Well/ Piezo-meter	Ground[b] Surface Elevation	June 15,[c] 1984	Nov 9,[c] 1984	Mar 14,[c] 1985	July 26,[c] 1985	Sept 6,[c] 1985	Dec 10,[c] 1985	Apr 2,[c] 1986	Aug 26,[d] 1986	Oct 21,[d] 1986	Jan 12, 1987	April 7, 1987	June 25, 1987	Sept 28, 1987	Nov. 23, 1987	April 20, 1988
W-1	96.1	40.6	39.9	40.1	39.8	40.3	40.0	40.8	40.1	39.8	40.2	40.6	40.4	39.6	39.5	28.6
W-2	144.1	114.8	—[e]	114.2	113.8	114.1	114.5	115.2	114.4	114.1	114.5	114.4	114.1	113.4	113.2	114.4
W-3	145.4	102.9	—	102.6	102.1	102.1	102.1	102.8	101.9	101.6	102.0	102.2	101.8	101.3	100.9	101.1
W-4	17.1	14.1	Abandoned July 1986 in accordance with WAC 173-160-310					—	—	—	—	—	—	—	—	—
W-11	97.8	86.6	82.4	85.9	83.7	84.5	86.4	85.8	83.6	83.4	82.3	85.8	84.7	83.4	82.6	85.1
W-12	94.9	77.4	72.5	89.9	87.0	86.3	90.4	90.7	88.2	88.0	90.8	90.2	88.5	85.6	83.3	90.8
W-13	94.4	93.7	95.3	90.5	86.7	85.2	92.1	91.8	87.1	86.3	92.2	90.5	88.2	84.8	83.3	91.4
W-14	185.3	168.1	166.9	168.1	166.4	165.8	167.7	169.1	166.7	166.1	168.1	167.5	166.5	165.5	165.1	167.9
W-15	144.5	127.4	—	127.6	126.1	125.9	127.0	127.8	126.1	125.6	126.9	126.9	126.1	125.3	123.3	121.8
W-16	142.3	118.3[f]	90.7	90.9	90.6	90.9	90.7	91.2	91.1	91.1	91.0	91.1	91.0	90.9	90.7	90.7
W-17	131.9	87.3	—	85.8	85.0	84.7	84.0	85.3	84.7	84.0	84.3	84.5	83.9	83.1	82.3	82.7
W-21	97.7	—	—	93.6	92.8	93.1	96.3	96.0	93.1	94.2	96.5	94.5	93.6	92.5	93.6	94.5
W-22	93.8	—	—	93.5	91.7	92.1	94.3	94.4	92.1	92.4	94.5	93.9	92.2	91.0	91.7	94.0
W-23	94.6	—	—	92.3	89.6	88.9	93.9	93.9	89.8	90.2	93.8	95.5	90.8	88.4	88.4	92.7
W-24	151.9	—	—	116.6	116.6	116.8	116.7	117.2	116.6	116.5	116.5	116.5	116.5	116.4	dry	116.4
W-25	145.9	—	—	110.8	110.4	111.0	111.0	111.3	111.1	111.0	111.3	110.7	—	110.4	—	110.6
W-26	137.7	—	—	88.7	88.6	88.8	88.7	89.4	88.1	87.8	88.1	87.1	—	86.5	—	dry
W-31	191.0	—	—	—	—	—	—	—	174.9	173.3	176.4	176.6	174.4	172.7	170.4	175.7
W-32	145.8	—	—	—	—	—	—	—	105.2	106.6	107.8	108.0	107.6	107.2	106.7	106.7
W-33	138.1	—	—	—	—	—	—	—	88.5	88.2	88.1	87.1	86.9	86.6	86.2	85.7
W-41	121.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	116.8
W-42	99.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	81.6[h]
W-43	143.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	119.6
W-44	144.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	96.5
W-45	140.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	87.4
W-46	134.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	84.3
P-1	192.3	181.5	178.7	183.1	176.9	178.1	180.1	183.0	178.0	176.2	180.0	180.4	177.5	175.8	174.4	179.6
P-2	180.9	168.0	166.7	167.9	165.7	166.6	166.0	168.1	166.3	165.3	167.1	167.4	166.5	165.5	164.7	167.0
P-3	165.0	159.4	159.5	159.2	159.3	159.0	159.9	159.9	158.1	157.3	159.5	159.0	160.0	158.7	158.9	160.3
P-4	119.5	—	—	116.7	115.7	115.0	117.3	117.4	115.7	115.9	112.7	111.7	110.8	109.8	111.7	112.4
P-5	120.0	—	—	117.7	116.5	116.3	117.8	110.5	116.5	116.6	113.1	111.4	111.7	110.6	109.6	111.7
P-6	120.6	—	—	117.9	116.6	116.6	117.7	110.7	116.9	116.8	112.0	110.5	110.4	110.1	108.7	109.4
P-7	116.7	—	—	113.0	111.7	112.2	112.5	113.8	113.3	112.6	111.6	110.0	110.1	108.8	107.3	110.3
P-8	111.7	—	—	108.4	107.9	108.3	108.5	109.3	108.8	108.0	109.2	107.6	107.3	105.9	105.9	109.1
P-10(A)	121.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	119.2
P-10(B)	121.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	108.6
P-10(C)	121.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	97.9
P-10(D)	121.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	71.9
P-10(E)	121.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	44.8
P-11	97.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7.4
P-12(A)	95.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	94.3
P-12(B)	95.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	81.4
P-12(C)	95.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	76.5
P-12(D)	95.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	66.6
P-12(E)	95.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	37.5
P-13	93.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35.0
P-14	130.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	dry
P-15	129.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	86.4
P-16	137.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	dry
TP-1[g]	88.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	81.8

(a) Feet Above Mean Lower Low Water (MLLW).
(b) Ground surface elevations presented in this column reflect results of August 1986 survey.
(c) All ground water elevation measurements made from 14 March 1985 to date reflect the distance (or feet) between the top of the ground water surface and the uncorrected ground surface elevation.
(d) Ground water elevations made on 26 August and 21 October 1986 were based on relative distance from the top of the ground water surface to the corrected ground surface elevation.
(e) No measurements taken.
(f) This elevation measurement is an anomaly.
(g) Water level taken on 27 April 1988
(h) Measurement taken following development prior to recovery; not used to prepare water level contours.

TABLE 3-5

GROUND WATER FLOW VELOCITIES

Hydrogeologic Zone	Method of Determination	Hydraulic Conductivity cm/sec	Hydraulic Gradient[a]	Average Porosity[b]	Seepage Velocity (cm/sec)	Seepage Velocity (ft/yr)
East Land Treatment Facility						
Zone E-1	Mass Balance[c]	9.7×10^{-5}	0.042	0.38	1.1×10^{-5}	11
	Variable Head Test[d]	2.4×10^{-5}			2.6×10^{-6}	2.7
Zone E-2	Mass Balance[c]	2.5×10^{-7}			7.9×10^{-7}	0.81
	Variable Head Test[d]	6.9×10^{-8}	1.1	0.35	2.2×10^{-7}	0.22
Zone E-3	Mass Balance[c]	2.7×10^{-4}			6.6×10^{-6}	6.8
	Variable Head Test[d]	5.6×10^{-5}	0.01	0.41	1.4×10^{-6}	1.4
West Land Treatment Facility						
Zone W-2 (unsaturated)	Vertical[e]	5.2×10^{-7}	0.87	0.35	1.3×10^{-6}	1.3
Zone W-3 (unsaturated portion)	Vertical[e]	2.5×10^{-6}	0.98	0.38	6.4×10^{-6}	6.7
Zone W-3	Variable Head Test	2.6×10^{-4}	0.093	0.38	6.4×10^{-5}	66
Zone W-4	Vertical	1.5×10^{-7}	0.15	0.38	5.9×10^{-8}	0.06
Zone W-5	Variable Head Test	6.0×10^{-5}	0.083	0.37	1.3×10^{-5}	14

(a) See Sections 3.1.2.3 and 3.2.2.3.
(b) Appendix B
(c) Method described in Appendix C.
(d) Average hydraulic conductivity from Table 3-3.
(e) Appendix I.

TABLE 3-6

TIME OF TRAVEL

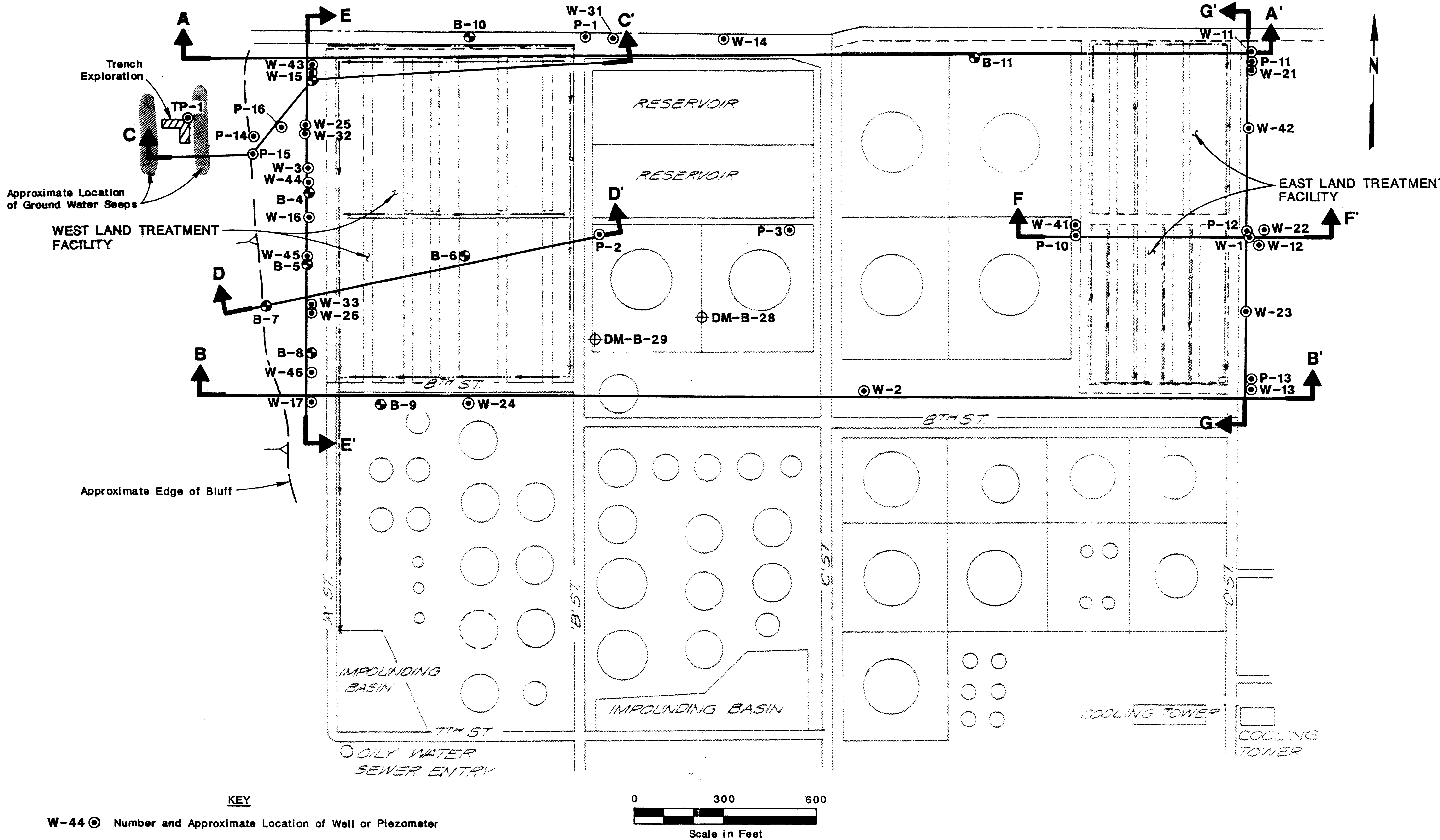
East Land Treatment Facility

Flow Path to Monitoring Wells Specified in Zone [a] [b]		Approximate Time of Travel to Down-gradient Monitoring Wells (years)	Approximate Time of Travel to Padilla Bay (years)
E-1	(mass balance method)	5	(c)
	(variable head method)	19	(c)
E-3	(mass balance method)	84	410
	(variable head method)	320	1900

West Land Treatment Facility

Flow Path [d]		Approximate Time of Travel to Down-gradient Monitoring Wells (years)	Approximate Time of Travel to Fidalgo Bay (years)
1	Zone W-3 Mon. Wells	11	39
2	Zone W-3 Mon. Wells	18	45
3	Zone W-3 Mon. Wells	260	290
4	Zone W-5 Mon. Wells	62	190

(a) See Section 3.1.2.4.
(b) Minimum and maximum values refer to mass balance and variable head test determinations of seepage velocity in Table 3-5.
(c) Flow net indicates that the flow path to Padilla Bay is not in Zone E-1, but is through Zone E-2 into Zone E-3.
(d) Flow paths are described in Sections 3.2.2.4 and shown graphically on Figure 3-22. Values reflect variable head hydraulic conductivity data only. Mass balance method not used for WLTF.



KEY

W-44 ◎ Number and Approximate Location of Well or Piezometer

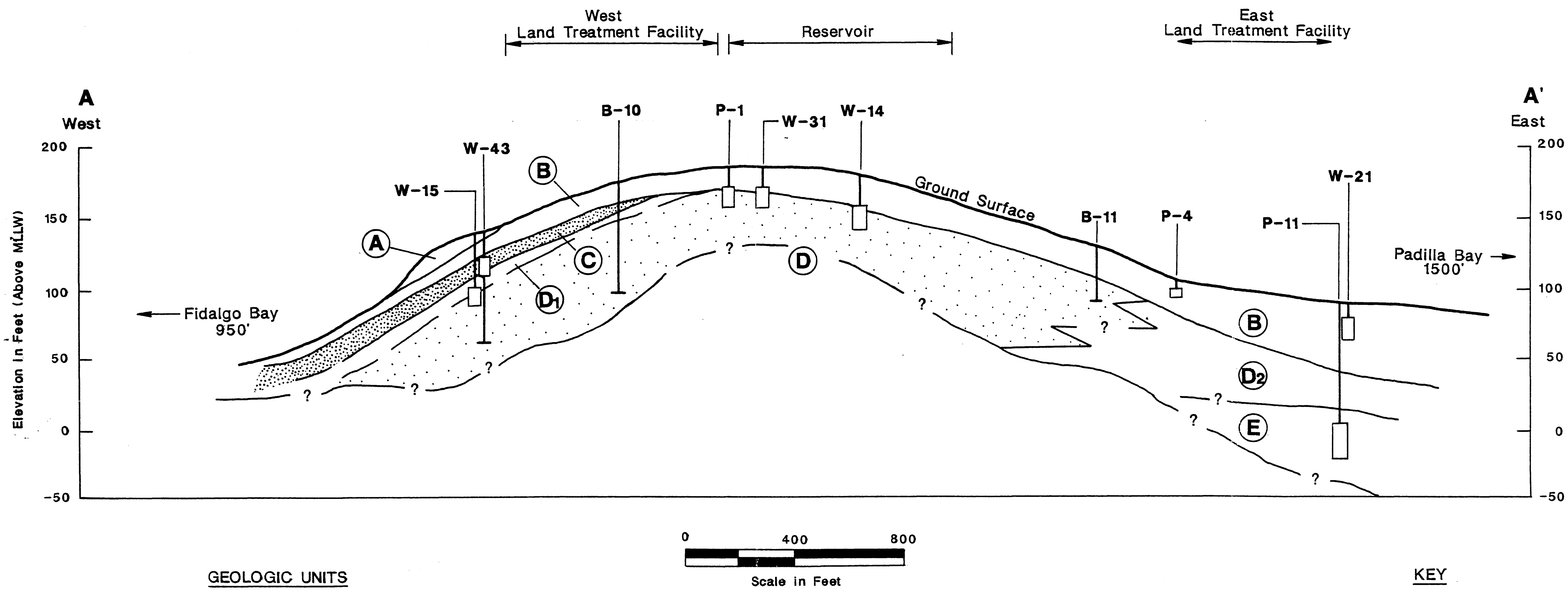
B-1 ◍ Number and Approximate Location of Soil Boring

DM-B-29 ⊕ Number and Approximate Location of Previous Soil Boring (Data from Texaco, 1986)

Approximate Location of Cross-Section

DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Site Plan With Cross Section Locations

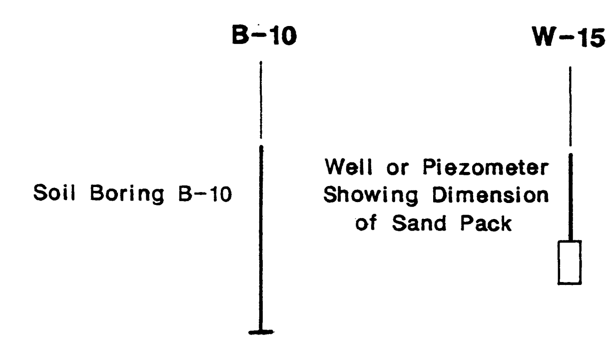
Figure 3-1



GEOLOGIC UNITS

A	Fill soil and (native) fine SAND
B	DIAMICTON (undifferentiated)
C	Brown fine to coarse SAND, minor GRAVEL
D	Interbedded gray SILT, CLAY, and fine SAND
D_1	Gray SILT, CLAY, and silty SAND (aquitard) member of Unit D recognized beneath WLTF
D_2	Laminated gray SILT and CLAY, with shells, no sand interbeds detected, ELTF stratigraphic equivalent of Unit D
E	Older brown CLAY with gray fine SAND lenses

KEY



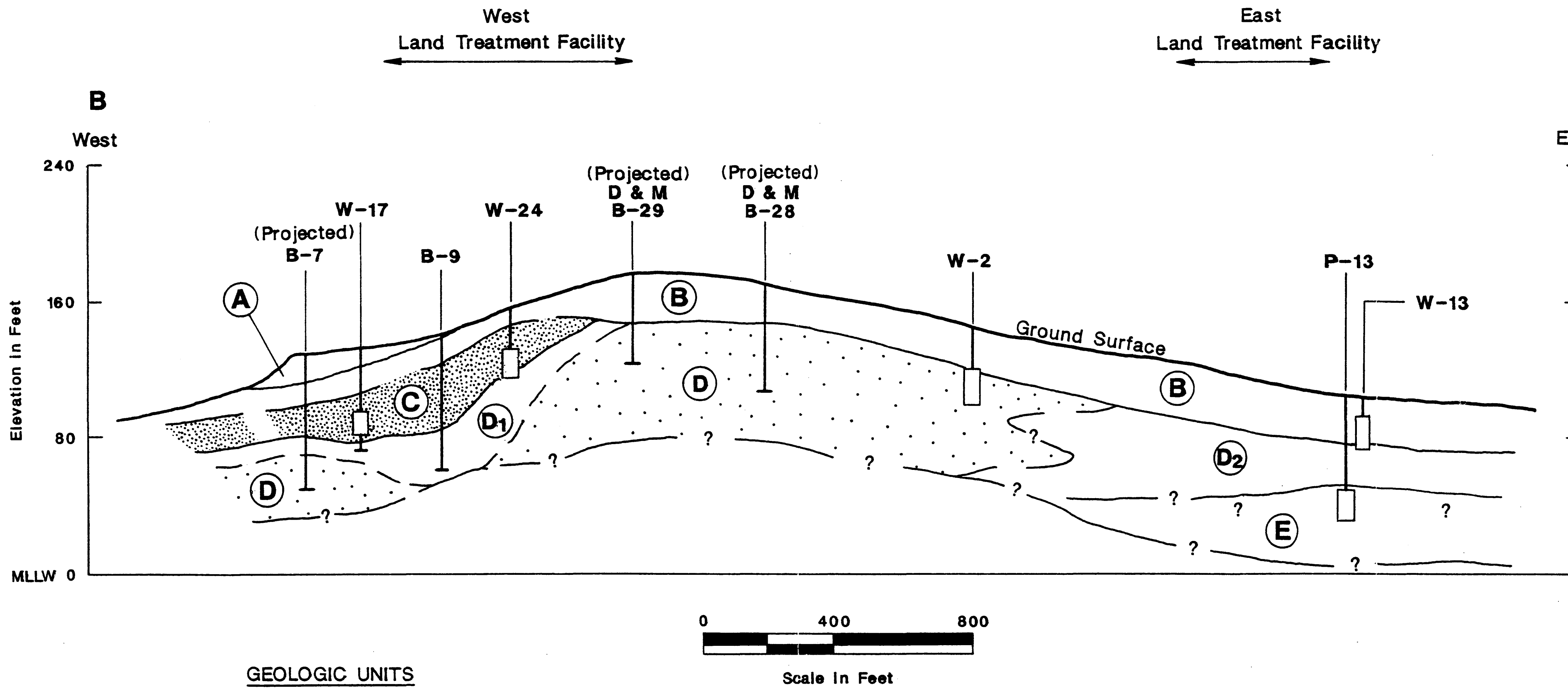
DATE
June 1988

TEXACO REFINING & MARKETING INC.
PUGET SOUND PLANT
ANACORTES, WASHINGTON

LANDAU ASSOCIATES, INC.

