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ENVIRONMENTAL MONITORING PLAN

KNOTT LANDFILL
DESCHUTES COUNTY, OREGON

61050 SE 27th Street
Bend, Oregon 97702

Prepared for:
Deschutes County
Department of Solid Waste
61000 SE 27th Street
Bend, Oregon 97702

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390 NE Emerson Avenue, #201, Bend, OR 97701
541.388.9290 Main
866.727.0140 Fax
www.pbsenv.com

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1.0 INTRODUCTION

This Environmental Monitoring Plan (EMP) describes environmental monitoring at Deschutes County's Knott Landfill (KLF) located in Bend, Oregon. PBS Engineering and Environmental Inc. (PBS) prepared this EMP on behalf of the Deschutes County Department of Solid Waste (County).

The County's renewed DEQ Solid Waste Disposal Site Permit Number 6 (Permit), issued August 21, 2015, requires environmental monitoring to assess environmental impacts and risks to public health and safety, if any, from possible contaminant releases from the landfill. The EMP describes the rationale, methods, schedule, and analytical requirements for conducting specific environmental monitoring, and it provides documentation for existing environmental control systems (e.g. landfill gas and groundwater monitoring wells, leachate collection system). The EMP will be updated or amended, as needed, to document any changes to the monitoring program over time and as monitoring parameters, locations, or methods change.

The plan describes monitoring of groundwater quality beneath the site and the presence and nature of landfill leachate and landfill gas at the facility. This EMP has been prepared in accordance with Title 40 Code of Federal Registry (CFR) Part 258, Oregon Administrative Rules (OAR) 340-094 (Solid Waste: Municipal Solid Waste Landfill Rules), and OAR 340-040 (Groundwater Quality Protection Rules). As required by Section 14.2 of the Permit, this EMP complies with the DEQ's *Solid Waste Landfill Guidance Document* (DEQ, 1996).

Environmental monitoring is required to assess environmental impacts, if any, and public health and safety risks from any contaminant releases from the landfill. The development of the EMP is a necessary step to ensure the collection of representative data, and is required under the County's Permit for the facility. The EMP describes the rational, protocol, schedule, and analytical requirements for conducting specific types of environmental monitoring, as well as providing backup documentation for existing environmental control systems (e.g. landfill gas extraction system, monitoring well construction). The EMP is a "living" document and will be updated or amended as the facility evolves over time and as monitoring or methods change.

1.1 EMP Maintenance

Revisions and updates to this EMP must be made in accordance with Section 14.3 of the Permit. EMP revisions are required if facility conditions, monitoring requirements, or sampling procedures change. EMP revisions must be submitted within 90 days of when conditions change to the DEQ for review and approval. The Submittal Address is listed in Section 7.6 of this EMP.

1.2 EMP Organization

This EMP is divided into seven (7) sections. Sections 1 and 2 introduce the EMP, provide background information on the landfill, and describe the physical characteristics of the site. Section 3 describes groundwater quality monitoring at KLF, including a description for the monitoring network and the sampling and analysis requirements. Section 4 describes landfill leachate collection system and the leachate monitoring at the landfill, Section 5 describes gas monitoring at the landfill, including a description of the monitoring network and the requirements of the Permit. Section 6 describes other environmental monitoring requirements for the landfill. Section 7 describes data analysis and reporting requirements. Section 8 lists cited references.

2.0 BACKGROUND

This section provides background information regarding the Knott Landfill facility, including general site description and development, regional and local geologic and hydrogeologic conditions.

2.1 Site Setting

2.1.1 Location and Setting

The Knott Landfill is a Municipal Solid Waste (MSW) landfill facility, which occupies approximately 135 acres. The site is within the southern half of Section 14, Township 18 South, Range 12 East, Willamette Meridian, and is situated at an elevation of approximately 3700 feet above mean sea level. The physical address of the facility 61050 SE 27th Street, Bend, Oregon 97702, and is located northeast of the intersection of SE 27th Street and Rickard Road (Figure 1). The landfill is located adjacent to the Bend city limits.

The Bend area is located in an area of high desert prairie, which typically receives less than 12 inches of precipitation per year, with maximum precipitation occurring during the winter months. Yearly temperatures range from an average high of 82.8° F in July to an average low of 21.6° F in January (Western Regional Climate Center, 2016).