Geologic Cross Section A–A'

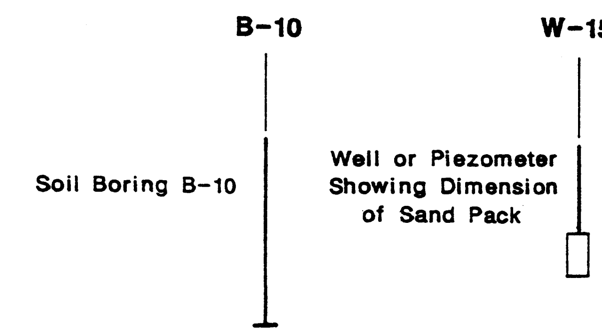
Figure 3–2



GEOLOGIC UNITS

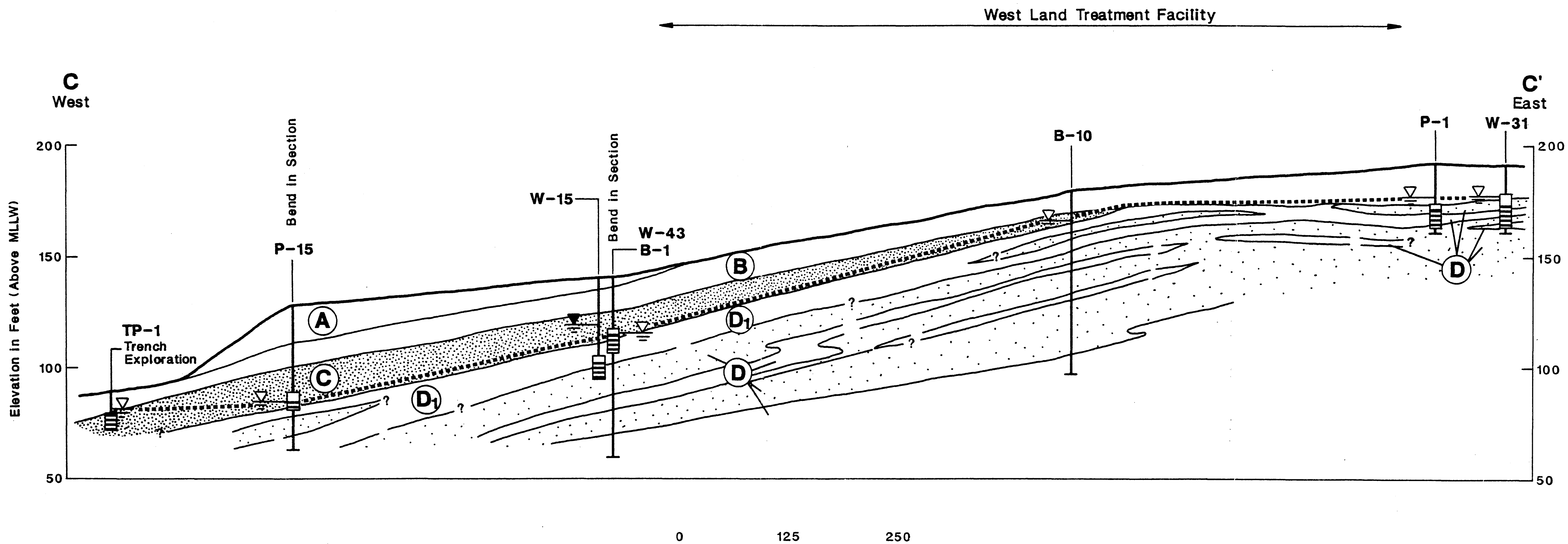
- (A) Fill soil and (native) fine SAND
- (B) DIAMICTON (undifferentiated)
- (C) Brown fine to coarse SAND, minor GRAVEL
- (D) Interbedded gray SILT, CLAY, and fine SAND
- (D_1) Gray SILT, CLAY, and silty SAND (aquitard) member of Unit D recognized beneath WLTF
- (D_2) Laminated gray SILT and CLAY, no sand interbeds detected with shells, ELTF stratigraphic equivalent of Unit D
- (E) Older brown CLAY with gray fine SAND lenses

KEY



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Geologic Cross-Section B-B'

Figure 3-3



GEOLOGIC UNITS

A	Fill soil and (native) fine SAND
B	DIAMICTON (undifferentiated)
C	Brown fine to coarse SAND, minor GRAVEL
D	Interbedded gray SILT, CLAY, and fine SAND
D1	Gray SILT, CLAY, and silty SAND (aquitard) Member of Unit D recognized beneath WLTF

KEY

B-10

Soil Boring B-10

W-15

Well or Piezometer Showing Dimension of Sand Pack

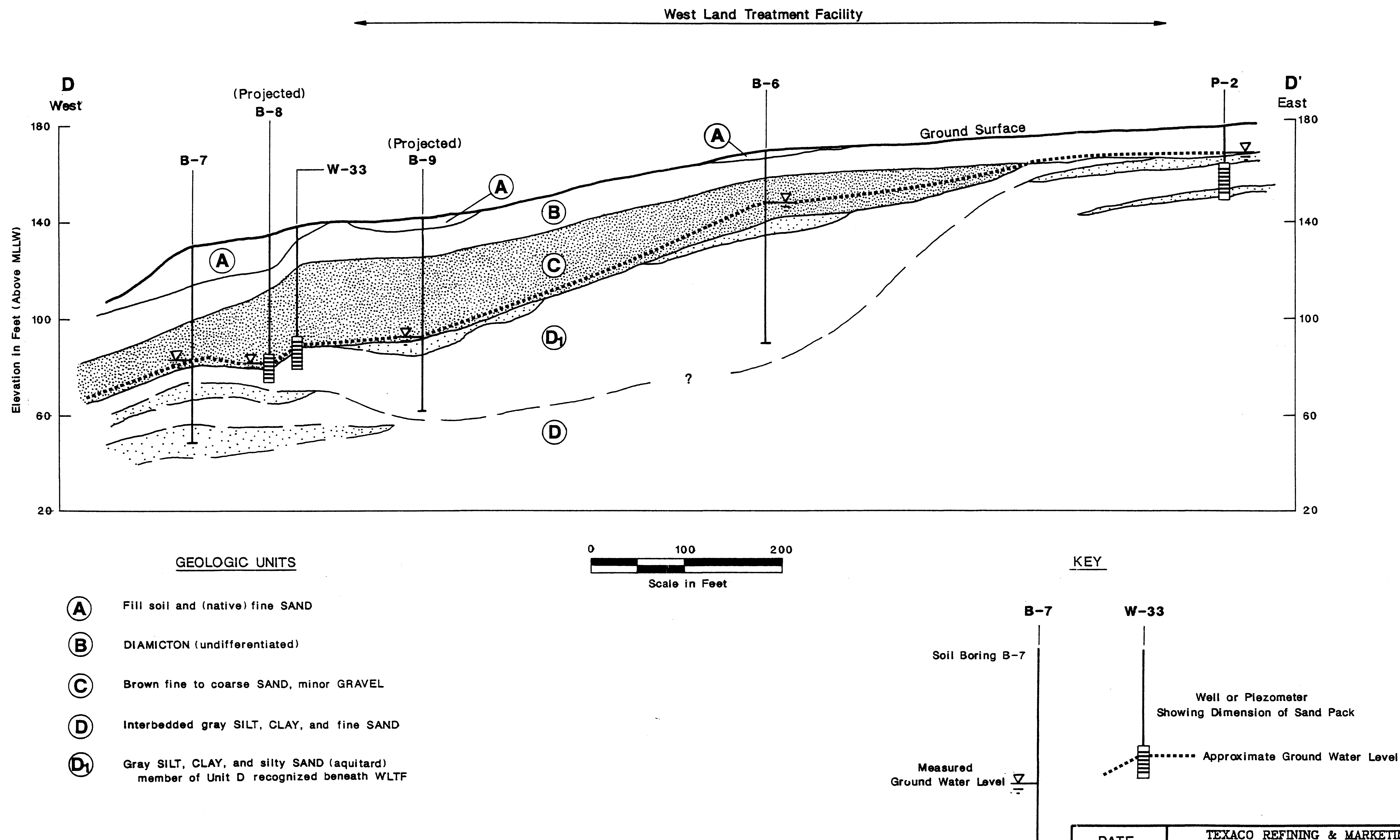
Approximate Ground Water Level

Measured Ground Water Level Upper Water Bearing Zone

Measured Ground Water Level Lower Water Bearing Zone

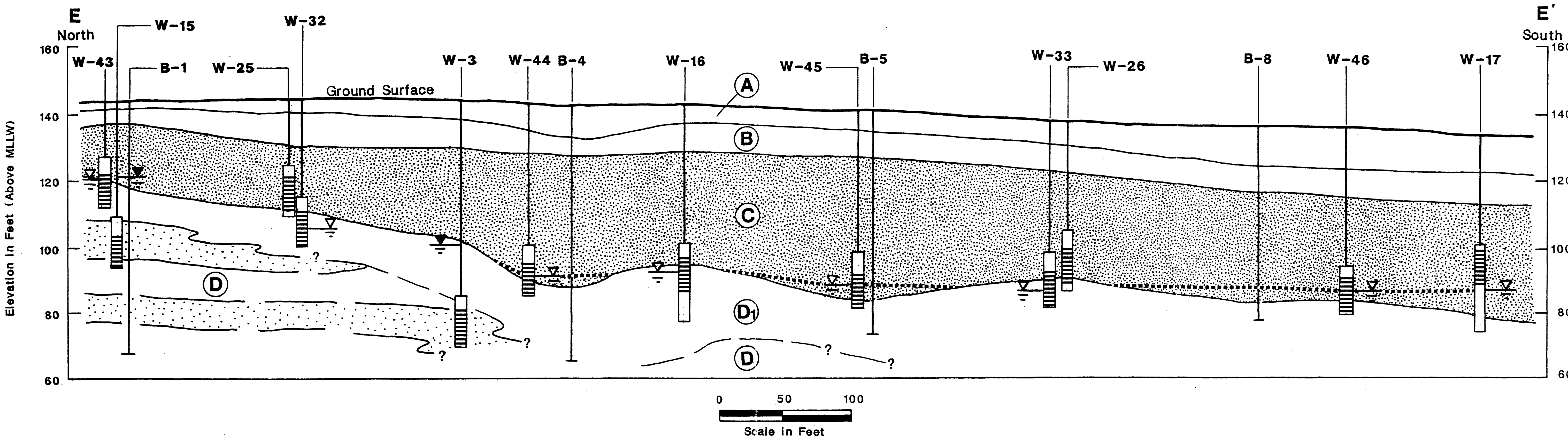
DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Geologic Cross-Section C-C' West Land Treatment Facility

Figure 3-4



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Geologic Cross Section D-D' West Land Treatment Facility

Figure 3-5



GEOLOGIC UNITS

A Fill soil and (native) fine SAND

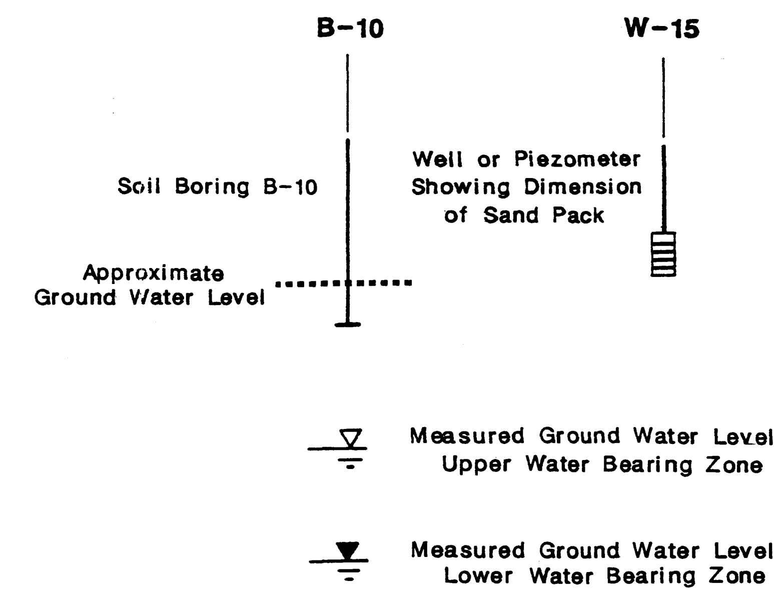
B DIAMICTON (undifferentiated)

C Brown fine to coarse SAND, minor GRAVEL

D Interbedded gray SILT, CLAY, and fine SAND

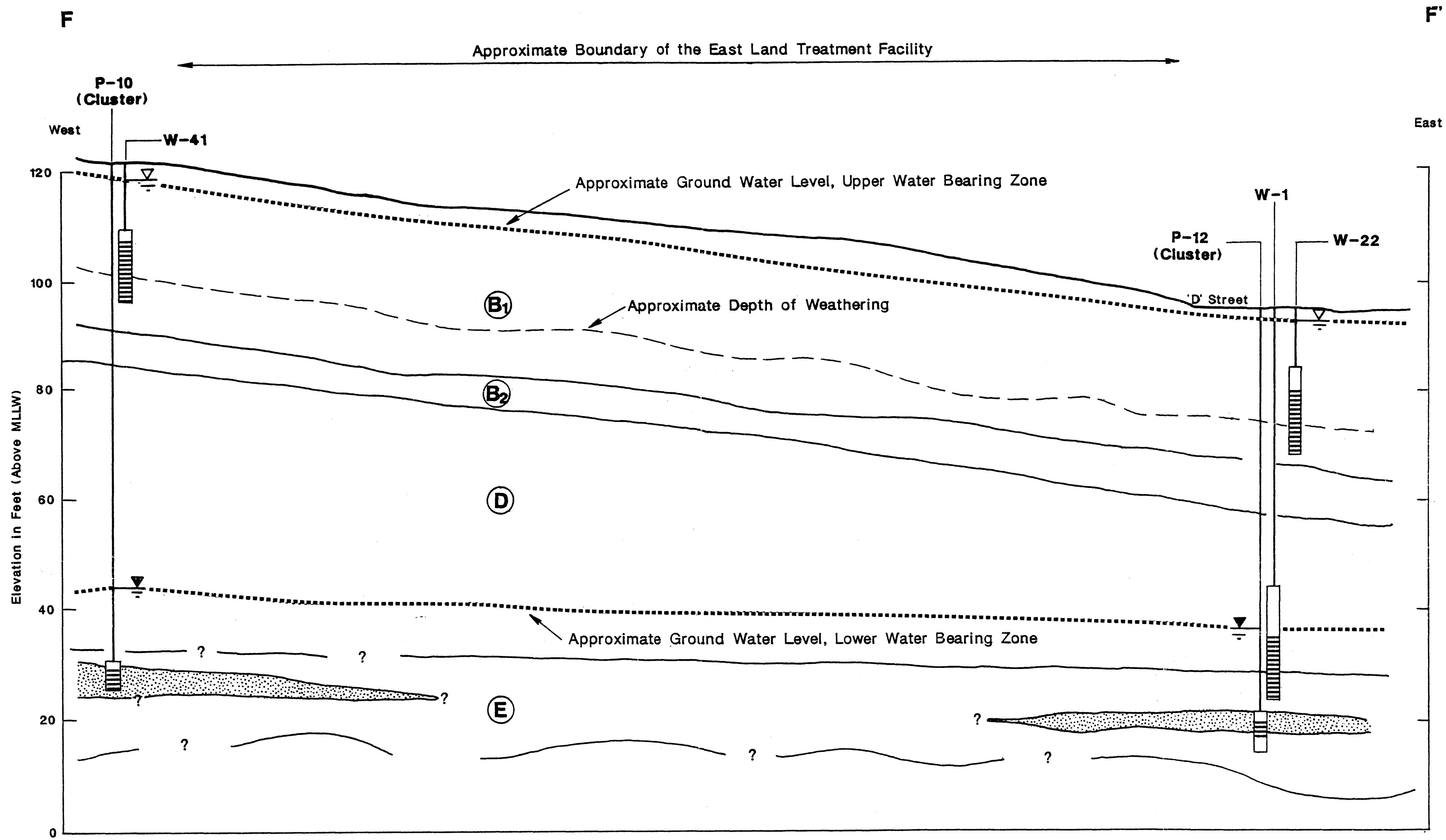
D1 Gray SILT, CLAY, and silty SAND (aquitard) member of Unit D recognized beneath WLTF

KEY



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Geologic Cross-Section E-E' West Land Treatment Facility

Figure 3-6



GEOLOGIC UNITS

- B_1 Brown to Gray Gravelly Silty CLAY
- B_2 Gray Gravelly Sandy Silt and Silty SAND
- D_2 Laminated gray SILT and CLAY, no sand interbeds detected with shells, ELTF stratigraphic equivalent of Unit D
- E Older brown CLAY with gray fine SAND lenses

0 50 100

Scale in Feet

KEY

B-10 Soil Boring B-10

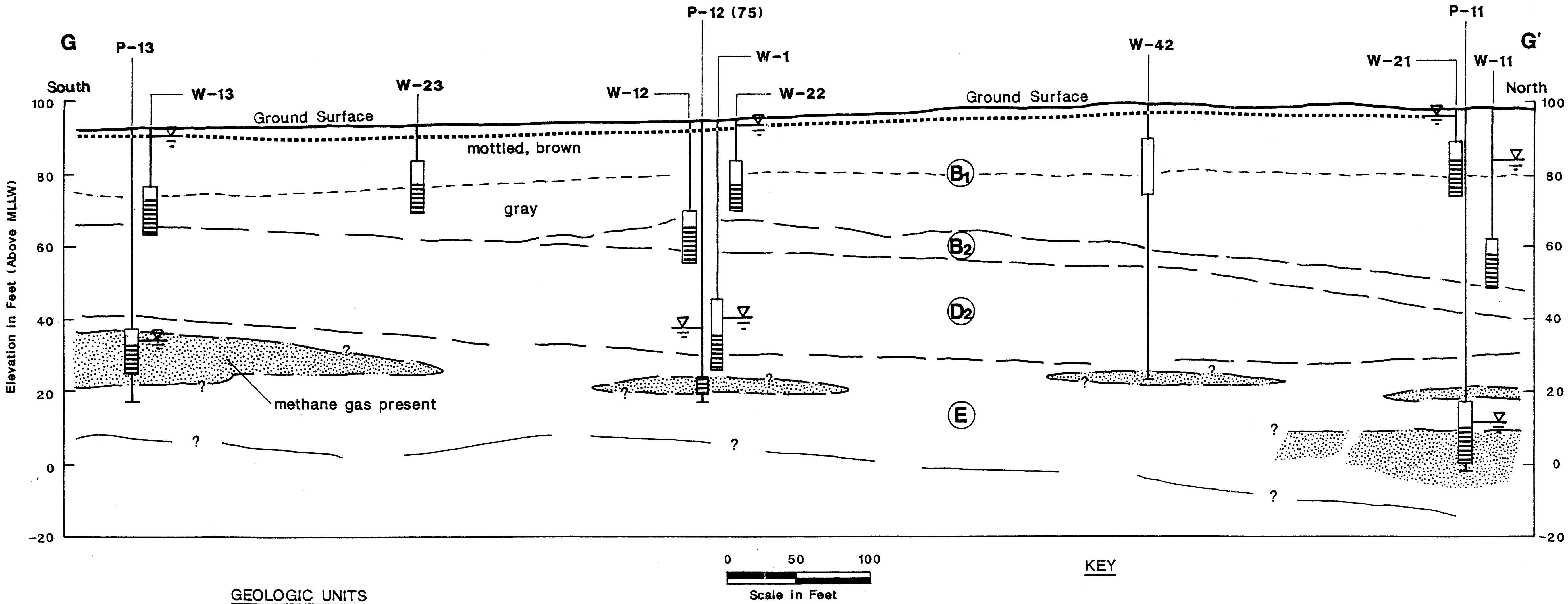
W-15 Well or Piezometer Showing Dimension of Sand Pack

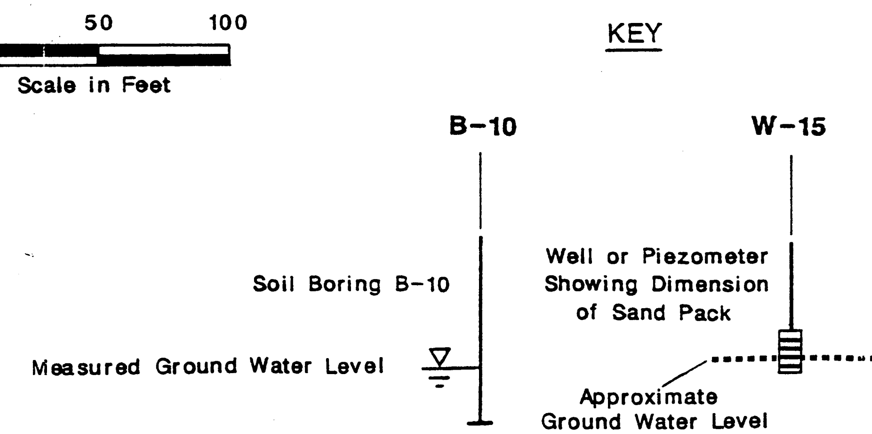
Measured Ground Water Level Upper Water Bearing Zone

Measured Ground Water Level Lower Water Bearing Zone

DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Geologic Cross-Section F-F' East Land Treatment Facility

Figure 3-7





GEOLOGIC UNITS

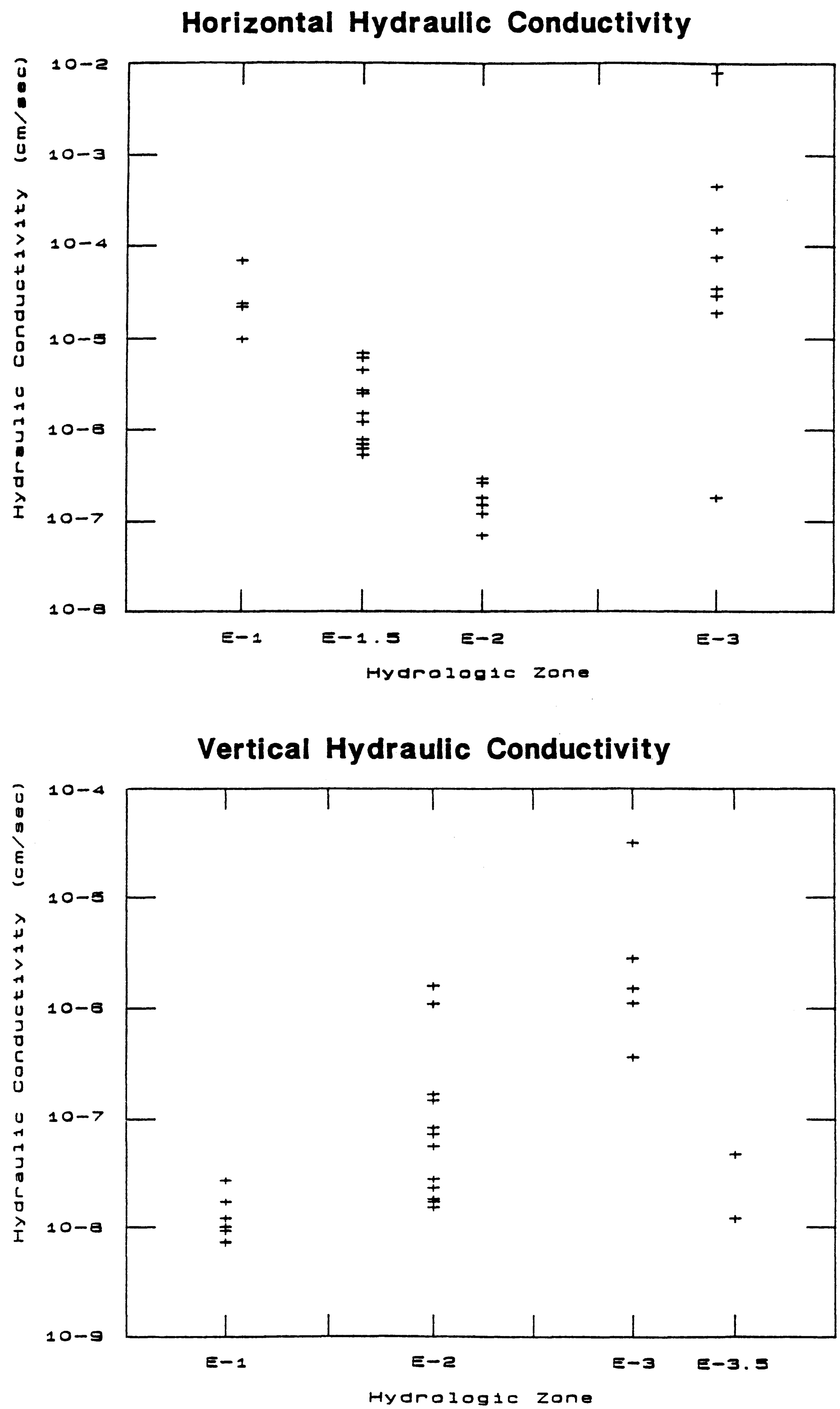
- B1 — Brown to Gray Gravelly Silty CLAY
- B2 — Gray Gravelly Sandy Silt and Silty SAND
- D2 — Laminated gray SILT and CLAY, no sand interbeds detected with shells, ELTF stratigraphic equivalent of Unit D
- E — Older brown CLAY with gray fine SAND lenses

DATE	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
June 1988	

LANDAU ASSOCIATES, INC.

Cross-Section G-G'
East Land Treatment Facility

Figure 3-8

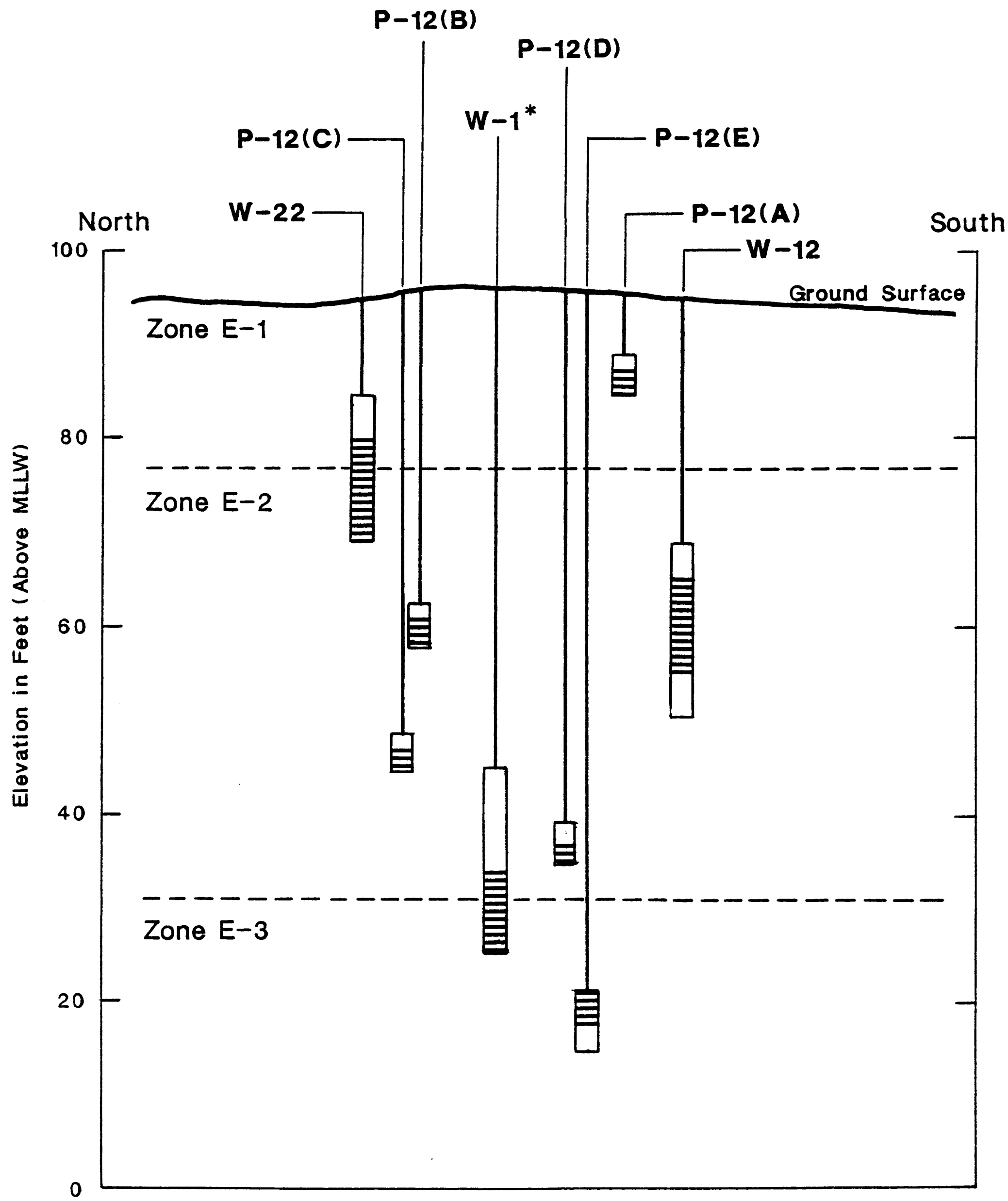


KEY

+ Hydraulic Conductivity Value

DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Hydraulic Conductivity East Land Treatment Facility

Figure 3-9



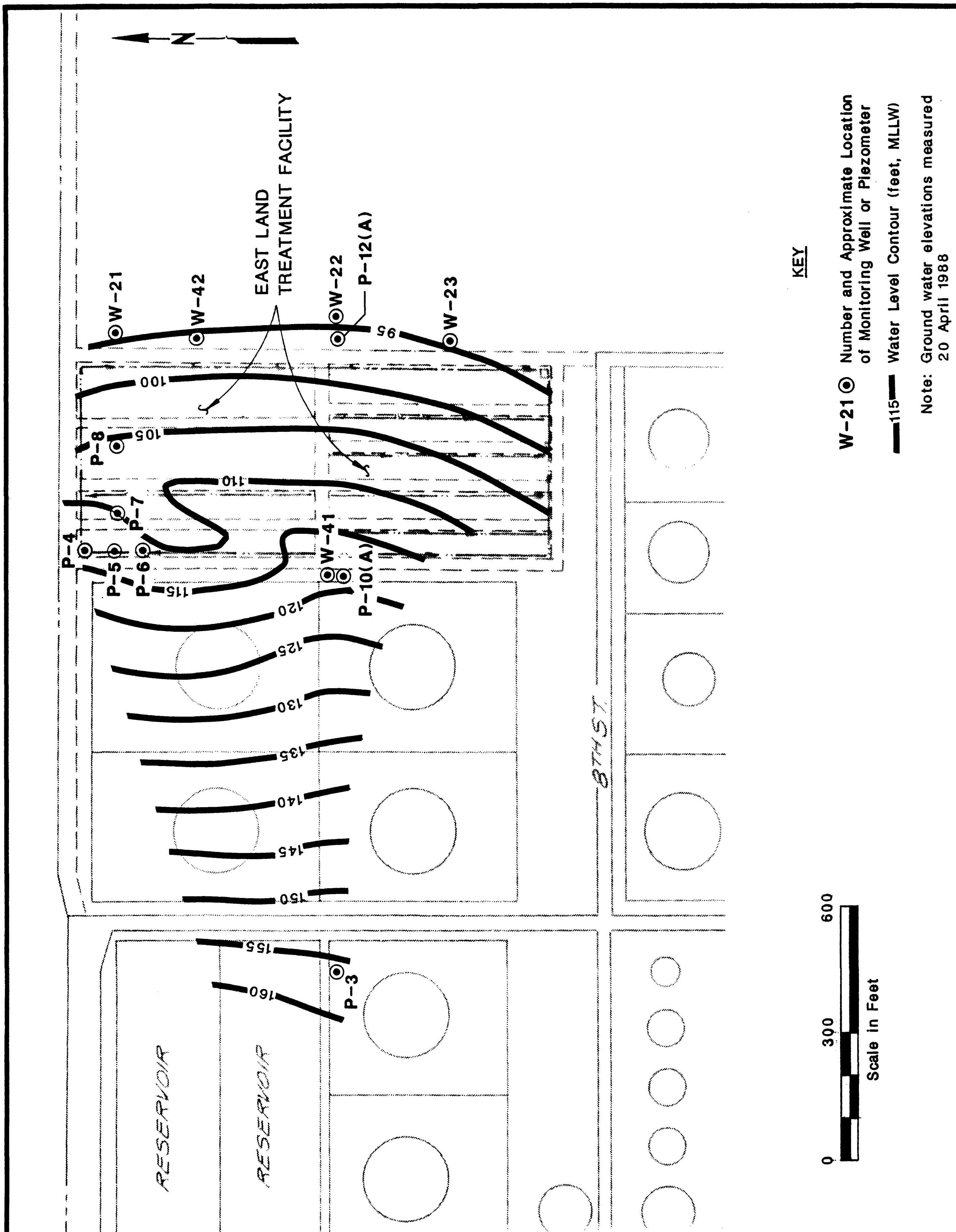
(SCHEMATIC DEPICTION - NOT TO SCALE)

* Pumping Well

NOTE: Please see Table 3-2 for Hydrologic Zone Designation.

DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Well W-1 Pumping Test, Observation Wells and Piezometers

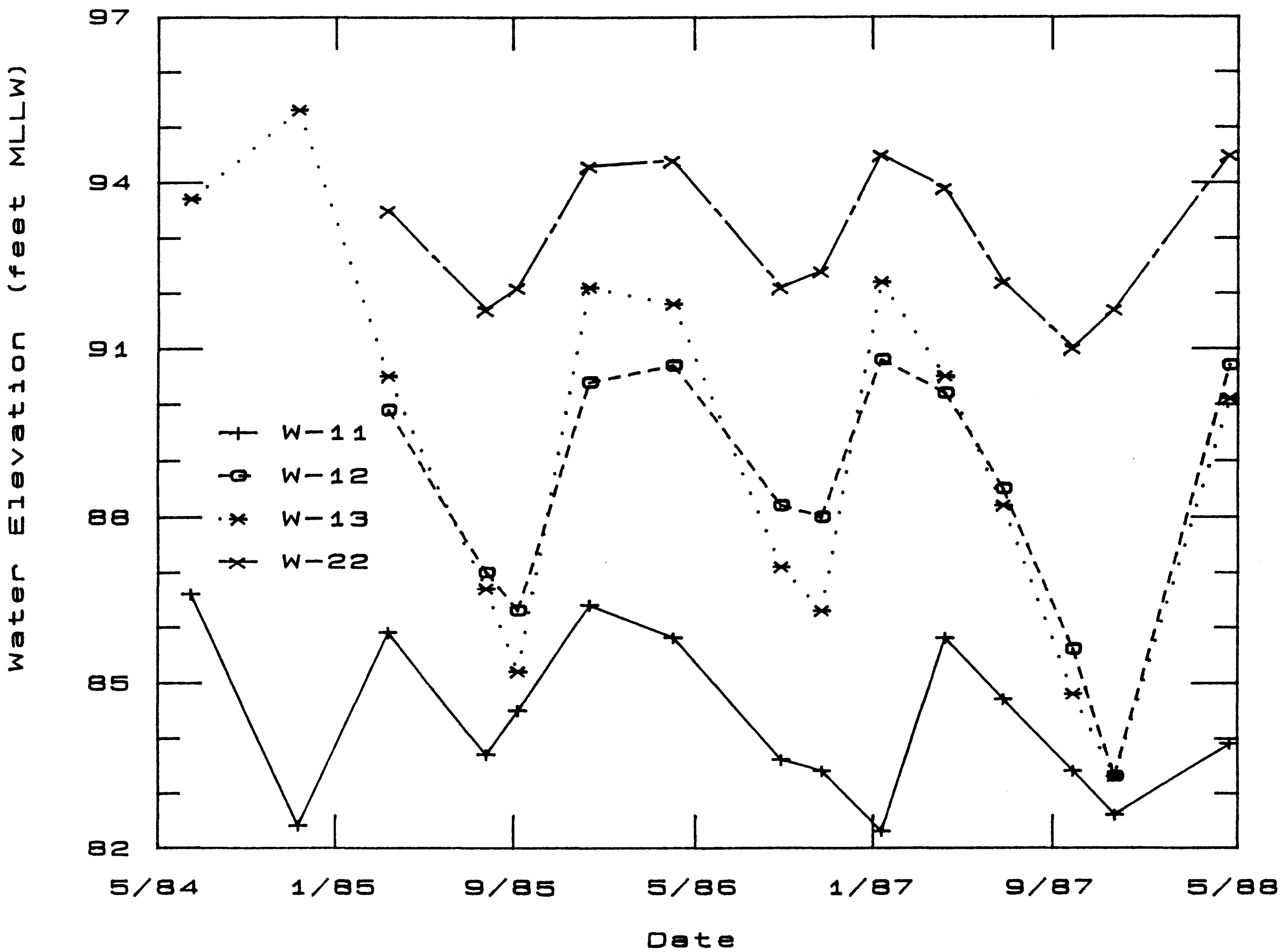
Figure 3-10



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Ground Water Level Contours, Zone E-1 East Land Treatment Facility

Figure 3-11

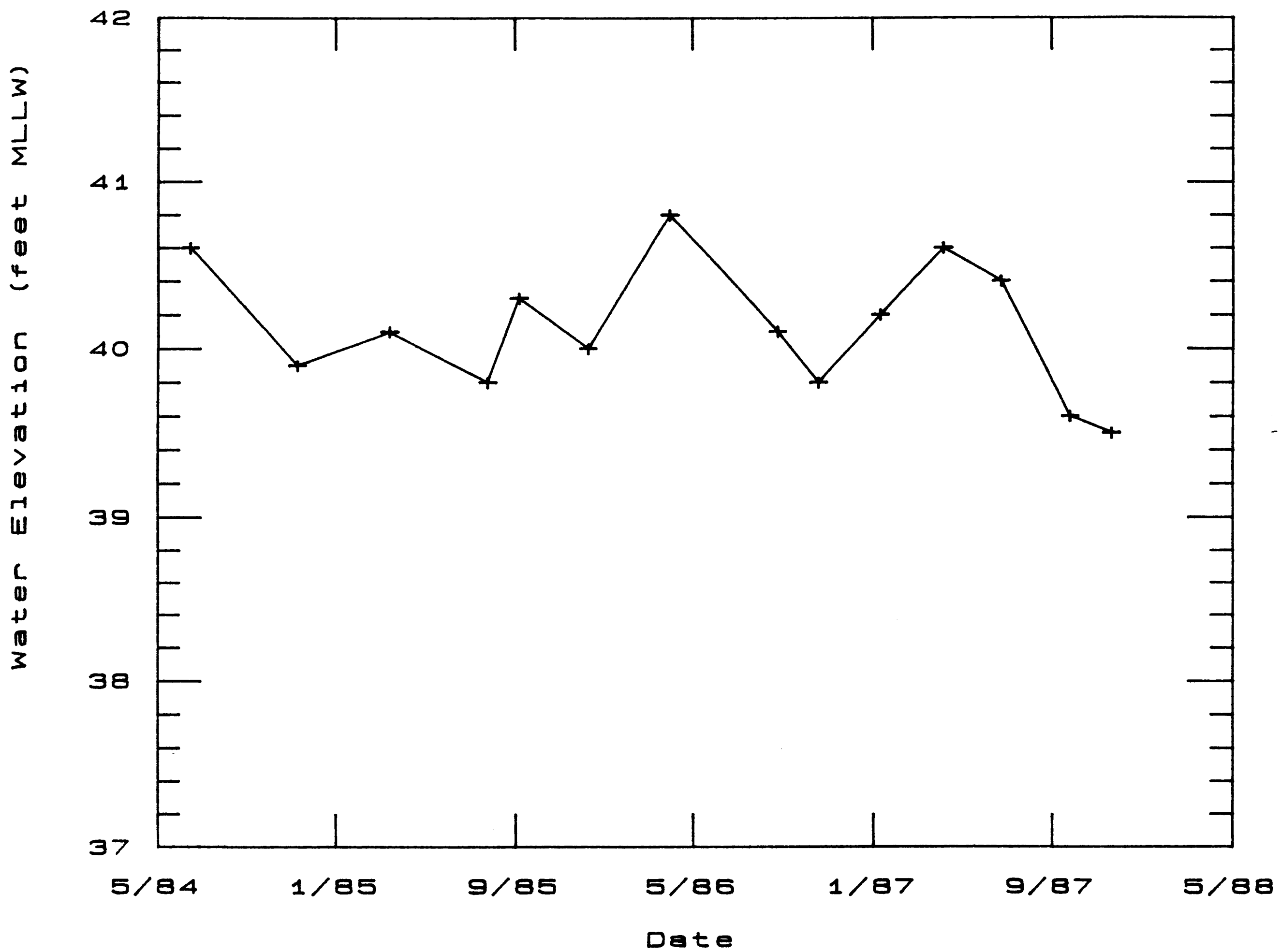
Wells W-11, W-12, W-13 and W-22



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Water Level Variation Wells W-11, W-12, W-13 and W-22

Figure 3-12

Well W-1

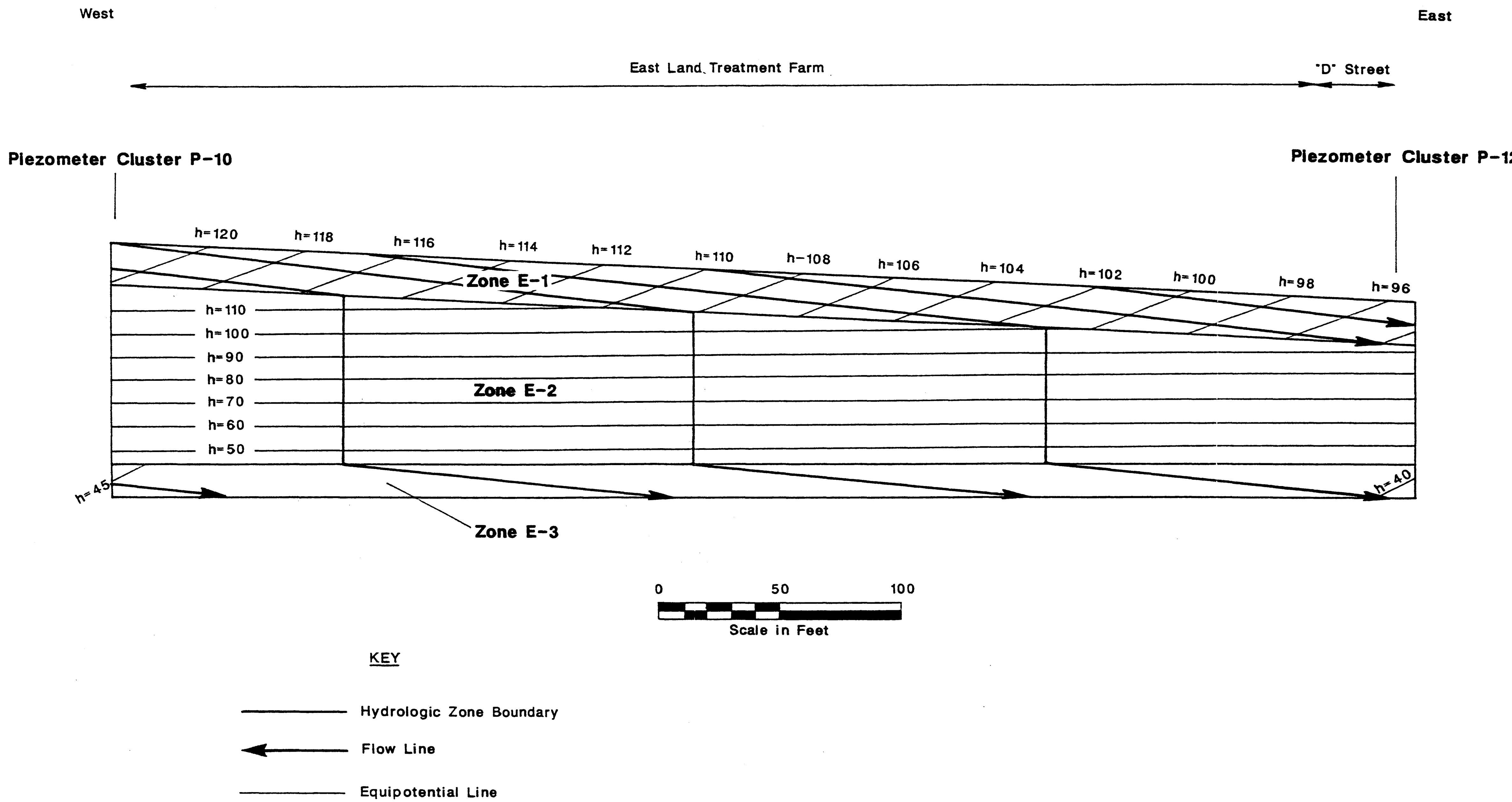


DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON

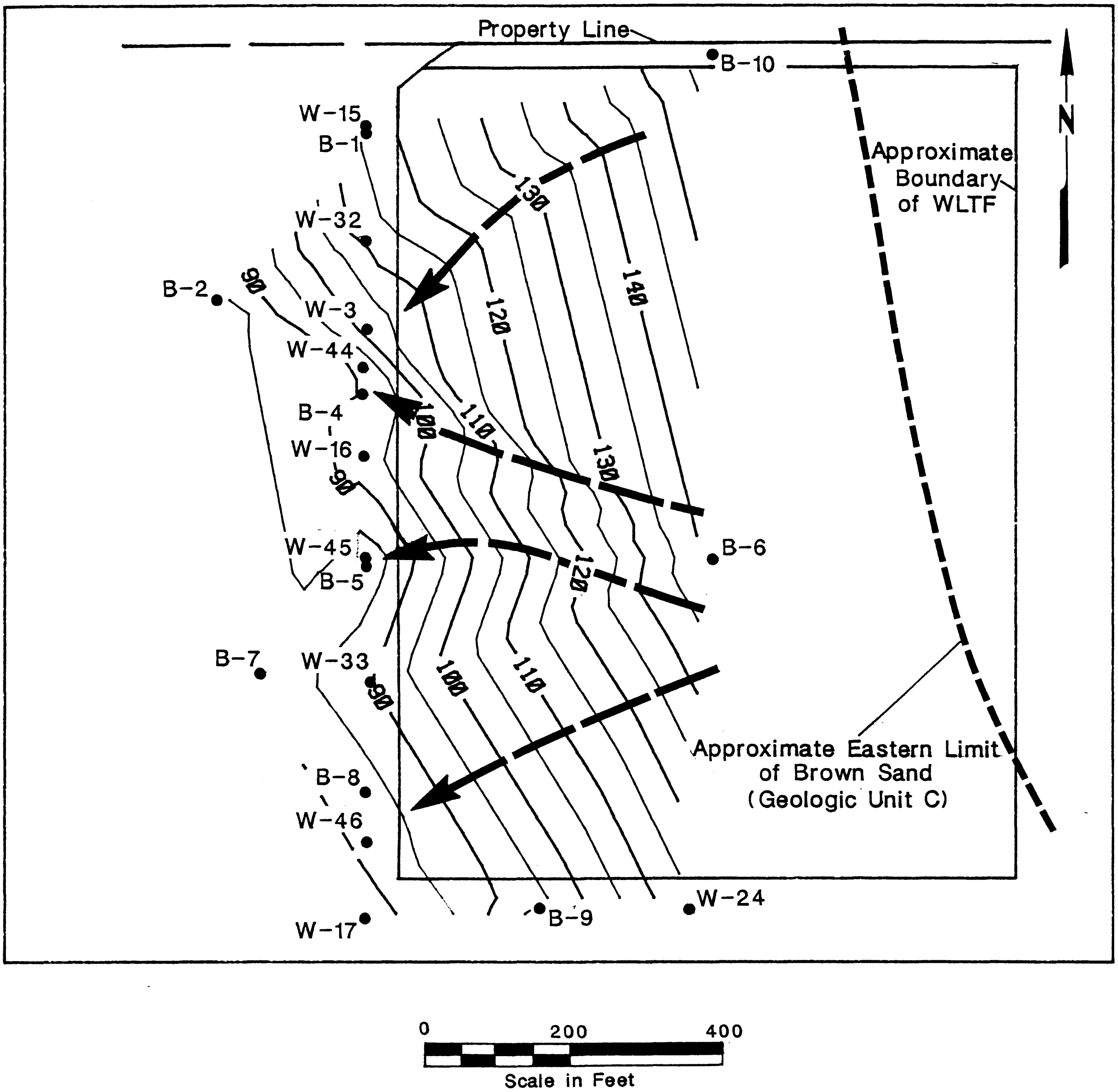
LANDAU ASSOCIATES, INC.

Water Level Variation
Well W-1

Figure 3-13



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Flow Net East Land Treatment Facility



KEY

B-10 Data Point

Contour-Controlled Seepage Path

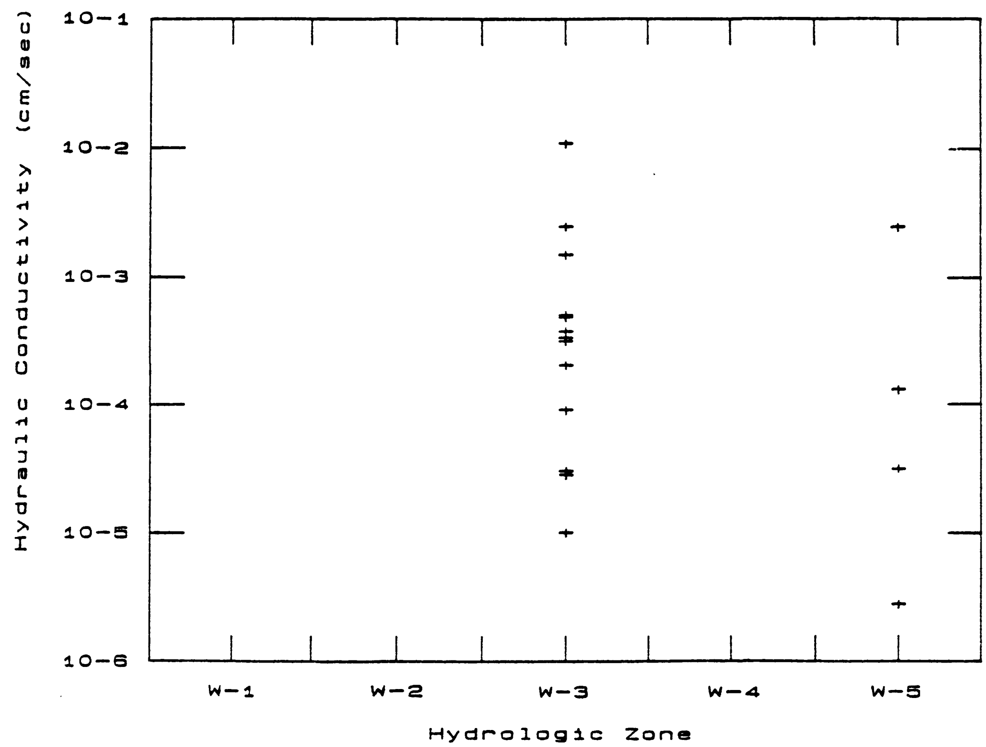
—140— Elevation Contour of Upper Surface of Geologic Unit D (Aquitard)

Note: Computer generated contours using linear interpolation between data points.

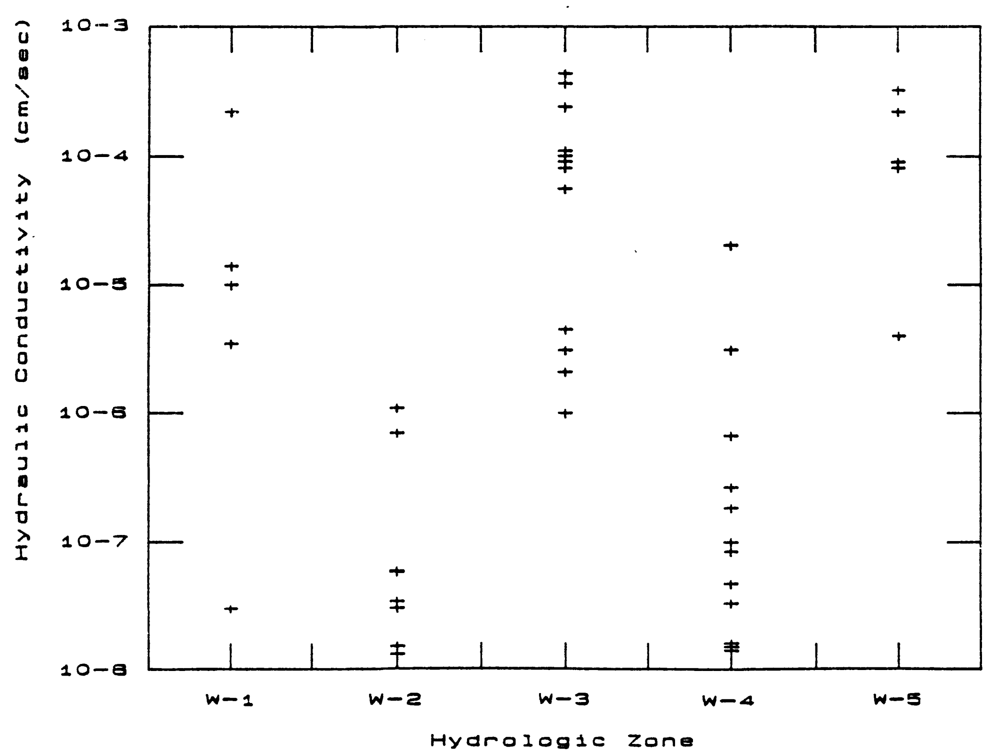
DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Contours of Upper Surface of Aquitard (Unit D) Underlying Brown Sand (Unit C)

Figure 3-15

Horizontal Hydraulic Conductivity



Vertical Hydraulic Conductivity

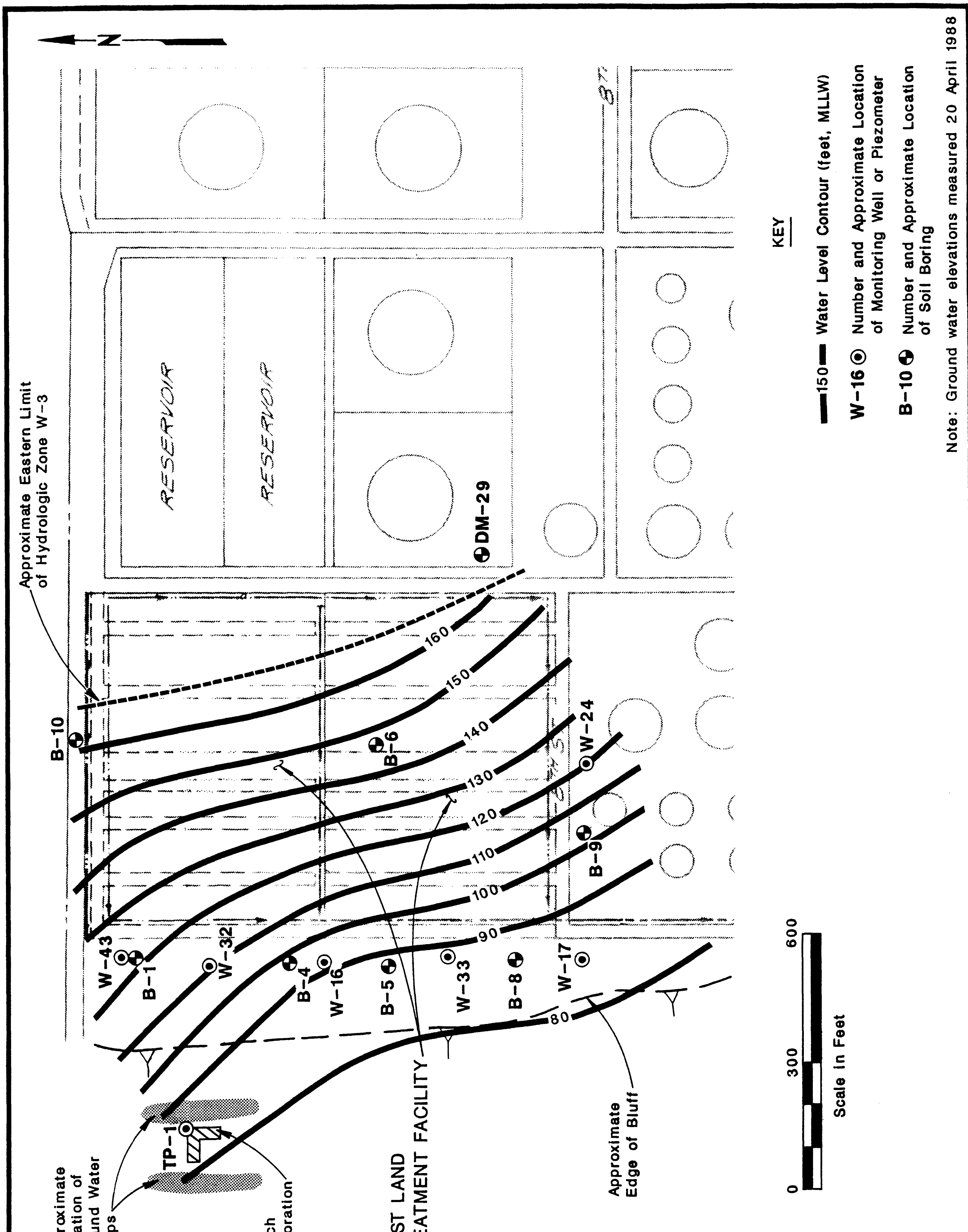


KEY

+ Hydraulic Conductivity Value

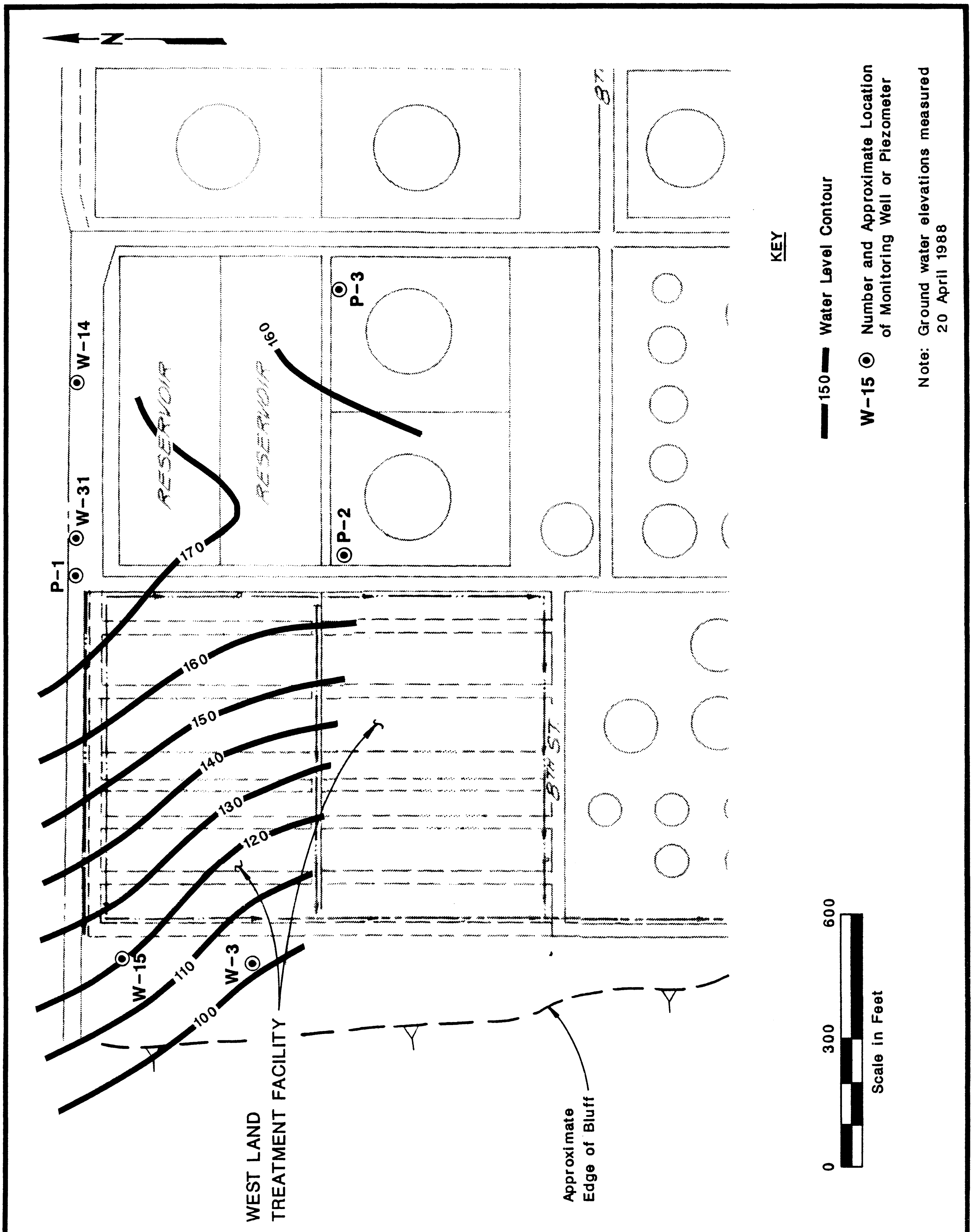
LANDAU ASSOCIATES, INC.	DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
	Hydraulic Conductivity West Land Treatment Facility	

Figure 3-16



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Ground Water Level Contours, Zone W-3 **West Land Treatment Facility**

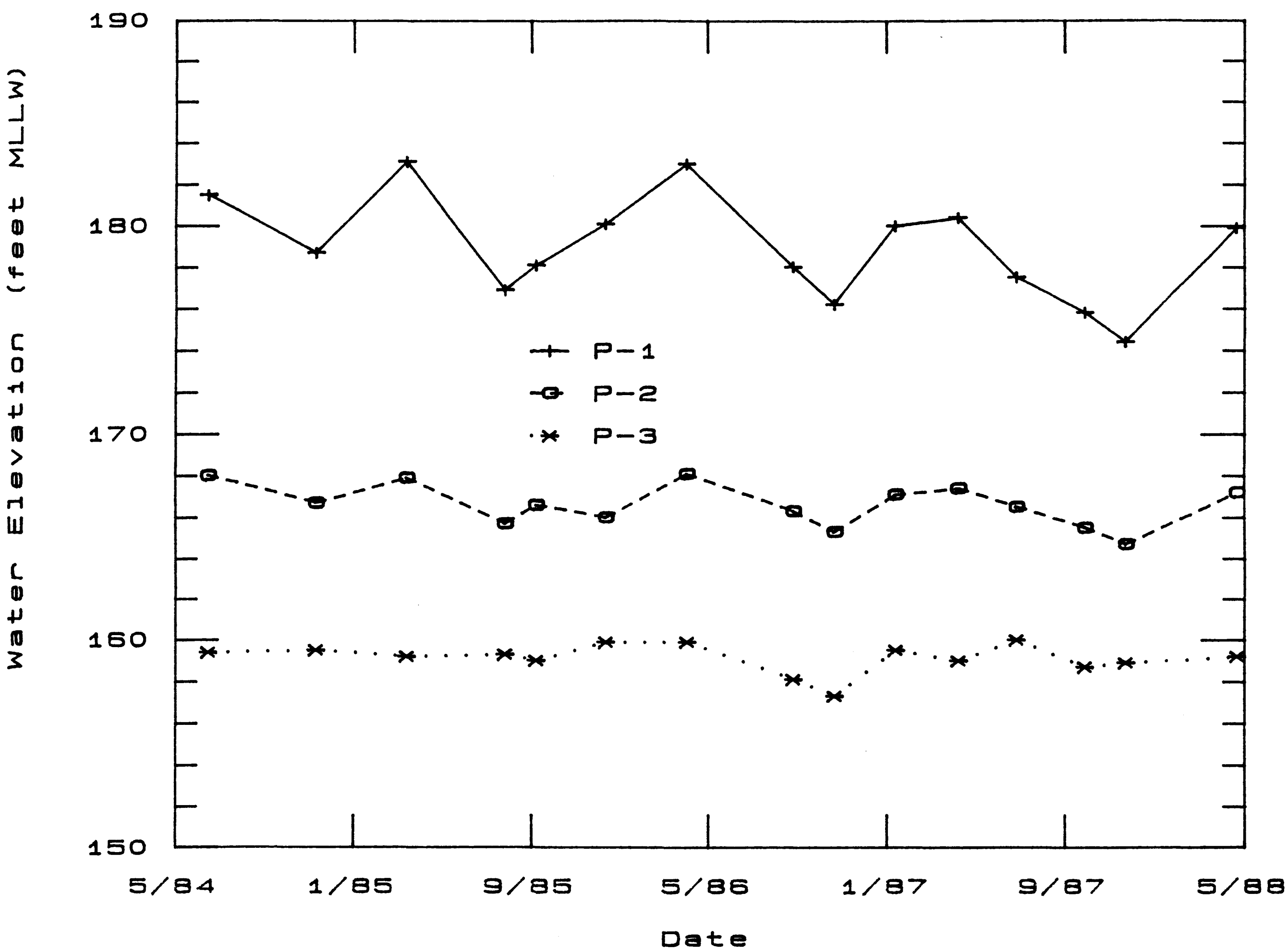
Figure 3-17



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Ground Water Level Contours, Zone W-5 West Land Treatment Facility

Figure 3-18

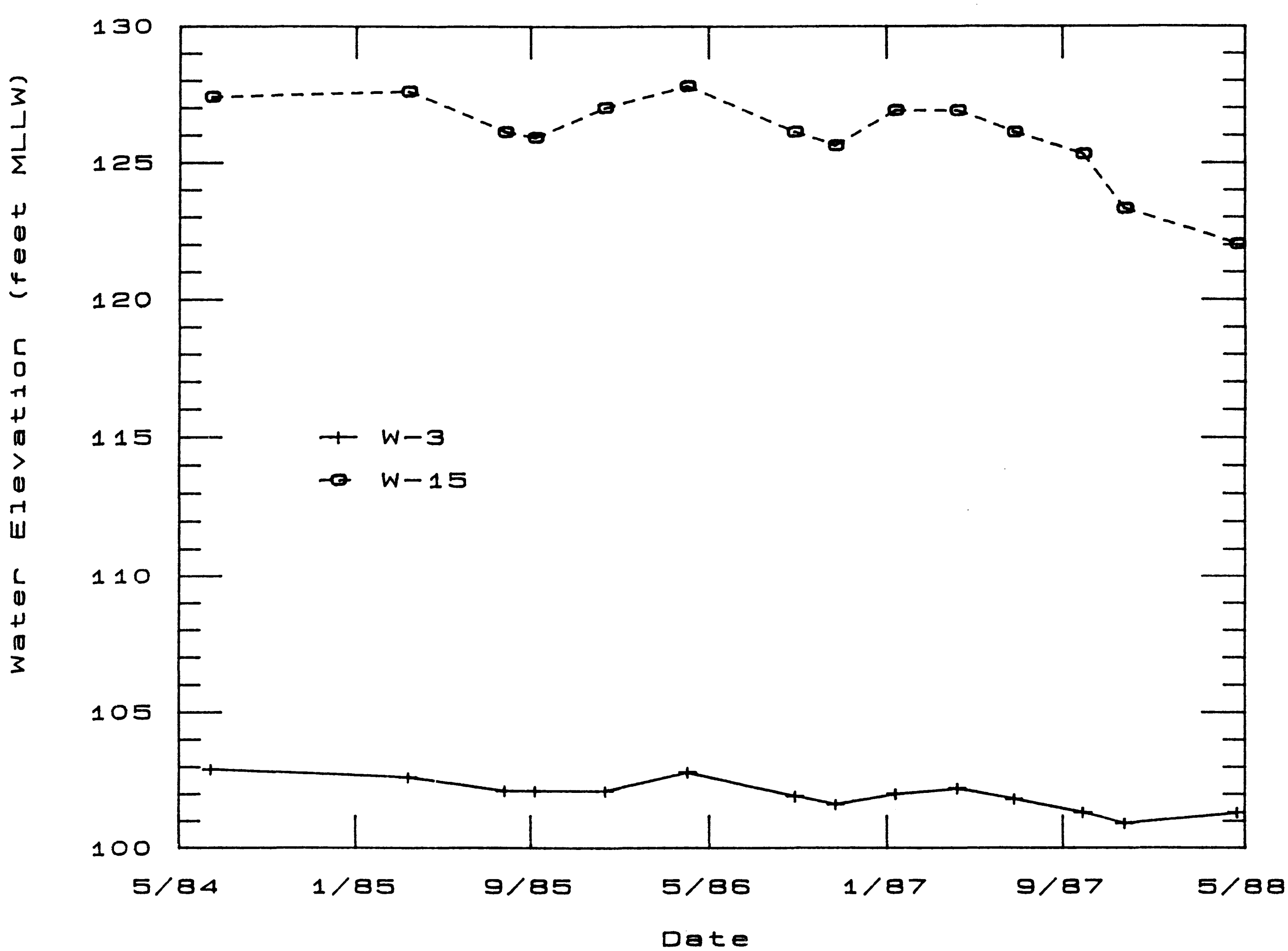
Piezometers P-1, P-2 and P-3



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Water Level Variation Piezometers P-1, P-2 and P-3

Figure 3-19

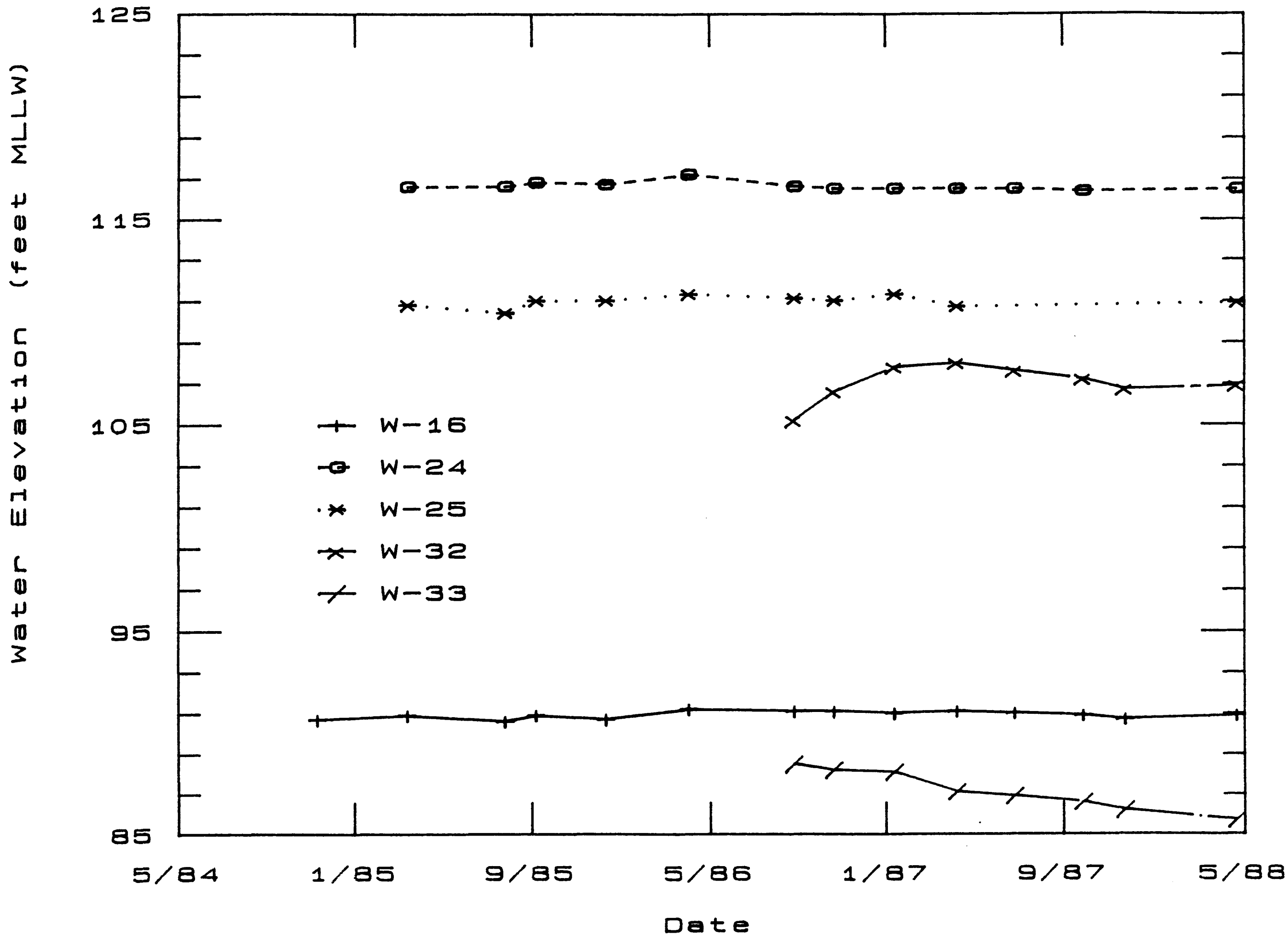
Wells W-3 and W-15



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Water Level Variation Wells W-3 and W-15

Figure 3-20

Wells W-16, W-24, W-25, W-32 and W-33



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Water Level Variation Wells W-16, W-24, W-25, W-32 and W-33

Figure 3-21

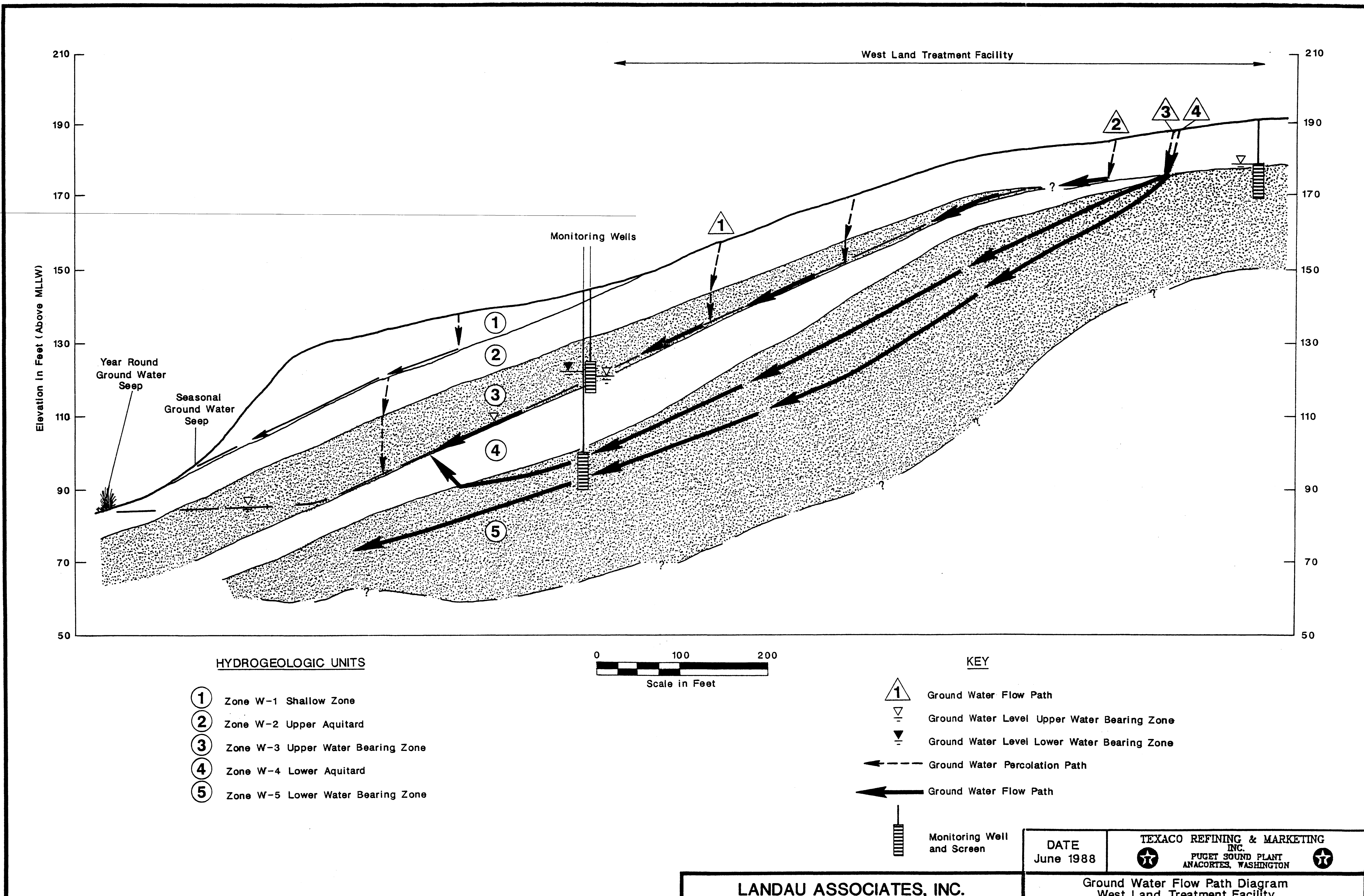

West Land Treatment Facility
Elevation in Feet (Above MLLW)
210
190
170
150
130
110
90
70
50
Monitoring Wells
Year Round Ground Water Seep
Seasonal Ground Water Seep
1
2
3
4
5
?
HYDROGEOLOGIC UNITS
1 Zone W-1 Shallow Zone
2 Zone W-2 Upper Aquitard
3 Zone W-3 Upper Water Bearing Zone
4 Zone W-4 Lower Aquitard
5 Zone W-5 Lower Water Bearing Zone
0
100
200
Scale in Feet
KEY
1 Ground Water Flow Path
Ground Water Level Upper Water Bearing Zone
Ground Water Level Lower Water Bearing Zone
Ground Water Percolation Path
Ground Water Flow Path
Monitoring Well and Screen
DATE June 1988
TEXACO REFINING & MARKETING INC.
PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.
Ground Water Flow Path Diagram
West Land Treatment Facility

Figure 3-22

SECTION 4

4.Ø MONITORING WELL SYSTEM

This section addresses specific monitoring issues identified in the Order and presents the monitoring networks recommended for the east and west land treatment facilities.

4.1 TECHNICAL ISSUES

The results of this investigation address specific hydrogeologic and monitoring issues, included in the Order, that were not directly addressed by the site characterization presentation in Section 3.Ø. These issues are:

- o Location of a new upgradient monitoring well (W-41) in the vicinity of the ELTF.
- o The completion depths of Wells W-3, W-15, and W-17.
- o pH conditions in Wells W-11, W-12, W-13, and W-14 with respect to their future use as monitoring wells.
- o As-built diagrams for Wells W-1, W-2, and W-3.
- o Disposition or abandonment of wells not planned to be used in the monitoring system.

The new upgradient well (W-41) for the ELTF was located to the west of the ELTF and adjacent to piezometer cluster P-1Ø. The completion depth (screen 15 to 25 feet) was guided by the results of a preliminary flow net analysis and time of travel to receptor calculations which indicated that ground water percolating through the ELTF would be intercepted by Zone E-1 downgradient monitoring wells about 15 times sooner than in wells in Zone E-3.

An examination of completion depths for Wells W-3 and W-15 indicated that the wells are screened in the WLTF lower water-bearing zone (Zone W-5). To provide monitoring capability in the upper water-bearing zone (Zone W-3). Wells W-44 and W-43 were installed near W-3 and W-15, respectively. Well W-17 was screened at a depth too shallow in Zone W-3 to intercept ground water that seasonally dropped below the bottom of the screened interval. Well W-46 was installed to the north of Well W-17, also within Zone W-3, but with the screen set at a lower elevation in order intercept ground water.

Wells W-11, W-12, W-13, and W-14 have had elevated pH, apparently associated with cement-bentonite grout near the well screen within a geologic formation of low permeability. A search was conducted for information published on the subject of using wells for ground water quality sampling which at one time had elevated pH, but have since stabilized. Elevated pH in monitoring wells related to cement grout was addressed in the literature; however, no discussion concerning the advisability of using wells after pH conditions have stabilized was identified. The discussion in Appendix A noted that a decline in the pH in one of the four wells, Well W-13, presented the possibility that it could be used for monitoring. The discussion in Appendix A identified the question that remains to be addressed of whether sufficient lag time has occurred following pH reduction to allow equilibration of chemical conditions in the well. Although use of Well W-13 for ground water monitoring is not proposed in this report, a method is presented to investigate equilibration (Appendix A) if use of W-13 is considered in the future.

General monitoring well design information was provided following installation of Wells W-1 through W-4 in 1981; however, no specific as-built diagrams were prepared for these wells. The construction information is important to determine which water-bearing zone is sampled by each well, and whether any zones may be interconnected by well construction. Well construction drawings were prepared using conservative interpretations of design and construction information. For example, an assumption that the gravel pack extends up to 10 feet above the top of the screen (Figures A-20 through A-23) permits the "worst case" condition to be evaluated. The diagrams indicate which soils are monitored by the wells (screen and gravel pack) and that no water-bearing zones are interconnected.

The Order required that the disposition of certain wells (and piezometers) not planned to be used within the ground water monitoring network be determined at the time the monitoring wells in the network were identified. Monitoring wells not planned for use in ground water quality sampling can still provide useful piezometric data. Therefore, no monitoring wells are recommended for abandonment.

Most piezometers installed during this study can also continue to provide data useful in defining ground water flow rate and direction. Piezometers installed during this study that are recommended for abandonment are Piezometers P-14, P-15, P-16, and the temporary piezometer (TP-1) which was installed in the backhoe trench. Piezometers should be abandoned in accordance with Washington State minimum standards for construction and maintenance of monitoring wells (WAC 173-163).

4.2 RECOMMENDED MONITORING WELL SYSTEMS

4.2.1 East Land Treatment Facility (ELTF)

The flow paths identified on Figure 3-14 and travel times in Table 3-6 indicate that ground water beneath the ELTF will arrive at monitoring wells in approximately 5 to 20 years in hydrogeologic Zone E-1, and will take approximately 15 times longer to reach monitoring wells in hydrogeologic Zone E-3. Although the flow net suggests that the probable flow path to Padilla Bay is in Zone E-3, ground water must first pass through Zone E-1. Therefore, the times of travel and flow path indicate that Zone E-1 is the preferred zone for detection monitoring.

The time of travel is one factor in assessing the coverage of the monitoring well network. Other factors include the distribution of potential contaminants, and the characteristics of the water-bearing zone. Ground water contours (Figure 3-11) for Zone E-1 indicate that flow is easterly. Therefore, wells which will be used to monitor upgradient or background conditions are preferably located to the west of the ELTF, and downgradient monitoring wells must be located to the east of the ELTF.

The ELTF can be considered an areal source of potential contamination with approximately uniform distribution of constituents. Ground water quality monitoring since 1981 has detected no contamination. Data suggests that ground water movement in the shallow water-bearing zone (Zone E-1) is through a system of closely spaced and approximately uniformly distributed weathered fissures, rather than along discreet paths of preferential flow. Therefore, if contaminants were migrating with ground water in

Zone E-1, they would be expected to be diffuse. The spacing of Wells W-21, W-22, W-23, and W-42, which are located downgradient of the ELTf and screened within Zone E-1 provide adequate detection monitoring coverage of an areal source for these hydrogeologic conditions.

Monitoring wells which will be used to provide background data are Wells W-2 and W-41 (Figure 4-1). Detection monitoring wells within Zone E-1 downgradient of the ELTF are Wells W-21, W-22, W-23, and W-42. These wells will comprise the detection monitoring system for the ELTF.

4.2.2 West Land Treatment Facility (WLTF)

The flow paths identified on Figure 3-22, and travel times presented in Table 3-6, indicate that ground water infiltrating through the WLTF to Zone W-3, the uppermost water-bearing zone, will reach the point of compliance within approximately 10 to 15 years, approximately 5 times faster than in the lower water-bearing zone, Zone W-5. The flow paths, and extent of Zone W-3, beneath approximately 80 percent of the WLTF suggest that constituents migrating with ground water would be detected in Zone W-3. The times of travel and flow paths indicate that Zone W-3 is the preferred zone for detection monitoring.

Hydrologic Zone W-3 is saturated only near the base. Contours of the upper surface of the Zone W-4 aquitard indicate that gravity controlled ground water flow within Zone W-3 will be channeled by "troughs" in the upper surface of the aquitard. Ground water monitoring within Zone W-3 must concentrate on "troughs" and not on "high" areas where the ground water levels drop below the upper surface of the lower aquitard. Wells W-44, W-45, and W-46, installed during this investigation, were placed in the areas of ground water channeling identified by soil borings.

Ground water contours in Zone W-3 indicate that ground water flow is towards the west-southwest. Upgradient or background monitoring wells are preferably located to the east of the WLTF, and downgradient monitoring wells should be located to the west and south of the WLTF.

Geologic Unit C, and hence hydrologic Zone W-3, does not extend to the east of the WLTF. Therefore, Wells W-2 and W-31 screened in the uppermost water-bearing zone to the east of the WLTF (Zone W-5) will be used to provide data on background conditions. Downgradient monitoring wells in Zone W-3 that will comprise the detection monitoring system (Figure 4-2) are Wells W-24, W-43, W-44, W-45, and W-46. The times of travel for water migrating from the WLTF through Zones W-3 and W-5 to monitoring wells, indicate that ground water monitoring in the lower water-bearing zone, Zone W-5 should be considered only if contamination is detected in Zone W-3.

* * * * * * *

Respectfully submitted,

LANDAU ASSOCIATES, INC.

By:

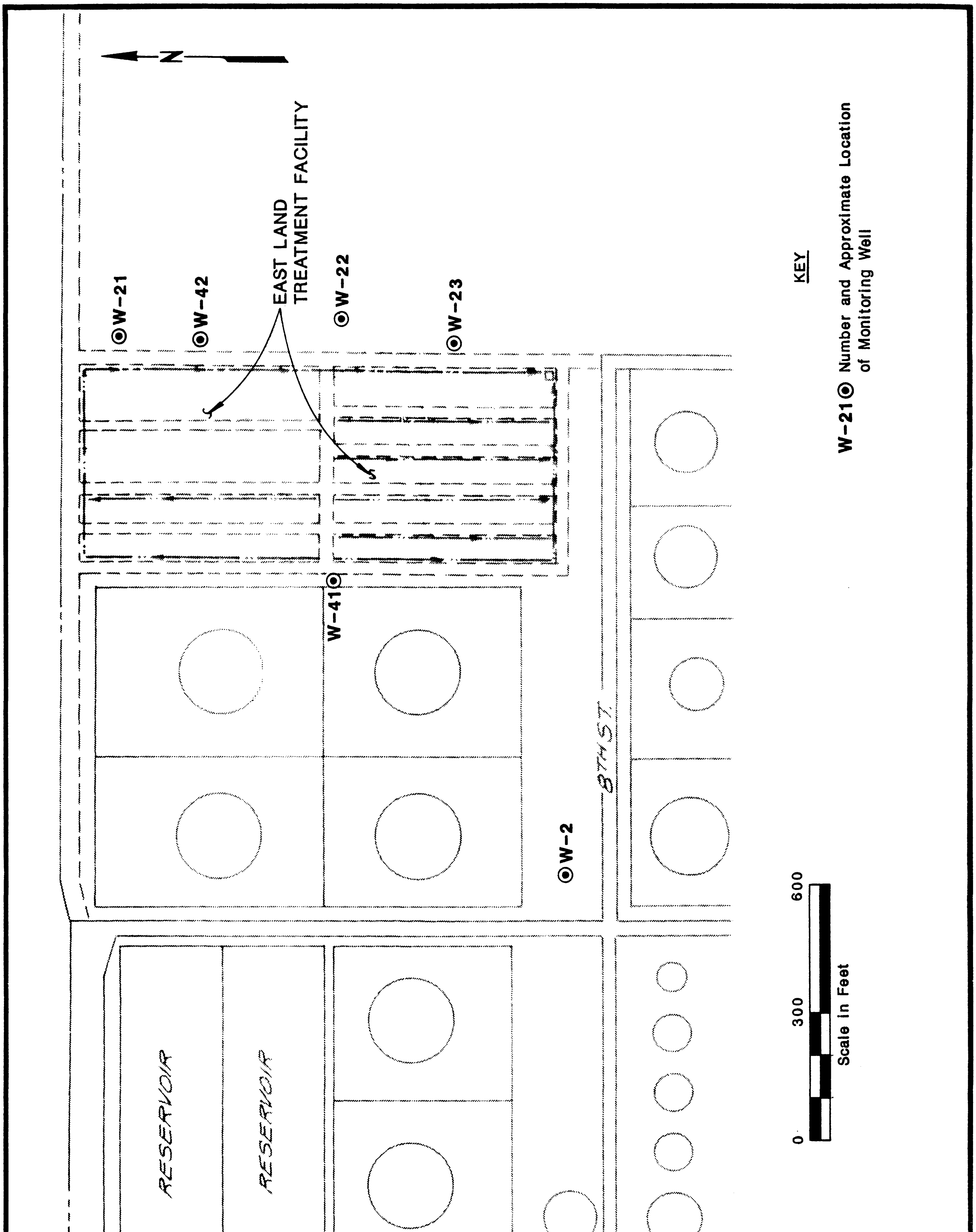
Henry G. Landau

Henry G. Landau, Ph.D., P.E.

Brian F. Butler

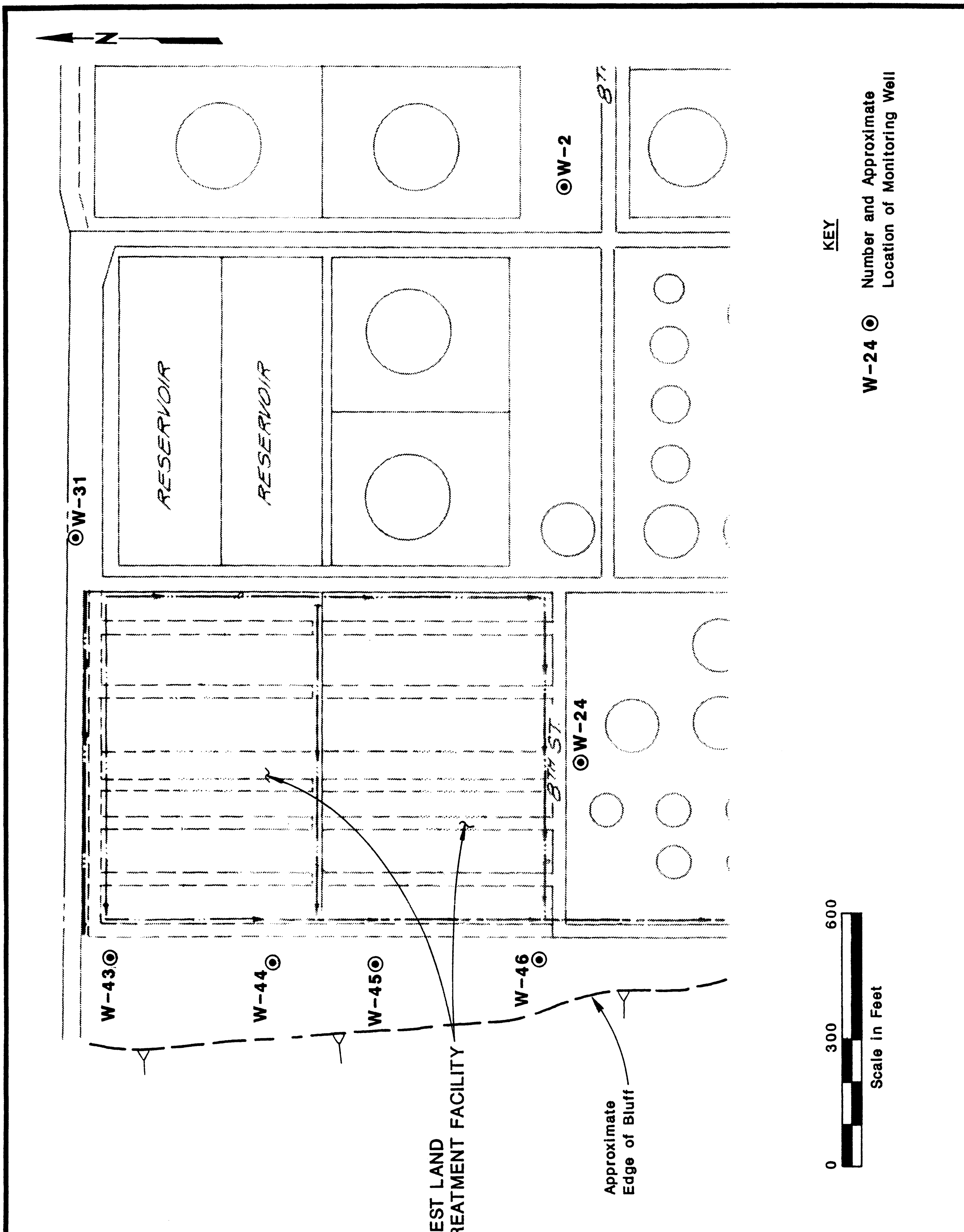
Brian F. Butler

HGL/BFB:ss
No. 27-Ø6.Ø1



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Monitoring Well System East Land Treatment Facility

Figure 4-1



DATE June 1988	TEXACO REFINING & MARKETING INC. PUGET SOUND PLANT ANACORTES, WASHINGTON
LANDAU ASSOCIATES, INC.	Monitoring Well System West Land Treatment Facility

Figure 4-2

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REFERENCES

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__________, 1987. Order No. DE 87-292.

APPENDIX D

Groundwater and Soil-Pore Water Monitoring Report

whatcom ENVIRONMENTAL
soil | water | air
compliance consulting
228 East Champion Street, Suite 101
Bellingham, WA 98225
tel 360.752.9571 | fax 360.752.9573
www.whatcomenvironmental.com

May 24, 2018

Mr. Gary Barklind
Shell Oil Products USA
8505 South Texas Road
Anacortes, WA 98221

RE: SWMU-55 Groundwater and Soil-Pore Water Monitoring Results

Mr. Barklind:

Whatcom Environmental Services has completed groundwater monitoring at the Solid Waste Management Unit 55 (SWMU-55) site located at the Shell Puget Sound Refinery (PSR). Shell PSR is located at 8505 South Texas Road in Anacortes, Washington (Figure 1). Groundwater samples were collected from two downgradient groundwater monitoring wells at SWMU-55 (W-24 and W-46). Monitoring well locations are shown on Figure 2. The groundwater wells at SWMU-55 are monitored annually per Section V.B of the PSR Permit for Land Treatment of Dangerous Waste (Permit).

Soil-pore water samples were collected from lysimeters L90-13 and L90-16E (shown on Figure 2). Soil-pore liquid samples are collected annually per Section V.B of the Permit.

Groundwater Sampling Methods

Groundwater samples were collected from wells W-24 and W-46 in 2018 using Environmental Protection Agency (EPA) approved methods. Well W-24 was sampled using the low-flow sampling technique, recommended and approved by the EPA. A YSI Model 556 multi probe meter was used in conjunction with a flow-through cell to monitor groundwater chemistry during the low-flow purging process. Purging was considered adequate and groundwater samples were collected when the water chemistry parameters had stabilized.

Well W-46 was collected using a bailer as the sample pump was inoperable at the time of sampling. A volume of water greater than three times the amount of water present in the well was bailed from the well prior to sample collection in accordance with EPA requirements.

Prior to sampling, the depth-to-water was measured in each well, and the groundwater elevation was calculated for the sampling event.

Groundwater samples were collected in sample bottles provided by the analytical laboratory and stored on ice in a cooler immediately after collection. Dissolved lead samples were filtered in the field using a disposable 0.45 µm in-line filter. Standard industry protocols regarding sample collection, preservation, chain-of-custody, and shipping were followed. Groundwater samples were identified by the monitoring well identification number of the well from which they were collected. The monitoring wells were sampled in January, April, and May 2018.

Groundwater samples were analyzed for the principal dangerous constituents listed in the Permit as well as contaminants of concern identified during the July 2017 test pit investigation at SWMU-55. All groundwater samples were analyzed at ALS Laboratory Group in Everett, Washington. The following laboratory methods were used to analyze the groundwater samples:

<u>NWTPH-Gx:</u> Gasoline range TPH
<u>NWTPH-Dx:</u> Diesel and oil range TPH
<u>EPA Method 8021</u>: MTBE and BTEX
<u>NWVPH:</u> Volatile petroleum hydrocarbons
<u>NWEPH:</u> Extractable petroleum hydrocarbons
<u>EPA Method 8270 SIM:</u> cPAHs and Naphthalenes
<u>EPA Method 6020:</u> Chromium, Nickel, and Vanadium
<u>EPA Method 7471:</u> Mercury

Groundwater Monitoring Results

A summary of the 2018 groundwater sampling results is provided in Table 1. The original laboratory data reports are provided in Appendix A. Well W-24 contained detectable concentrations of diesel range TPH in the April 30, 2018 sampling event. Follow-up sampling using the NWVPH and NWEPH analytical methods (used for MTCA

Method B) did not contain detectable concentrations of organics. Per lab personnel, this is likely the result of a more rigorous silica gel cleanup process used by the NWEPH method.

Well W-24 contained a concentration of dissolved nickel above the method detection level. The dissolved nickel concentration was less than the Ecology MTCA Method B residential groundwater cleanup level. Well W-46 contained concentrations of dissolved nickel and dissolved vanadium which were also below the MTCA Method B residential groundwater cleanup levels.

Soil Pore Water Sampling

Samples of the soil pore water beneath SWMU-55 were collected in May 2018 from lysimeters L90-13 and L90-16E. Sampling was conducted in accordance with the procedures in Permit Attachment 11. The following laboratory methods were used to analyze the soil-pore water samples:

<u>NWTPH-Gx:</u> Gasoline range TPH
<u>NWTPH-Dx:</u> Diesel and oil range TPH
<u>EPA Method 8021</u>: MTBE and BTEX
<u>EPA Method 8270 SIM:</u> cPAHs and Naphthalenes
<u>EPA Method 6020:</u> Chromium, Nickel, and Vanadium
<u>EPA Method 7471:</u> Mercury

A summary of the 2018 soil pore water sample results is provided in Table 1. The original laboratory data reports are provided in Appendix A.

Both lysimeters contained detectable concentrations of diesel range TPH (no Method B follow-up sampling was conducted). Lysimeter L90-13 contained detectable concentrations of benzene, dissolved nickel, and dissolved vanadium at or below MTCA Method B residential groundwater cleanup levels. Lysimeter L90-16E contained detectable concentrations of 2-Methylnapthalene, dissolved nickel, and dissolved vanadium below MTCA Method B residential groundwater cleanup levels.

Historical SWMU-55 Groundwater and Soil-Pore Water Sampling

PSR has been performing the monitoring described in Part V.B of the Permit since 1998. Groundwater from wells W-46 and W-24 and soil-pore water from the porous cup lysimeters L90-13 and L90-16E have been sampled annually. Groundwater samples have been analyzed for benzene, toluene and naphthalene. Soil-pore water samples have been analyzed for benzene, toluene, naphthalene, chromium, nickel and vanadium. A report describing the analytical results has been transmitted to Ecology annually. A summary of the sample results is provided in Table 2. There have been no detections of principal dangerous constituents (as defined in the Permit) above the MTCA Method B cleanup levels in the groundwater and soil-pore water at the site.

Conclusions

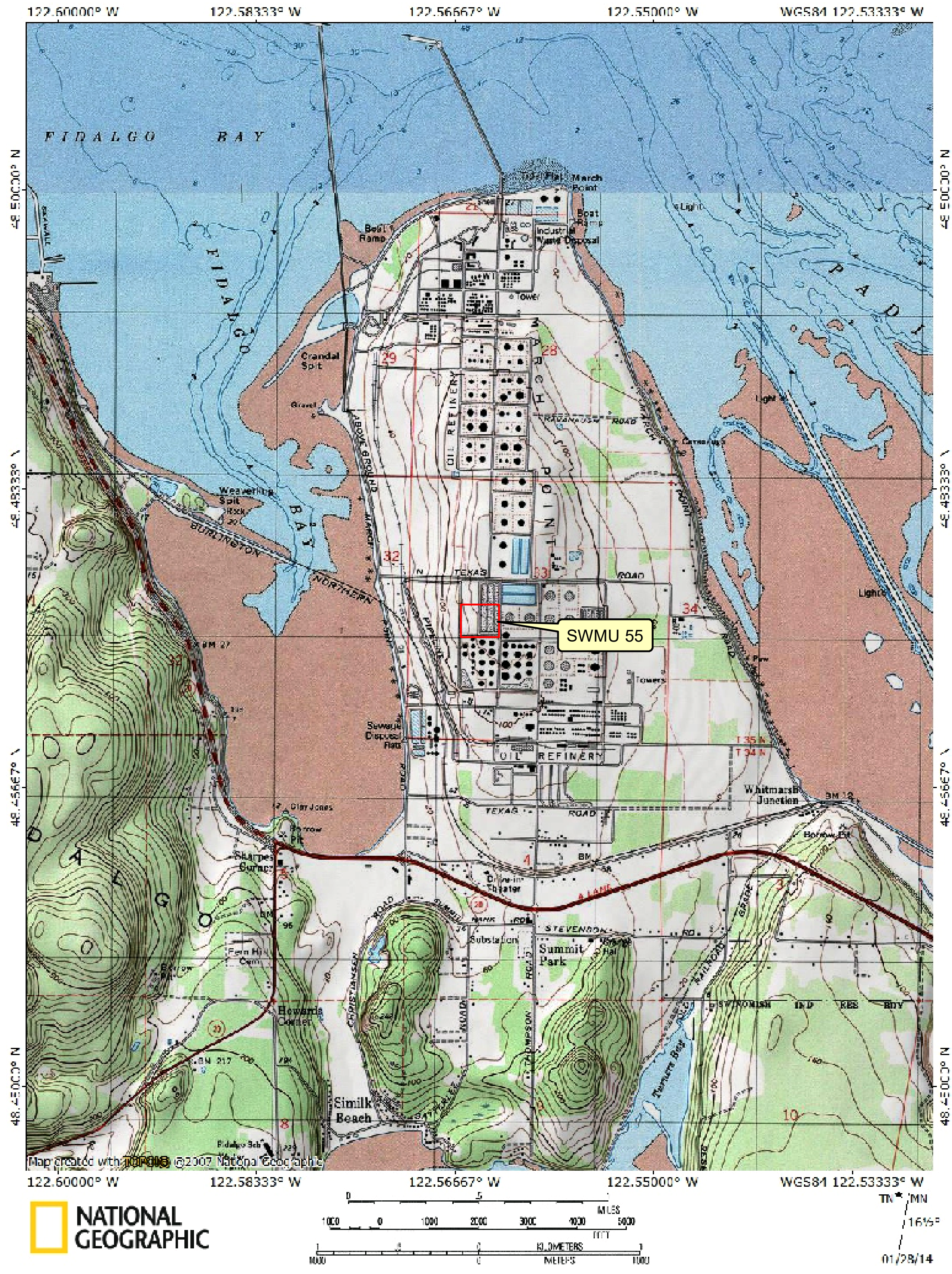
Historical groundwater sampling and the expanded 2018 groundwater sampling at SWMU-55 have not detected any compounds above MTCA Method B residential groundwater cleanup levels. Historical soil-pore water sampling and the expanded 2018 soil-pore water sampling at SWMU-55 have not detected any compounds above MTCA Method B residential groundwater cleanup levels.

Based on the results of this investigation, there is no evidence of groundwater or soil-pore water contamination above MTCA Method B residential groundwater cleanup levels at the SWMU-55 site.

Whatcom Environmental Services appreciates the opportunity to assist Shell Oil Products USA with the SWMU-55 sampling project at the Puget Sound Refinery. If you have any questions regarding this report, please call me at (360) 752-9571.

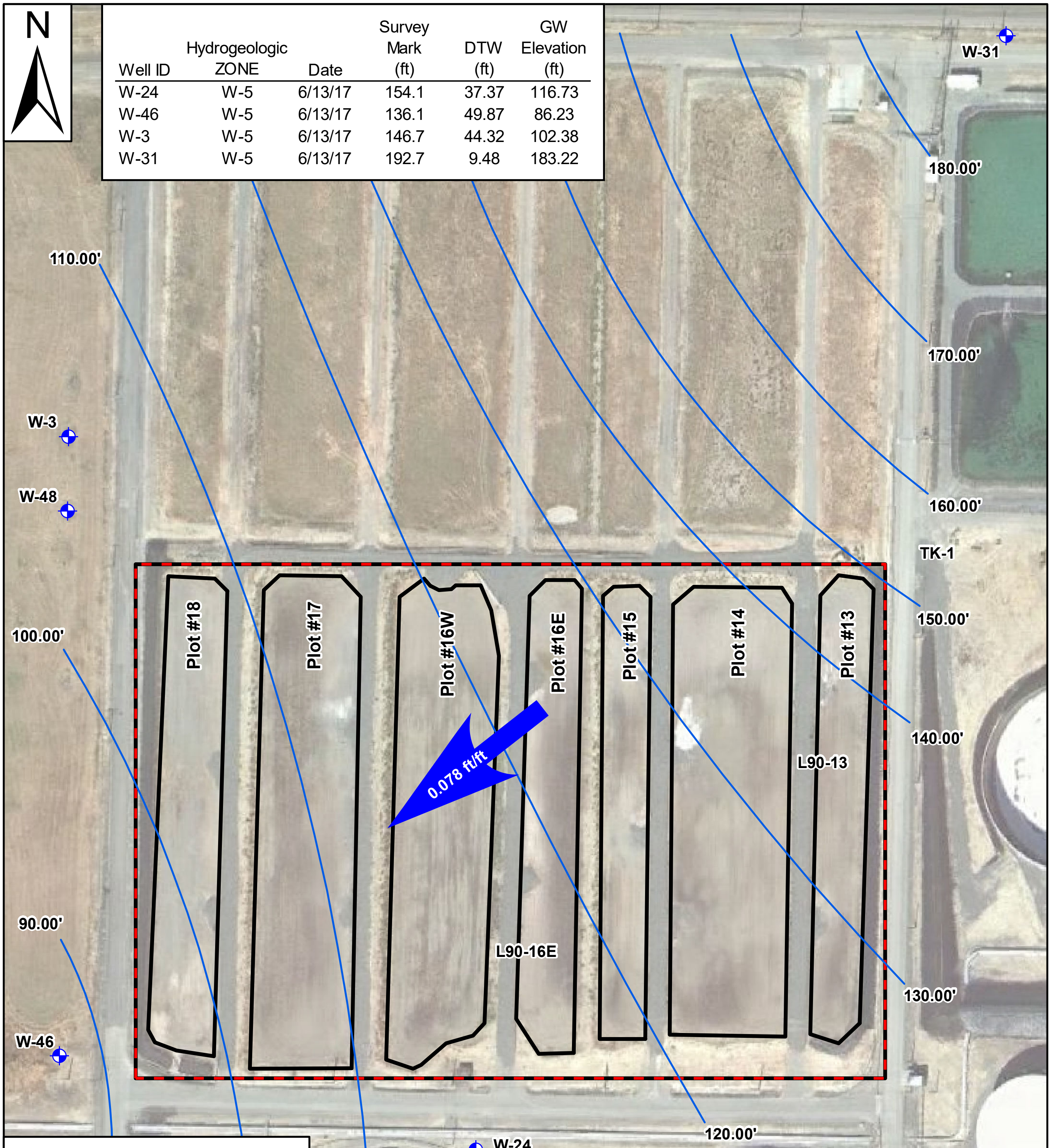
Sincerely,

Eric Libolt
Whatcom Environmental Services



Prepared for: Shell PSR	Prepared by: whatcom ENVIRONMENTAL	Site Location Map
		SWMU 55 — Figure 1
		01/31/18

Well ID	Hydrogeologic ZONE	Date	Survey Mark (ft)	DTW (ft)	GW Elevation (ft)
W-24	W-5	6/13/17	154.1	37.37	116.73
W-46	W-5	6/13/17	136.1	49.87	86.23
W-3	W-5	6/13/17	146.7	44.32	102.38
W-31	W-5	6/13/17	192.7	9.48	183.22



selected-wells

GW Contours (6/16/2017)

SWMU-55 Plots

SWMU-55 Area

All data are approximate and should be used for relative location reference only. 2011 aerial photograph (GoogleEarth).

June 2017 Groundwater Surface Elevations and Gradient

Prepared for: Shell PSR

Prepared by: whatcom ENVIRONMENTAL

Shell Puget Sound Refinery
Anacortes, WA 98221

SWMU 55

05/24/18

Figure 2

Table 1. 2018 Groundwater Data - SWMU 55

			W-24			W-46			L90-13	L90-16E		
Analyte	Method	Units	1/5/2018	4/30/2018	5/17/2018	1/5/2018	5/2/2018	5/17/2018	5/1/2018	5/1/2018	Permit PQL	MTCA Method B
Volatile Range TPH	NWTPH-Gx	ug/L	-	ND (<50)	-	-	ND (<50)	-	ND (<50)	ND (<50)	No Level	No Level
Diesel Range TPH	NWTPH-Dx	ug/L	-	600	-	-	ND(<130)	-	1700	820	No Level	No Level
Oil Range TPH	NWTPH-Dx	ug/L	-	ND (<250)	-	-	ND (<250)	-	ND (<330)	ND (<250)	No Level	No Level
Aliphatic EC 5-6	NWVPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Aliphatic EC >6-8	NWVPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Aliphatic EC >10-12	NWVPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Aliphatic EC >12-16	NWEPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Aliphatic EC >16-21	NWEPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Aliphatic EC >21-34	NWEPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Aromatic EC >8-10	NWVPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Aromatic EC >10-12	NWEPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Aromatic EC >12-16	NWEPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Aromatic EC >16-21	NWEPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Aromatic EC >21-34	NWEPH	ug/L	-	-	ND (<50)	-	-	ND (<50)	-	-	No Level	No Level
Benzene	EPA-8021	ug/L	-	ND (<1.0)	ND (<5.0)	-	ND (<1.0)	ND (<5.0)	2	ND (<1.0)	2	5*
Toluene	EPA-8021	ug/L	-	ND (<1.0)	ND (<5.0)	-	ND (<1.0)	ND (<5.0)	ND (<1.0)	ND (<1.0)	2	1,000*
Ethylbenzene	EPA-8021	ug/L	-	ND (<1.0)	ND (<5.0)	-	ND (<1.0)	ND (<5.0)	ND (<1.0)	ND (<1.0)	No Level	700*
Xylenes	EPA-8021	ug/L	-	ND (<3.0)	ND (<5.0)	-	ND (<3.0)	ND (<5.0)	ND (<3.0)	ND (<3.0)	No Level	1,600
Hexane	NWVPH	ug/L	-	-	ND (<5.0)	-		ND (<5.0)			No Level	480
Naphthalene	EPA-8270 SIM	ug/L	-	ND (<0.02)	ND (<0.024)	-	ND (<0.02)	ND (<0.024)	ND (<0.02)	ND (<0.02)	10	160**
2-Methylnaphthalene	EPA-8270 SIM	ug/L	-	ND (<0.02)	ND (<0.052)	-	ND (<0.02)	ND (<0.052)	ND (<0.02)	0.02	No Level	160**
1-Methylnaphthalene	EPA-8270 SIM	ug/L	-	ND (<0.02)	ND (<0.030)	-	ND (<0.02)	ND (<0.030)	ND (<0.02)	ND (<0.02)	No Level	160**
Benzo(A)Anthracene	EPA-8270 SIM	ug/L	ND (<0.02)	ND (<0.02)	ND (<0.031)	ND (<0.02)	ND (<0.02)	ND (<0.031)	ND (<0.02)	ND (<0.02)	No Level	0.2***
Chrysene	EPA-8270 SIM	ug/L	ND (<0.02)	ND (<0.02)	ND (<0.062)	ND (<0.02)	ND (<0.02)	ND (<0.062)	ND (<0.02)	ND (<0.02)	No Level	0.2***
Benzo(B)Fluoranthene	EPA-8270 SIM	ug/L	ND (<0.02)	ND (<0.02)	ND (<0.091)	ND (<0.02)	ND (<0.02)	ND (<0.091)	ND (<0.02)	ND (<0.02)	No Level	0.2***
Benzo(K)Fluoranthene	EPA-8270 SIM	ug/L	ND (<0.02)	ND (<0.02)	ND (<0.15)	ND (<0.02)	ND (<0.02)	ND (<0.15)	ND (<0.02)	ND (<0.02)	No Level	0.2***
Benzo(A)Pyrene	EPA-8270 SIM	ug/L	ND (<0.02)	ND (<0.02)	ND (<0.069)	ND (<0.02)	ND (<0.02)	ND (<0.069)	ND (<0.02)	ND (<0.02)	No Level	0.2***
Indeno(1,2,3-Cd)Pyrene	EPA-8270 SIM	ug/L	ND (<0.02)	ND (<0.02)	ND (<0.055)	ND (<0.02)	ND (<0.02)	ND (<0.055)	ND (<0.02)	ND (<0.02)	No Level	0.2***
Dibenz(A,H)Anthracene	EPA-8270 SIM	ug/L	ND (<0.02)	ND (<0.02)	ND (<0.11)	ND (<0.02)	ND (<0.02)	ND (<0.11)	ND (<0.02)	ND (<0.02)	No Level	0.2***
Mercury(Dissolved)	EPA 245.1	ug/L	ND (<0.2)	ND (<0.2)	-	ND (<0.2)	ND (<0.2)	-	ND (<0.2)	ND (<0.2)	No Level	2*
Chromium (Dissolved)	EPA 200.8	ug/L	NS	ND (<2.0)	-	NS	ND (<2.0)	-	ND (<2.0)	ND (<2.0)	70	100*
Nickel (Dissolved)	EPA 200.8	ug/L	NS	41	-	NS	3.4	-	58	41	50	320
Vanadium (Dissolved)	EPA 200.8	ug/L	NS	ND (<2.0)	-	NS	2.8	-	4.2	21	80	80

* Indicates Washington Maximum Contaminant Level (MCL)

** Includes the sum of Naphthalene, 2-Methynaphthalene, and 1-Methylnaphthalene

*** Includes the sum of all the cPAHs multiplied by their respective toxicity equivalency factors in accordance with WAC 173-340-708(8)

\- Indicates the sample was not analyzed for the selected analyte

Table 2. Groundwater and Soil-Pore Water Data - SWMU 55

ID Sample Date	Benzene 8021B/8260B* (µg/L)	Toluene 8021B/8260B* (µg/L)	Napthalene 8270C/8260B* (µg/L)	Chromium 6020 (µg/L)	Nickel 6020 (µg/L)	Vanadium 6020 (µg/L)
Permit PQL	2	2	10	70	50	80
MTCA Method B	5**	1000**	160	100	320	80
Well 46						
1/19/1998	NA	NA	NA	ND(<10.0)	ND(<40.0)	ND(<10.0)
12/28/1998	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/8/1999	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/5/2000	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/4/2001	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/3/2002	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/2/2003	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/7/2004	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/6/2005	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/19/2006	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/4/2007	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/3/2008	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/8/2009	ND(<1.0)	ND(<1.0)	ND(<2.0)	NA	36	NA
12/8/2010	ND(<0.5)	ND(<0.5)	ND(<2.0)	NA	7.2	NA
12/1/2011	ND(<0.50)	ND(<0.50)	ND(<1.9)	NA	NA	NA
11/27/2012	ND(<1.0)	ND(<1.0)	ND(<1.9)	NA	NA	NA
11/20/2013	ND(<1.0)	ND(<1.0)	ND(<1.0)	NA	NA	NA
11/20/2014	ND(<1.0)	ND(<1.0)	ND(<3.0)	NA	NA	NA
10/29/2015	ND(<2.0)	ND(<2.0)	ND(<2.0)	NA	NA	NA
11/8/2016	ND(<2.0)	ND(<2.0)	ND(<2.0)	NA	NA	NA
10/25/2017	ND(<2.0)	ND(<2.0)	ND(<4.0)	NA	NA	NA
Well 24						
1/19/1998	NA	NA	NA	ND(<10.0)	ND(<40.0)	ND(<10.0)
12/28/1998	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/8/1999	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/5/2000	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/4/2001	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/3/2002	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/2/2003	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/7/2004	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/6/2005	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/19/2006	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/4/2007	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/3/2008	ND(<2.0)	ND(<2.0)	ND(<10.0)	NA	NA	NA
12/8/2009	ND(<1.0)	ND(<1.0)	ND(<2.2)	NA	48	NA
12/8/2010	ND(<0.5)	ND(<0.5)	ND(<2.0)	NA	46	NA
12/1/2011	ND(<0.50)	ND(<0.50)	ND(<1.9)	NA	NA	NA
11/27/2012	ND(<1.0)	ND(<1.0)	ND(<1.9)	NA	NA	NA
11/20/2013	ND(<1.0)	ND(<1.0)	ND(<1.0)	NA	NA	NA
11/20/2014	ND(<1.0)	ND(<1.0)	ND(<3.0)	NA	NA	NA
10/29/2015	ND(<2.0)	ND(<2.0)	ND(<2.0)	NA	NA	NA
11/8/2016	ND(<2.0)	ND(<2.0)	ND(<2.0)	NA	NA	NA
10/25/2017	ND(<2.0)	ND(<2.0)	ND(<4.0)	NA	NA	NA

Table 2. Groundwater and Soil-Pore Water Data - SWMU 55

ID Sample Date	Benzene 8021B/8260B* (µg/L)	Toluene 8021B/8260B* (µg/L)	Napthalene 8270C/8260B* (µg/L)	Chromium 6020 (µg/L)	Nickel 6020 (µg/L)	Vanadium 6020 (µg/L)
Permit PQL	2	2	10	70	50	80
MTCA Method B	5**	1000**	160	100	320	80
L-13						
12/10/1998	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.16	67.5	2.03
12/7/1999	ND(<2.0)	ND(<2.0)	ND(<10.0)	2.66	253	6.75
12/6/2000	1.19	ND(<2.0)	ND(<10.0)	2.32	83.5	2.22
12/4/2001	0.767	ND(<2.0)	ND(<10.0)	1.21	105	2.26
12/3/2002	1.35	ND(<2.0)	NA	1.22	101	2.54
12/2/2003	0.791	ND(<2.0)	NA	1.65	139	16.4
12/7/2004	ND(<2.0)	ND(<2.0)	NA	1.06	88.2	1.8
12/7/2005	1.75	ND(<2.0)	ND(<10.0)	1.77	93	2.41
12/19/2006	ND(<2.0)	ND(<2.0)	NA	1.39	94.6	2.04
12/4/2007	1.03	ND(<2.0)	NA	1.15	97.6	2.05
12/2/2008	1.54	ND(<2.0)	ND(<10.0)	ND(<70.0)	104	2.1
12/9/2009	ND(<1.0)	ND(<1.0)	ND(<4.4)	ND(<2.0)	130	5
12/8/2010	ND(<0.5)	ND(<0.5)	ND(<1.9)	3.9	120	19
12/1/2011	3.2	ND(<0.50)	ND(<1.9)	ND(<25)	45	30
11/27/2012	1.9	ND(<1.0)	ND(<1.0)	ND(<2)	92	ND(<10)
11/20/2013	2	ND(<1.0)	ND(<1.9)	ND(<25)	86	ND(<20)
11/20/2014	1.8	ND(<1.0)	ND(<3.0)	ND(<2)	80	ND(<10)
10/29/2015	2.7	ND(<2.0)	ND(<2.0)	ND(<2)	83	ND(<20)
11/8/2016	2.4	ND(<2.0)	ND(<2.0)	ND(<2)	76	ND(<20)
10/25/2017	2.9	ND(<2.0)	ND(<4.0)	ND(<25)	70	ND(<30)
L-16E						
12/10/1998	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.3	44.6	ND(<80)
12/7/1999	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.55	108	6.13
12/6/2000	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.49	47.9	11.6
12/4/2001	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.59	56.6	3.56
12/3/2002	ND(<2.0)	ND(<2.0)	ND(<10.0)	1.45	90.1	6.55
12/2/2003	ND(<2.0)	ND(<2.0)	NA	3.74	211	21.2
12/7/2004	ND(<2.0)	ND(<2.0)	NA	2.43	138	13.3
12/7/2005	ND(<2.0)	ND(<2.0)	NA	1.65	115	8.88
12/19/2006	ND(<2.0)	ND(<2.0)	NA	1.38	99.7	8.18
12/4/2007	ND(<2.0)	ND(<2.0)	NA	1.3	119	7.37
12/2/2008	ND(<2.0)	ND(<2.0)	ND(<10.0)	ND(<70.0)	116	8.73
12/9/2009	ND(<1.0)	ND(<1.0)	ND(<3.3)	ND(<2.0)	110	8.3
12/8/2010	ND(<0.5)	ND(<0.5)	ND(<1.9)	5.1	85	24
12/1/2011	ND(<0.50)	ND(<0.50)	ND(<1.9)	ND(<25)	66	24
11/27/2012	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<2)	130	19
11/20/2013	ND(<1.0)	ND(<1.0)	ND(<1.9)	ND(<25)	70	ND(<20)
11/20/2014	ND(<1.0)	ND(<1.0)	ND(<1.9)	ND(<2)	73	20
10/29/2015	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2)	89	ND(<20)
11/8/2016	ND(<2.0)	ND(<2.0)	ND(<2.0)	ND(<2)	67	27
10/25/2017	ND(<2.0)	ND(<2.0)	ND(<4.0)	ND(<25)	61	31

* - Samples collected after 2011 sampling event were analyzed using EPA Method 8260B for benzene, toluene, and naphthalene.

** Indicates Washington Maximum Contaminant Level (MCL)

ND indicates analyte was Not Detected at level above reporting limit. Reporting limit is given in parentheses.

NA indicates that the specified analyte was Not Analyzed

APPENDIX A

Original Laboratory Analytical Data Reports

January 11, 2018

Mr. Eric Libolt
Whatcom Environmental Svcs., Inc.
228 E. Champion St., Suite 101
Bellingham, WA 98225

Dear Mr. Libolt,

On January 9th, 2 samples were received by our laboratory and assigned our laboratory project number EV18010051. The project was identified as your Shell PSR - SWMU 55. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan
Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	1/11/2018
		ALS JOB#:	EV18010051
		ALS SAMPLE#:	EV18010051-01
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	01/09/2018
CLIENT PROJECT:	Shell PSR - SWMU 55	COLLECTION DATE:	1/5/2018 10:05:00 AM
CLIENT SAMPLE ID	W-24	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Benzo[A]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Chrysene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Benzo[A]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Mercury (Dissolved)	EPA-245.1	U	0.20	1	UG/L	01/10/2018	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
Terphenyl-d14	EPA-8270 SIM	**99.2**	01/10/2018	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE:	1/11/2018
		ALS JOB#:	EV18010051
		ALS SAMPLE#:	EV18010051-02
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	01/09/2018
CLIENT PROJECT:	Shell PSR - SWMU 55	COLLECTION DATE:	1/5/2018 11:50:00 AM
CLIENT SAMPLE ID	W-46	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Benzo[A]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Chrysene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Benzo[A]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	01/10/2018	PAB
Mercury (Dissolved)	EPA-245.1	U	0.20	1	UG/L	01/10/2018	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
Terphenyl-d14	EPA-8270 SIM	**106**	01/10/2018	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

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ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	1/11/2018 EV18010051 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR - SWMU 55		

LABORATORY BLANK RESULTS

MB-010418W - Batch 124077 - Water by EPA-8270 SIM

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Naphthalene	EPA-8270 SIM	U	UG/L	0.020	01/04/2018	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	UG/L	0.020	01/04/2018	PAB
Chrysene	EPA-8270 SIM	U	UG/L	0.020	01/04/2018	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	UG/L	0.020	01/04/2018	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	UG/L	0.020	01/04/2018	PAB
Benzo[A]Pyrene	EPA-8270 SIM	U	UG/L	0.020	01/04/2018	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	UG/L	0.020	01/04/2018	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	UG/L	0.020	01/04/2018	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	U	UG/L	0.020	01/04/2018	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-R308847 - Batch R308847 - Water by EPA-245.1

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Mercury (Dissolved)	EPA-245.1	U	UG/L	0.20	01/10/2018	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	1/11/2018 EV18010051 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR - SWMU 55		

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: 124077 - Water by EPA-8270 SIM

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Naphthalene - BS	EPA-8270 SIM	**78.3**			36	118	01/04/2018	PAB
Naphthalene - BSD	EPA-8270 SIM	**74.6**	**5**		36	118	01/04/2018	PAB
Benzo[G,H,I]Perylene - BS	EPA-8270 SIM	**109**			43	140	01/04/2018	PAB
Benzo[G,H,I]Perylene - BSD	EPA-8270 SIM	**113**	**4**		43	140	01/04/2018	PAB

ALS Test Batch ID: R308847 - Water by EPA-245.1

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Mercury (Dissolved) - BS	EPA-245.1	**104**			80.6	118	01/10/2018	RAL
Mercury (Dissolved) - BSD	EPA-245.1	**102**	**2**		80.6	118	01/10/2018	RAL

APPROVED BY

Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental
8620 Holly Drive, Suite 100
Everett, WA 98208
Phone (425) 356-2600
Fax (425) 356-2626
http://www.alsglobal.com

Chain Of Custody/ Laboratory Analysis Request

ALS Job# (Laboratory Use Only): EV18010051

Date 1/8/18 Page 1 Of 1

PROJECT ID: Shell PSR - SWMU 55
REPORT TO COMPANY: Whatcom Environmental Services
PROJECT MANAGER: Eric Libolt
ADDRESS: 228 E. Champion St #107
Bellingham, WA 98225
PHONE: 360-752-9571 FAX: 360-752-9573
P.O. #: E-MAIL: elibolt@whatcom---
INVOICE TO COMPANY:
ATTENTION: SAME AS ABOVE
ADDRESS:

ANALYSIS REQUESTED

	SAMPLE I.D.	DATE	TIME	TYPE	LAB#	NWTPH-HCID	NWTPH-DX	NWTPH-GX	BTEX by EPA 8021 ☐ BTEX by EPA 8260 ☐	MTBE by EPA 8021 ☐ MTBE by EPA 8260 ☐	Halogenated Volatiles by EPA 8260	Volatile Organic Compounds by EPA 8260	EDB / EDC by EPA 8260 SIM (water)	EDB / EDC by EPA 8260 (soil)	Semivolatile Organic Compounds by EPA 8270	Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM	PCB by EPA 8082 ☐ Pesticides by EPA 8081 ☐	Metals-MTCA-5 ☐ RCRA-8 ☐ Pri Pol ☐ TAL ☐	Metals Other (Specify) Mercury (Dissolved)	TCLP-Metals ☐ VOA ☐ Semi-Vol ☑ Pest ☐ Herbs ☐	OTHER (Specify): cPAHs							NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?
1.	W-24	1/5/18	10:05	water	1														X		X							2	
2.	W-46	1/5/18	11:50	water	2														X		X							2	
3.																													
4.																													
5.																													
6.																													
7.																													
8.																													
9.																													
10.																													

SPECIAL INSTRUCTIONS: Metal sample field filtered.

SIGNATURES (Name, Company, Date, Time):
1. Relinquished By: [signature] WES, 1/8/18, 1:30pm
Received By: [signature] ALS, 1/9/18, 4:15pm
2. Relinquished By:
Received By:

TURNAROUND REQUESTED in Business Days*

Organic, Metals & Inorganic Analysis: 10 (Standard) 5 3 2 1 SAME DAY

Fuels & Hydrocarbon Analysis: 5 (Standard) 3 1 SAME DAY

OTHER:
Specify:

*Turnaround request less than standard may incur Rush Charges

May 11, 2018

Mr. Eric Libolt
Whatcom Environmental Svcs., Inc.
228 E. Champion St., Suite 101
Bellingham, WA 98225

Dear Mr. Libolt,

On May 4th, 4 samples were received by our laboratory and assigned our laboratory project number EV18050030. The project was identified as your Shell PSR: SWMU-55. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan
Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 98208 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	5/11/2018 EV18050030 EV18050030-01
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	05/04/2018
CLIENT PROJECT:	Shell PSR: SWMU-55	COLLECTION DATE:	4/30/2018 2:50:00 PM
CLIENT SAMPLE ID	W-24	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	50	1	UG/L	05/04/2018	JMK
Benzene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Toluene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Ethylbenzene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Xylenes	EPA-8021	U	3.0	1	UG/L	05/04/2018	JMK
TPH-Diesel Range	NWTPH-DX	**4300**	130	1	UG/L	05/07/2018	EBS
TPH-Diesel Range	NWTPH-DX w/ SGA	**600**	130	1	UG/L	05/10/2018	EBS
TPH-Oil Range	NWTPH-DX	U	250	1	UG/L	05/07/2018	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	U	250	1	UG/L	05/10/2018	EBS
Naphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
2-Methylnaphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
1-Methylnaphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Chrysene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Benzo[A]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Mercury (Dissolved)	EPA-245.1	U	0.20	1	UG/L	05/07/2018	RAL
Chromium (Dissolved)	EPA-200.8	U	2.0	1	UG/L	05/08/2018	RAL
Nickel (Dissolved)	EPA-200.8	**41**	2.0	1	UG/L	05/08/2018	RAL
Vanadium (Dissolved)	EPA-200.8	U	2.0	1	UG/L	05/08/2018	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**103**	05/04/2018	JMK
TFT	EPA-8021	**89.0**	05/04/2018	JMK
C25	NWTPH-DX	**108**	05/07/2018	EBS
C25	NWTPH-DX w/ SGA	**122**	05/10/2018	EBS
Terphenyl-d14	EPA-8270 SIM	**99.8**	05/08/2018	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains an unidentified diesel range product.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 98208 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	5/11/2018 EV18050030 EV18050030-02
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	05/04/2018
CLIENT PROJECT:	Shell PSR: SWMU-55	COLLECTION DATE:	5/2/2018 10:00:00 AM
CLIENT SAMPLE ID	W-46	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	50	1	UG/L	05/04/2018	JMK
Benzene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Toluene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Ethylbenzene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Xylenes	EPA-8021	U	3.0	1	UG/L	05/04/2018	JMK
TPH-Diesel Range	NWTPH-DX	**940**	130	1	UG/L	05/07/2018	EBS
TPH-Diesel Range	NWTPH-DX w/ SGA	U	130	1	UG/L	05/10/2018	EBS
TPH-Oil Range	NWTPH-DX	U	250	1	UG/L	05/07/2018	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	U	250	1	UG/L	05/10/2018	EBS
Naphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
2-Methylnaphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
1-Methylnaphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Chrysene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Benzo[A]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Mercury (Dissolved)	EPA-245.1	U	0.20	1	UG/L	05/07/2018	RAL
Chromium (Dissolved)	EPA-200.8	U	2.0	1	UG/L	05/08/2018	RAL
Nickel (Dissolved)	EPA-200.8	**3.4**	2.0	1	UG/L	05/08/2018	RAL
Vanadium (Dissolved)	EPA-200.8	**2.8**	2.0	1	UG/L	05/08/2018	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**98.0**	05/04/2018	JMK
TFT	EPA-8021	**89.5**	05/04/2018	JMK
C25	NWTPH-DX	**109**	05/07/2018	EBS
C25	NWTPH-DX w/ SGA	**120**	05/10/2018	EBS
Terphenyl-d14	EPA-8270 SIM	**97.9**	05/08/2018	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains an unidentified diesel range product.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 98208 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	5/11/2018 EV18050030 EV18050030-03
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	05/04/2018
CLIENT PROJECT:	Shell PSR: SWMU-55	COLLECTION DATE:	5/1/2018 1:00:00 PM
CLIENT SAMPLE ID	L90-13	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	50	1	UG/L	05/04/2018	JMK
Benzene	EPA-8021	**2.0**	1.0	1	UG/L	05/04/2018	JMK
Toluene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Ethylbenzene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Xylenes	EPA-8021	U	3.0	1	UG/L	05/04/2018	JMK
TPH-Diesel Range	NWTPH-DX	**12000**	160	1	UG/L	05/07/2018	EBS
TPH-Diesel Range	NWTPH-DX w/ SGA	**1700**	160	1	UG/L	05/10/2018	EBS
TPH-Oil Range	NWTPH-DX	ND- F1	330	1	UG/L	05/07/2018	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	U	330	1	UG/L	05/10/2018	EBS
Mercury (Dissolved)	EPA-245.1	U	0.20	1	UG/L	05/07/2018	RAL
Chromium (Dissolved)	EPA-200.8	U	2.0	1	UG/L	05/08/2018	RAL
Nickel (Dissolved)	EPA-200.8	**58**	2.0	1	UG/L	05/08/2018	RAL
Vanadium (Dissolved)	EPA-200.8	**4.2**	2.0	1	UG/L	05/08/2018	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**99.7**	05/04/2018	JMK
TFT	EPA-8021	**94.9**	05/04/2018	JMK
C25	NWTPH-DX	**113**	05/07/2018	EBS
C25	NWTPH-DX w/ SGA	**113**	05/10/2018	EBS

U - Analyte analyzed for but not detected at level above reporting limit.
F1 - Reporting limit for compound raised due to low sample amount.
Chromatogram indicates that it is likely that sample contains an unidentified diesel range product.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 98208 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	5/11/2018 EV18050030 EV18050030-04
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	05/04/2018
CLIENT PROJECT:	Shell PSR: SWMU-55	COLLECTION DATE:	5/1/2018 1:40:00 PM
CLIENT SAMPLE ID	L90-16E	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	50	1	UG/L	05/04/2018	JMK
Benzene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Toluene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Ethylbenzene	EPA-8021	U	1.0	1	UG/L	05/04/2018	JMK
Xylenes	EPA-8021	U	3.0	1	UG/L	05/04/2018	JMK
TPH-Diesel Range	NWTPH-DX	**5400**	130	1	UG/L	05/07/2018	EBS
TPH-Diesel Range	NWTPH-DX w/ SGA	**820**	130	1	UG/L	05/10/2018	EBS
TPH-Oil Range	NWTPH-DX	U	250	1	UG/L	05/07/2018	EBS
TPH-Oil Range	NWTPH-DX w/ SGA	U	250	1	UG/L	05/10/2018	EBS
Naphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
2-Methylnaphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
1-Methylnaphthalene	EPA-8270 SIM	**0.020**	0.020	1	UG/L	05/08/2018	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Chrysene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	0.024	1	UG/L	05/08/2018	PAB
Benzo[A]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	05/08/2018	PAB
Mercury (Dissolved)	EPA-245.1	U	0.20	1	UG/L	05/07/2018	RAL
Chromium (Dissolved)	EPA-200.8	U	2.0	1	UG/L	05/08/2018	RAL
Nickel (Dissolved)	EPA-200.8	**41**	2.0	1	UG/L	05/08/2018	RAL
Vanadium (Dissolved)	EPA-200.8	**21**	2.0	1	UG/L	05/08/2018	RAL

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	NWTPH-GX	**99.7**	05/04/2018	JMK
TFT	EPA-8021	**91.2**	05/04/2018	JMK
C25	NWTPH-DX	**123**	05/07/2018	EBS
C25	NWTPH-DX w/ SGA	**123**	05/10/2018	EBS
Terphenyl-d14	EPA-8270 SIM	**102**	05/08/2018	PAB

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains an unidentified diesel range product.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 98208 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	5/11/2018 EV18050030 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR: SWMU-55		

LABORATORY BLANK RESULTS

MBG-050418W - Batch 128114 - Water by NWTPH-GX

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range	NWTPH-GX	U	UG/L	50	05/04/2018	JMK

U - Analyte analyzed for but not detected at level above reporting limit.

MB-050418W - Batch 128114 - Water by EPA-8021

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Benzene	EPA-8021	U	UG/L	1.0	05/04/2018	JMK
Toluene	EPA-8021	U	UG/L	1.0	05/04/2018	JMK
Ethylbenzene	EPA-8021	U	UG/L	1.0	05/04/2018	JMK
Xylenes	EPA-8021	U	UG/L	3.0	05/04/2018	JMK

U - Analyte analyzed for but not detected at level above reporting limit.

MB-050718W - Batch 128138 - Water by NWTPH-DX

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range	NWTPH-DX	U	UG/L	130	05/07/2018	EBS
TPH-Oil Range	NWTPH-DX	U	UG/L	250	05/07/2018	EBS

U - Analyte analyzed for but not detected at level above reporting limit.

MB-050718W - Batch 128182 - Water by EPA-8270 SIM

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Naphthalene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB
2-Methylnaphthalene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB
1-Methylnaphthalene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB
Benzo[A]Anthracene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB
Chrysene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB
Benzo[B]Fluoranthene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB
Benzo[K]Fluoranthene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB
Benzo[A]Pyrene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB
Benzo[G,H,I]Perylene	EPA-8270 SIM	U	UG/L	0.020	05/08/2018	PAB

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 98208 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	5/11/2018 EV18050030 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR: SWMU-55		

LABORATORY BLANK RESULTS

MBLK-315894 - Batch R315894 - Water by EPA-245.1

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Mercury (Dissolved)	EPA-245.1	U	UG/L	0.20	05/07/2018	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

MB-050718W - Batch 128128 - Water by EPA-200.8

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Chromium (Dissolved)	EPA-200.8	U	UG/L	2.0	05/07/2018	RAL
Nickel (Dissolved)	EPA-200.8	U	UG/L	2.0	05/07/2018	RAL
Vanadium (Dissolved)	EPA-200.8	U	UG/L	2.0	05/07/2018	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 98208 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	5/11/2018 EV18050030 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR: SWMU-55		

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: 128114 - Water by NWTPH-GX

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
TPH-Volatile Range - BS	NWTPH-GX	**89.4**			66.5	122.7	05/04/2018	JMK
TPH-Volatile Range - BSD	NWTPH-GX	**83.9**	**6**		66.5	122.7	05/04/2018	JMK

ALS Test Batch ID: 128114 - Water by EPA-8021

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Benzene - BS	EPA-8021	**90.3**			83	120	05/04/2018	JMK
Benzene - BSD	EPA-8021	**92.4**	**2**		83	120	05/04/2018	JMK
Toluene - BS	EPA-8021	**90.1**			85	115	05/04/2018	JMK
Toluene - BSD	EPA-8021	**91.7**	**2**		85	115	05/04/2018	JMK
Ethylbenzene - BS	EPA-8021	**95.2**			85	113	05/04/2018	JMK
Ethylbenzene - BSD	EPA-8021	**96.9**	**2**		85	113	05/04/2018	JMK
Xylenes - BS	EPA-8021	**97.1**			85	116	05/04/2018	JMK
Xylenes - BSD	EPA-8021	**98.9**	**2**		85	116	05/04/2018	JMK

ALS Test Batch ID: 128138 - Water by NWTPH-DX

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range - BS	NWTPH-DX	**87.2**			67	125.2	05/07/2018	EBS
TPH-Diesel Range - BSD	NWTPH-DX	**92.8**	**6**		67	125.2	05/07/2018	EBS

ALS Test Batch ID: 128182 - Water by EPA-8270 SIM

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Naphthalene - BS	EPA-8270 SIM	**43.9**			36	118	05/08/2018	PAB
Naphthalene - BSD	EPA-8270 SIM	**37.7**	**15**		36	118	05/08/2018	PAB
Benzo[G,H,I]Perylene - BS	EPA-8270 SIM	**92.1**			43	140	05/08/2018	PAB
Benzo[G,H,I]Perylene - BSD	EPA-8270 SIM	**89.3**	**3**		43	140	05/08/2018	PAB

ALS Test Batch ID: R315894 - Water by EPA-245.1

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Mercury (Dissolved) - BS	EPA-245.1	**112**			80.6	118	05/07/2018	RAL
Mercury (Dissolved) - BSD	EPA-245.1	**104**	**7**		80.6	118	05/07/2018	RAL

ALS Test Batch ID: 128128 - Water by EPA-200.8

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Chromium (Dissolved) - BS	EPA-200.8	**102**			86.2	107	05/07/2018	RAL

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 98208 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	5/11/2018 EV18050030 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR: SWMU-55		

LABORATORY CONTROL SAMPLE RESULTS

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Chromium (Dissolved) - BSD	EPA-200.8	**104**	**2**		86.2	107	05/07/2018	RAL
Nickel (Dissolved) - BS	EPA-200.8	**101**			85.4	109	05/07/2018	RAL
Nickel (Dissolved) - BSD	EPA-200.8	**100**	**1**		85.4	109	05/07/2018	RAL
Vanadium (Dissolved) - BS	EPA-200.8	**100**			80.1	108	05/07/2018	RAL
Vanadium (Dissolved) - BSD	EPA-200.8	**101**	**1**		80.1	108	05/07/2018	RAL

APPROVED BY

Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 98208 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental
8620 Holly Drive, Suite 100
Everett, WA 98208
Phone (425) 356-2600
Fax (425) 356-2626
http://www.alsglobal.com

Chain Of Custody/ Laboratory Analysis Request

ALS Job# (Laboratory Use Only): EV18050030

Date 5/3/18 Page 1 Of 1

PROJECT ID: Shell PSR : SWMU - 55
REPORT TO COMPANY: Whatcom Environmental Svcs.
PROJECT MANAGER: Eric Libolt
ADDRESS: 228 E Champion St #101
Bellingham WA 98225
PHONE: P.O. #:
E-MAIL: elibolt@whatcomenvironmental.com
INVOICE TO COMPANY:
ATTENTION: SAME AS ABOVE
ADDRESS:

ANALYSIS REQUESTED / OTHER (Specify)

	SAMPLE I.D.	DATE	TIME	TYPE	LAB#	NWTPH-HCID	NWTPH-DX	NWTPH-GX	BTEX by EPA 8021 ☒ BTEX by EPA 8260 ☐	MTBE by EPA 8021 ☐ MTBE by EPA 8260 ☐	Halogenated Volatiles by EPA 8260	Volatile Organic Compounds by EPA 8260	EDB / EDC by EPA 8260 SIM (water)	EDB / EDC by EPA 8260 (soil)	Semivolatile Organic Compounds by EPA 8270	Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM	PCB by EPA 8082 ☐ Pesticides by EPA 8081 ☐	Metals-MTCA-5 ☐ RCRA-8 ☐ Pri Pol ☐ TAL ☐	Metals Other (Specify)	TCLP-Metals ☐ VOA ☐ Semi-Vol ☐ Pest ☐ Herbs ☐	cPAHs (8270 SIM)	Mercury	Chromium	Nickel	Vanadium	Naphthalenes (8270SIM)	Dx-with cleanup	NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?
1.	W-24	4/30/18	2:50	water	1		X	X	X												X	X	X	X	X	X	X	8	
2.	W-46	5/2/18	10:00	↓	2		X	X	X												X	X	X	X	X	X	X	8	
3.	L90-13	5/1/18	1:00	↓	3		X	X	X													X	X	X	X		X	7	
4.	L90-16E	5/1/18	1:40	↓	4		X	X	X												X	X	X	X	X	X	X	8	
5.																													
6.																													
7.																													
8.																													
9.																													
10.																													

SPECIAL INSTRUCTIONS Metals samples field-filtered. X Added 5/10/18 per Eric on standard TAT

SIGNATURES (Name, Company, Date, Time):
1. Relinquished By: [signature] WES, 5/3/18 1:30p
Received By:
2. Relinquished By:
Received By: Shawn Robinson ALS 5/4/18 12:30 pm

TURNAROUND REQUESTED in Business Days*
Organic, Metals & Inorganic Analysis
~~10~~ Standard | 5 | 3 | 2 | 1 | SAME DAY
Fuels & Hydrocarbon Analysis
~~5~~ Standard | 3 | 1 | SAME DAY

OTHER:
Specify:

*Turnaround request less than standard may incur Rush Charges

May 21, 2018

Mr. Eric Libolt
Whatcom Environmental Svcs., Inc.
228 E. Champion St., Suite 101
Bellingham, WA 98225

Dear Mr. Libolt,

On May 15th, 1 sample was received by our laboratory and assigned our laboratory project number EV18050087. The project was identified as your Shell PSR: SWMU-55. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan
Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	5/21/2018 EV18050087 EV18050087-01
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	05/15/2018
CLIENT PROJECT:	Shell PSR: SWMU-55	COLLECTION DATE:	5/14/2018 1:00:00 PM
CLIENT SAMPLE ID	L90-13	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Naphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/18/2018	GAP
2-Methylnaphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/18/2018	GAP
1-Methylnaphthalene	EPA-8270 SIM	U	0.020	1	UG/L	05/18/2018	GAP
Benzo[A]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	05/18/2018	GAP
Chrysene	EPA-8270 SIM	U	0.020	1	UG/L	05/18/2018	GAP
Benzo[B]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	05/18/2018	GAP
Benzo[K]Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	05/18/2018	GAP
Benzo[A]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	05/18/2018	GAP
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	0.020	1	UG/L	05/18/2018	GAP
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	0.020	1	UG/L	05/18/2018	GAP

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
Terphenyl-d14	EPA-8270 SIM	**95.4**	05/18/2018	GAP

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	5/21/2018 EV18050087 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR: SWMU-55		

LABORATORY BLANK RESULTS

MB-051718W - Batch 128577 - Water by EPA-8270 SIM

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Naphthalene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP
2-Methylnaphthalene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP
1-Methylnaphthalene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP
Benzo[A]Anthracene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP
Chrysene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP
Benzo[B]Fluoranthene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP
Benzo[K]Fluoranthene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP
Benzo[A]Pyrene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP
Benzo[G,H,I]Perylene	EPA-8270 SIM	U	UG/L	0.020	05/18/2018	GAP

U - Analyte analyzed for but not detected at level above reporting limit.

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	5/21/2018 EV18050087 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR: SWMU-55		

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: 128577 - Water by EPA-8270 SIM

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Naphthalene - BS	EPA-8270 SIM	**41.8**			36	118	05/18/2018	GAP
Naphthalene - BSD	EPA-8270 SIM	**45.7**	**9**		36	118	05/18/2018	GAP
2-Methylnaphthalene - BS	EPA-8270 SIM	**41.0**			20	150	05/18/2018	GAP
2-Methylnaphthalene - BSD	EPA-8270 SIM	**45.8**	**11**		20	150	05/18/2018	GAP
1-Methylnaphthalene - BS	EPA-8270 SIM	**44.7**			20	150	05/18/2018	GAP
1-Methylnaphthalene - BSD	EPA-8270 SIM	**48.9**	**9**		20	150	05/18/2018	GAP
Benzo[A]Anthracene - BS	EPA-8270 SIM	**55.4**			20	150	05/18/2018	GAP
Benzo[A]Anthracene - BSD	EPA-8270 SIM	**70.8**	**24**		20	150	05/18/2018	GAP
Chrysene - BS	EPA-8270 SIM	**69.9**			20	150	05/18/2018	GAP
Chrysene - BSD	EPA-8270 SIM	**83.4**	**18**		20	150	05/18/2018	GAP
Benzo[B]Fluoranthene - BS	EPA-8270 SIM	**58.3**			20	150	05/18/2018	GAP
Benzo[B]Fluoranthene - BSD	EPA-8270 SIM	**72.7**	**22**		20	150	05/18/2018	GAP
Benzo[K]Fluoranthene - BS	EPA-8270 SIM	**65.3**			20	150	05/18/2018	GAP
Benzo[K]Fluoranthene - BSD	EPA-8270 SIM	**79.5**	**20**		20	150	05/18/2018	GAP
Benzo[A]Pyrene - BS	EPA-8270 SIM	**57.4**			20	150	05/18/2018	GAP
Benzo[A]Pyrene - BSD	EPA-8270 SIM	**69.3**	**19**		20	150	05/18/2018	GAP
Indeno[1,2,3-Cd]Pyrene - BS	EPA-8270 SIM	**53.0**			20	150	05/18/2018	GAP
Indeno[1,2,3-Cd]Pyrene - BSD	EPA-8270 SIM	**67.9**	**25**		20	150	05/18/2018	GAP
Dibenz[A,H]Anthracene - BS	EPA-8270 SIM	**44.1**			20	150	05/18/2018	GAP
Dibenz[A,H]Anthracene - BSD	EPA-8270 SIM	**55.4**	**23**		20	150	05/18/2018	GAP
Benzo[G,H,I]Perylene - BS	EPA-8270 SIM	**60.3**			43	140	05/18/2018	GAP
Benzo[G,H,I]Perylene - BSD	EPA-8270 SIM	**76.3**	**23**		43	140	05/18/2018	GAP

APPROVED BY

Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental
8620 Holly Drive, Suite 100
Everett, WA 98208
Phone (425) 356-2600
Fax (425) 356-2626
http://www.alsglobal.com

Chain Of Custody/ Laboratory Analysis Request

ALS Job# (Laboratory Use Only): EY18050087

Date 5/14/18 Page 1 Of 1

PROJECT ID: Shell PSR: SWMU-55
REPORT TO COMPANY: Whatcom Environmental Svcs
PROJECT MANAGER: Eric Libolt
ADDRESS: 228 E Champion St #101
Bellingham WA 98225
PHONE: 3607529571 P.O. #:
E-MAIL: elibolt@whatcom...
INVOICE TO COMPANY:
ATTENTION: SAME AS ABOVE
ADDRESS:

	SAMPLE I.D.	DATE	TIME	TYPE	LAB#
1.	L90-13	5/14/18	1:00	water	1
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

	ANALYSIS REQUESTED															OTHER (Specify)								
	NWTPH-HCID	NWTPH-DX	NWTPH-GX	BTEX by EPA 8021 ☐ BTEX by EPA 8260 ☐	MTBE by EPA 8021 ☐ MTBE by EPA 8260 ☐	Halogenated Volatiles by EPA 8260	Volatile Organic Compounds by EPA 8260	EDB / EDC by EPA 8260 SIM (water)	EDB / EDC by EPA 8260 (soil)	Semivolatile Organic Compounds by EPA 8270	Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM	PCB by EPA 8082 ☐ Pesticides by EPA 8081 ☐	Metals-MTCA-5 ☐ RCRA-8 ☐ Pri Pol ☐ TAL ☐	Metals Other (Specify)	TCLP-Metals ☐ VOA ☐ Semi-Vol ☐ Pest ☐ Herbs ☐		CPAHs (8270 SIM)	Naphthalenes (8270 SIM)					NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?
1.																	X	X					1	
2.																								
3.																								
4.																								
5.																								
6.																								
7.																								
8.																								
9.																								
10.																								

SPECIAL INSTRUCTIONS

SIGNATURES (Name, Company, Date, Time):
1. Relinquished By: [signature] LES 5/14/18 2pm
Received By:
2. Relinquished By:
Received By: Shawn Robinson ALS 5/15/18 3:25 pm

TURNAROUND REQUESTED in Business Days*

Organic, Metals & Inorganic Analysis: ~~Standard~~ ☒ 5 ☐ 3 ☐ 2 ☐ 1 ☐ SAME DAY

Fuels & Hydrocarbon Analysis: ☒ Standard ☐ 3 ☐ 1 ☐ SAME DAY

OTHER:
Specify:

*Turnaround request less than standard may incur Rush Charges

May 23, 2018

Mr. Eric Libolt
Whatcom Environmental Svcs., Inc.
228 E. Champion St., Suite 101
Bellingham, WA 98225

Dear Mr. Libolt,

On May 18th, 2 samples were received by our laboratory and assigned our laboratory project number EV18050117. The project was identified as your Shell PSR - SWMU-55. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan
Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	5/23/2018 EV18050117 EV18050117-01
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	05/18/2018
CLIENT PROJECT:	Shell PSR - SWMU-55	COLLECTION DATE:	5/17/2018 10:50:00 AM
CLIENT SAMPLE ID	W-24	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
Benzene	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
Toluene	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
Ethylbenzene	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
M & P- Xylenes	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
O-Xylene	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
C5-C6 Aliphatics	NWVPH	U	50	1	UG/L	05/22/2018	JMK
>C6-C8 Aliphatics	NWVPH	U	50	1	UG/L	05/22/2018	JMK
>C8-C10 Aliphatics	NWVPH	U	50	1	UG/L	05/22/2018	JMK
>C8-C10 Aromatics	NWVPH	U	50	1	UG/L	05/22/2018	JMK
Hexane	NWVPH	U	2.0	1	UG/L	05/22/2018	JMK
>C10-C12 Aliphatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C12-C16 Aliphatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C16-C21 Aliphatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C21-C34 Aliphatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C10-C12 Aromatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C12-C16 Aromatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C16-C21 Aromatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C21-C34 Aromatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
Naphthalene	EPA-8270 SIM	U	0.024	1	UG/L	05/23/2018	GAP
2-Methylnaphthalene	EPA-8270 SIM	U	0.052	1	UG/L	05/23/2018	GAP
1-Methylnaphthalene	EPA-8270 SIM	U	0.030	1	UG/L	05/23/2018	GAP
Acenaphthylene	EPA-8270 SIM	U	0.074	1	UG/L	05/23/2018	GAP
Acenaphthene	EPA-8270 SIM	U	0.11	1	UG/L	05/23/2018	GAP
Fluorene	EPA-8270 SIM	U	0.033	1	UG/L	05/23/2018	GAP
Phenanthrene	EPA-8270 SIM	U	0.063	1	UG/L	05/23/2018	GAP
Anthracene	EPA-8270 SIM	U	0.082	1	UG/L	05/23/2018	GAP
Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	05/23/2018	GAP
Pyrene	EPA-8270 SIM	U	0.038	1	UG/L	05/23/2018	GAP
Benzo[A]Anthracene	EPA-8270 SIM	U	0.031	1	UG/L	05/23/2018	GAP
Chrysene	EPA-8270 SIM	U	0.062	1	UG/L	05/23/2018	GAP
Benzo[B]Fluoranthene	EPA-8270 SIM	U	0.091	1	UG/L	05/23/2018	GAP
Benzo[K]Fluoranthene	EPA-8270 SIM	U	0.15	1	UG/L	05/23/2018	GAP
Benzo[A]Pyrene	EPA-8270 SIM	U	0.069	1	UG/L	05/23/2018	GAP
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	0.055	1	UG/L	05/23/2018	GAP
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	0.11	1	UG/L	05/23/2018	GAP
Benzo[G,H,I]Perylene	EPA-8270 SIM	U	0.060	1	UG/L	05/23/2018	GAP

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ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	5/23/2018 EV18050117 EV18050117-01
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	05/18/2018
CLIENT PROJECT:	Shell PSR - SWMU-55	COLLECTION DATE:	5/17/2018 10:50:00 AM
CLIENT SAMPLE ID	W-24	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**109**	05/22/2018	JMK
TFT - Aliphatic	NWVPH	**110**	05/22/2018	JMK
TFT - Aromatic	NWVPH	**110**	05/22/2018	JMK
TFT - Hexane	NWVPH	**109**	05/22/2018	JMK
C25	NWEPH	**97.0**	05/21/2018	EBS
p-Terphenyl	NWEPH	**90.0**	05/21/2018	EBS
Terphenyl-d14	EPA-8270 SIM	**68.0**	05/23/2018	GAP

U - Analyte analyzed for but not detected at level above reporting limit.

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ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	5/23/2018 EV18050117 EV18050117-02
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	05/18/2018
CLIENT PROJECT:	Shell PSR - SWMU-55	COLLECTION DATE:	5/17/2018 11:30:00 AM
CLIENT SAMPLE ID	W-46	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
Benzene	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
Toluene	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
Ethylbenzene	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
M & P- Xylenes	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
O-Xylene	EPA-8021	U	5.0	1	UG/L	05/22/2018	JMK
C5-C6 Aliphatics	NWVPH	U	50	1	UG/L	05/22/2018	JMK
>C6-C8 Aliphatics	NWVPH	U	50	1	UG/L	05/22/2018	JMK
>C8-C10 Aliphatics	NWVPH	U	50	1	UG/L	05/22/2018	JMK
>C8-C10 Aromatics	NWVPH	U	50	1	UG/L	05/22/2018	JMK
Hexane	NWVPH	U	2.0	1	UG/L	05/22/2018	JMK
>C10-C12 Aliphatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C12-C16 Aliphatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C16-C21 Aliphatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C21-C34 Aliphatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C10-C12 Aromatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C12-C16 Aromatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C16-C21 Aromatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
>C21-C34 Aromatics	NWEPH	U	50	1	UG/L	05/21/2018	EBS
Naphthalene	EPA-8270 SIM	U	0.024	1	UG/L	05/23/2018	GAP
2-Methylnaphthalene	EPA-8270 SIM	U	0.052	1	UG/L	05/23/2018	GAP
1-Methylnaphthalene	EPA-8270 SIM	U	0.030	1	UG/L	05/23/2018	GAP
Acenaphthylene	EPA-8270 SIM	U	0.074	1	UG/L	05/23/2018	GAP
Acenaphthene	EPA-8270 SIM	U	0.11	1	UG/L	05/23/2018	GAP
Fluorene	EPA-8270 SIM	U	0.033	1	UG/L	05/23/2018	GAP
Phenanthrene	EPA-8270 SIM	U	0.063	1	UG/L	05/23/2018	GAP
Anthracene	EPA-8270 SIM	U	0.082	1	UG/L	05/23/2018	GAP
Fluoranthene	EPA-8270 SIM	U	0.020	1	UG/L	05/23/2018	GAP
Pyrene	EPA-8270 SIM	U	0.038	1	UG/L	05/23/2018	GAP
Benzo[A]Anthracene	EPA-8270 SIM	U	0.031	1	UG/L	05/23/2018	GAP
Chrysene	EPA-8270 SIM	U	0.062	1	UG/L	05/23/2018	GAP
Benzo[B]Fluoranthene	EPA-8270 SIM	U	0.091	1	UG/L	05/23/2018	GAP
Benzo[K]Fluoranthene	EPA-8270 SIM	U	0.15	1	UG/L	05/23/2018	GAP
Benzo[A]Pyrene	EPA-8270 SIM	U	0.069	1	UG/L	05/23/2018	GAP
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	0.055	1	UG/L	05/23/2018	GAP
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	0.11	1	UG/L	05/23/2018	GAP
Benzo[G,H,I]Perylene	EPA-8270 SIM	U	0.060	1	UG/L	05/23/2018	GAP

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS JOB#: ALS SAMPLE#:	5/23/2018 EV18050117 EV18050117-02
CLIENT CONTACT:	Eric Libolt	DATE RECEIVED:	05/18/2018
CLIENT PROJECT:	Shell PSR - SWMU-55	COLLECTION DATE:	5/17/2018 11:30:00 AM
CLIENT SAMPLE ID	W-46	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
TFT	EPA-8021	**107**	05/22/2018	JMK
TFT - Aliphatic	NWVPH	**109**	05/22/2018	JMK
TFT - Aromatic	NWVPH	**107**	05/22/2018	JMK
TFT - Hexane	NWVPH	**112**	05/22/2018	JMK
C25	NWEPH	**101**	05/21/2018	EBS
p-Terphenyl	NWEPH	**79.0**	05/21/2018	EBS
Terphenyl-d14	EPA-8270 SIM	**67.1**	05/23/2018	GAP

U - Analyte analyzed for but not detected at level above reporting limit.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	5/23/2018 EV18050117 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR - SWMU-55		

LABORATORY BLANK RESULTS

MBLK-R316767 - Batch R316767 - Water by EPA-8021

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether	EPA-8021	U	UG/L	5.0	05/22/2018	JMK
Benzene	EPA-8021	U	UG/L	5.0	05/22/2018	JMK
Toluene	EPA-8021	U	UG/L	5.0	05/22/2018	JMK
Ethylbenzene	EPA-8021	U	UG/L	5.0	05/22/2018	JMK
M & P- Xylenes	EPA-8021	U	UG/L	5.0	05/22/2018	JMK
O-Xylene	EPA-8021	U	UG/L	5.0	05/22/2018	JMK

U - Analyte analyzed for but not detected at level above reporting limit.

MB-052218W - Batch R316764 - Water by NWVPH

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
C5-C6 Aliphatics	NWVPH	U	UG/L	50	05/22/2018	JMK
>C6-C8 Aliphatics	NWVPH	U	UG/L	50	05/22/2018	JMK
>C8-C10 Aliphatics	NWVPH	U	UG/L	50	05/22/2018	JMK
>C8-C10 Aromatics	NWVPH	U	UG/L	50	05/22/2018	JMK
Hexane	NWVPH	U	UG/L	2.0	05/22/2018	JMK

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-316697 - Batch R316697 - Water by NWEPH

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
>C10-C12 Aliphatics	NWEPH	U	UG/L	50	05/21/2018	EBS
>C12-C16 Aliphatics	NWEPH	U	UG/L	50	05/21/2018	EBS
>C16-C21 Aliphatics	NWEPH	U	UG/L	50	05/21/2018	EBS
>C21-C34 Aliphatics	NWEPH	U	UG/L	50	05/21/2018	EBS
>C10-C12 Aromatics	NWEPH	U	UG/L	50	05/21/2018	EBS
>C12-C16 Aromatics	NWEPH	U	UG/L	50	05/21/2018	EBS
>C16-C21 Aromatics	NWEPH	U	UG/L	50	05/21/2018	EBS
>C21-C34 Aromatics	NWEPH	U	UG/L	50	05/21/2018	EBS

U - Analyte analyzed for but not detected at level above reporting limit.

MB-052118W - Batch 128709 - Water by EPA-8270 SIM

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Naphthalene	EPA-8270 SIM	U	UG/L	0.024	05/23/2018	GAP
2-Methylnaphthalene	EPA-8270 SIM	U	UG/L	0.052	05/23/2018	GAP
1-Methylnaphthalene	EPA-8270 SIM	U	UG/L	0.030	05/23/2018	GAP
Acenaphthylene	EPA-8270 SIM	U	UG/L	0.074	05/23/2018	GAP

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225		DATE: ALS SDG#: WDOE ACCREDITATION:	5/23/2018 EV18050117 C601
CLIENT CONTACT:	Eric Libolt			
CLIENT PROJECT:	Shell PSR - SWMU-55			

LABORATORY BLANK RESULTS

MB-052118W - Batch 128709 - Water by EPA-8270 SIM

Acenaphthene	EPA-8270 SIM	U	UG/L	0.11	05/23/2018	GAP
Fluorene	EPA-8270 SIM	U	UG/L	0.033	05/23/2018	GAP
Phenanthrene	EPA-8270 SIM	U	UG/L	0.063	05/23/2018	GAP
Anthracene	EPA-8270 SIM	U	UG/L	0.082	05/23/2018	GAP
Fluoranthene	EPA-8270 SIM	U	UG/L	0.020	05/23/2018	GAP
Pyrene	EPA-8270 SIM	U	UG/L	0.038	05/23/2018	GAP
Benzo[A]Anthracene	EPA-8270 SIM	U	UG/L	0.031	05/23/2018	GAP
Chrysene	EPA-8270 SIM	U	UG/L	0.062	05/23/2018	GAP
Benzo[B]Fluoranthene	EPA-8270 SIM	U	UG/L	0.091	05/23/2018	GAP
Benzo[K]Fluoranthene	EPA-8270 SIM	U	UG/L	0.15	05/23/2018	GAP
Benzo[A]Pyrene	EPA-8270 SIM	U	UG/L	0.069	05/23/2018	GAP
Indeno[1,2,3-Cd]Pyrene	EPA-8270 SIM	U	UG/L	0.055	05/23/2018	GAP
Dibenz[A,H]Anthracene	EPA-8270 SIM	U	UG/L	0.11	05/23/2018	GAP
Benzo[G,H,I]Perylene	EPA-8270 SIM	U	UG/L	0.060	05/23/2018	GAP

U - Analyte analyzed for but not detected at level above reporting limit.

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	5/23/2018 EV18050117 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR - SWMU-55		

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: R316767 - Water by EPA-8021

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Methyl T-Butyl Ether - BS	EPA-8021	**100**			69.2	133	05/22/2018	JMK
Methyl T-Butyl Ether - BSD	EPA-8021	**99.4**	**1**		69.2	133	05/22/2018	JMK
Benzene - BS	EPA-8021	**102**			83	120	05/22/2018	JMK
Benzene - BSD	EPA-8021	**103**	**1**		83	120	05/22/2018	JMK
Toluene - BS	EPA-8021	**103**			85	115	05/22/2018	JMK
Toluene - BSD	EPA-8021	**104**	**1**		85	115	05/22/2018	JMK
Ethylbenzene - BS	EPA-8021	**105**			85	113	05/22/2018	JMK
Ethylbenzene - BSD	EPA-8021	**106**	**1**		85	113	05/22/2018	JMK
M & P- Xylenes - BS	EPA-8021	**103**					05/22/2018	JMK
M & P- Xylenes - BSD	EPA-8021	**104**	**1**				05/22/2018	JMK
O-Xylene - BS	EPA-8021	**102**					05/22/2018	JMK
O-Xylene - BSD	EPA-8021	**103**	**1**				05/22/2018	JMK

ALS Test Batch ID: R316764 - Water by NWVPH

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
C5-C6 Aliphatics - BS	NWVPH	**94.6**			70	130	05/22/2018	JMK
C5-C6 Aliphatics - BSD	NWVPH	**92.3**	**2**		70	130	05/22/2018	JMK
>C6-C8 Aliphatics - BS	NWVPH	**107**			70	130	05/22/2018	JMK
>C6-C8 Aliphatics - BSD	NWVPH	**106**	**1**		70	130	05/22/2018	JMK
>C8-C10 Aliphatics - BS	NWVPH	**113**			70	130	05/22/2018	JMK
>C8-C10 Aliphatics - BSD	NWVPH	**111**	**2**		70	130	05/22/2018	JMK
>C8-C10 Aromatics - BS	NWVPH	**110**			70	130	05/22/2018	JMK
>C8-C10 Aromatics - BSD	NWVPH	**109**	**1**		70	130	05/22/2018	JMK
Hexane - BS	NWVPH	**102**			70	130	05/22/2018	JMK
Hexane - BSD	NWVPH	**98.7**	**3**		70	130	05/22/2018	JMK

ALS Test Batch ID: R316697 - Water by NWEPH

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
>C10-C12 Aliphatics - BS	NWEPH	**101**			70	130	05/21/2018	EBS
>C10-C12 Aliphatics - BSD	NWEPH	**108**	**7**		70	130	05/21/2018	EBS
>C12-C16 Aliphatics - BS	NWEPH	**114**			70	130	05/21/2018	EBS
>C12-C16 Aliphatics - BSD	NWEPH	**122**	**7**		70	130	05/21/2018	EBS
>C16-C21 Aliphatics - BS	NWEPH	**115**			70	130	05/21/2018	EBS
>C16-C21 Aliphatics - BSD	NWEPH	**123**	**7**		70	130	05/21/2018	EBS
>C21-C34 Aliphatics - BS	NWEPH	**96.0**			70	130	05/21/2018	EBS
>C21-C34 Aliphatics - BSD	NWEPH	**102**	**6**		70	130	05/21/2018	EBS
>C10-C12 Aromatics - BS	NWEPH	**95.0**			70	130	05/21/2018	EBS

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CERTIFICATE OF ANALYSIS

CLIENT:	Whatcom Environmental Svcs., Inc. 228 E. Champion St., Suite 101 Bellingham, WA 98225	DATE: ALS SDG#: WDOE ACCREDITATION:	5/23/2018 EV18050117 C601
CLIENT CONTACT:	Eric Libolt		
CLIENT PROJECT:	Shell PSR - SWMU-55		

LABORATORY CONTROL SAMPLE RESULTS

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
>C10-C12 Aromatics - BSD	NWEPH	**84.0**	**12**		70	130	05/21/2018	EBS
>C12-C16 Aromatics - BS	NWEPH	**108**			70	130	05/21/2018	EBS
>C12-C16 Aromatics - BSD	NWEPH	**93.0**	**15**		70	130	05/21/2018	EBS
>C16-C21 Aromatics - BS	NWEPH	**116**			70	130	05/21/2018	EBS
>C16-C21 Aromatics - BSD	NWEPH	**97.0**	**18**		70	130	05/21/2018	EBS
>C21-C34 Aromatics - BS	NWEPH	**119**			70	130	05/21/2018	EBS
>C21-C34 Aromatics - BSD	NWEPH	**99.0**	**18**		70	130	05/21/2018	EBS

ALS Test Batch ID: 128709 - Water by EPA-8270 SIM

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Naphthalene - BS	EPA-8270 SIM	**75.0**			36	118	05/23/2018	GAP
Naphthalene - BSD	EPA-8270 SIM	**62.4**	**18**		36	118	05/23/2018	GAP
Acenaphthene - BS	EPA-8270 SIM	**85.3**			37	125	05/23/2018	GAP
Acenaphthene - BSD	EPA-8270 SIM	**69.1**	**21**		37	125	05/23/2018	GAP
Pyrene - BS	EPA-8270 SIM	**107**			59	156	05/23/2018	GAP
Pyrene - BSD	EPA-8270 SIM	**89.4**	**18**		59	156	05/23/2018	GAP
Benzo[G,H,I]Perylene - BS	EPA-8270 SIM	**89.5**			43	140	05/23/2018	GAP
Benzo[G,H,I]Perylene - BSD	EPA-8270 SIM	**71.0**	**23**		43	140	05/23/2018	GAP

APPROVED BY

Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
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Chain Of Custody/ Laboratory Analysis Request

ALS Job# (Laboratory Use Only): EV18050117

Date 5/17/18 Page 1 Of 1

PROJECT ID: Shell PSR: SWMU-55
REPORT TO COMPANY: Whatcom Environmental
PROJECT MANAGER: Eric Libolt
ADDRESS: 228 E Champion St #101
Bellingham WA 98225
PHONE: 3607529571 P.O. #:
E-MAIL: elibolt@whatcomenvironmental.com
INVOICE TO COMPANY:
ATTENTION: SAME AS ABOVE
ADDRESS:

ANALYSIS REQUESTED: NWTPH-HCID; NWTPH-DX; NWTPH-GX; BTEX by EPA 8021 ☐ BTEX by EPA 8260 ☐; MTBE by EPA 8021 ☐ MTBE by EPA 8260 ☐; Halogenated Volatiles by EPA 8260; Volatile Organic Compounds by EPA 8260; EDB / EDC by EPA 8260 SIM (water); EDB / EDC by EPA 8260 (soil); Semivolatile Organic Compounds by EPA 8270; Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM; PCB by EPA 8082 ☐ Pesticides by EPA 8081 ☐; Metals-MTCA-5 ☐ RCRA-8 ☐ Pri Pol ☐ TAL ☐; Metals Other (Specify); TCLP-Metals ☐ VOA ☐ Semi-Vol ☐ Pest ☐ Herbs ☐

OTHER (Specify): EPH / VPH + targeted analytes

	SAMPLE I.D.	DATE	TIME	TYPE	LAB#	NWTPH-HCID	NWTPH-DX	NWTPH-GX	BTEX	MTBE	Halogenated Volatiles 8260	VOC 8260	EDB/EDC 8260 SIM (water)	EDB/EDC 8260 (soil)	SVOC 8270	PAH 8270 SIM	PCB / Pesticides	Metals-MTCA-5 / RCRA-8 / Pri Pol / TAL	Metals Other	TCLP	EPH / VPH + targeted analytes	NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?
1.	W-24	5/17/18	1050	Water	1																X	3	
2.	W-46	↓	1130	Water	2																X	3	
3.																							
4.																							
5.																							
6.																							
7.																							
8.																							
9.																							
10.																							

SPECIAL INSTRUCTIONS

SIGNATURES (Name, Company, Date, Time):
1. Relinquished By: [signature] WES, 5/17/18, 1:45P
Received By: Skyler J. Silver ALS 5/18/18 1430
2. Relinquished By:
Received By:

TURNAROUND REQUESTED in Business Days*

Organic, Metals & Inorganic Analysis: ~~10~~ Standard ☐ 5 ☐ 3 ☐ 2 ☐ 1 ☐ SAME DAY

Fuels & Hydrocarbon Analysis: ~~5~~ Standard ☐ 3 ☐ 1 ☐ SAME DAY

OTHER:
Specify: per Rick Bagan Results by Wed, May 23, 2018

*Turnaround request less than standard may incur Rush Charges