The area immediately surrounding Knott Landfill is primarily rural residential, with single family residences on acreage located to the south and east of the facility. A pet boarding facility is located approximately 1/3-mile west of the facility. A middle school is located approximately 1/4-mile northwest of the site. Central Electric Cooperative and Deschutes County Department of Public Works facilities are located to the north of the facility. An electric company substation is located adjacent to the southeast corner of the landfill.

Surface water bodies in the vicinity of Knott Landfill include several unlined seasonal irrigation canals that are diverted from the Deschutes River located approximately 5 miles west of the facility. The Arnold Irrigation District's Main Canal is located approximately 1.5 miles south of the site. An extension of the Arnold Canal flows north from the main canal approximately 1 mile east of the landfill. The Central Oregon Irrigation District's Main Canal is located approximately 1.5 miles north of the landfill and flows to the east northeast.

2.1.2 Geology

The Knott Landfill site lies within the High Lava Plains Geological Province (Orr et aI, 1992), approximately 15 miles east of the crest of the Cascade Mountain Range. As the name implies, the High Lava Plains comprises a broad plain containing a multitude of relatively young volcanic features. Features include volcanic cones and buttes, lava flows and lava tube caves are scattered across the landscape. Two other major geologic provinces are located near the city of Bend. To the west is the north-south trending Cascade Mountain Range, which contains numerous volcanic eruptive centers, and extends from northern California to British Columbia.

To the south of the High Lava Plains is the Basin and Range Province, which extends south through much of the southwestern United States. The Basin and Range Province consists of large north-south trending fault bounded basins often 10 to 20 miles wide separated by fault-blocked ranges (USGS, 2001). The basins represent the down-

dropped portion of the fault blocks, and are believed to be the result of regional crustal extension.

Rock units in the area are primarily of volcanic origin in the form of basaltic lava flows, ignimbrites, fallout tephra, and debris flows. Alluvial deposits are also present. Volcanic rocks and sediment originating from both the Cascade Range and smaller volcanic centers are present throughout the area. The youngest rocks consist of Pleistocene age basalt flows from the northern flanks of Newberry Volcano located approximately 18 miles south of the landfill. Basalt thicknesses range from 10 to 100 feet (DOGAMI, 1976). Underlying the Newberry lava flows is the Pliocene age Deschutes Formation consisting of basalt lava flows, interbedded with conglomerate, sandstone and siltstone deposits. Locally, the Deschutes Formation is primarily of Cascade origin, although some material was derived from intra-basin volcanic centers or from erosion of older volcanic units to the east. The Deschutes Formation ranges in thickness up to over 2,000 feet, and serves as the principal aquifer unit in the Upper Deschutes Basin (See Section 2.1.3). Underlying the Deschutes Formation are older volcanic strata including the Prineville Basalt and beneath that, the late Eocene to early Miocene age John Day Formation (DOGAMI, 1976, Peterson et. al., 1974, USGS, 2001).

The area around Bend has three major fault zones that generally converge in this area of Central Oregon. Generally, each fault zone consists of a series of smaller sub-parallel normal faults extending for as much as 130 miles (Orr et al, 1992). Fault zones include the Walker Fault Zone, which trends northeast, the Brothers Fault Zone, which trends northwest, and the Sisters Fault Zone, which trends north-northwest. Knott Landfill is located within the Sisters Fault Zone, which terminates approximately 5 miles southeast of the landfill. A review of the published geologic maps of the area indicates that the landfill is bounded by normal faults on the northeast and southwest side of the landfill, and the landfill is located within the down thrown block or graben (Peterson et. al., 1974).

Prior to use as a solid waste disposal facility, the Knott Landfill site was used as a gravel pit. The material mined from the pit has previously been mapped as part of the Deschutes Formation (Peterson et. al., 1974). However, recent studies indicate that the unconsolidated sands and gravels within the Knott Landfill graben are not Deschutes Formation, but rather the result of more recent alluvial deposition (Chitwood, 2001). The alluvial deposits at Knott are mineralogically similar to the rocks of the Newberry Volcano, and their origin can be traced there. Normal faulting, which created the graben in which the landfill sits, occurred prior to the deposition of the most recent lava flows from Newberry Volcano. Newberry lava flows overflowed the edges of the graben structure, but did not fill it, as was the case in areas north of the landfill (Chitwood, 2001).

2.1.3 Hydrogeology

Knott Landfill lies within the Upper Deschutes River Basin. The Upper Deschutes River Basin encompasses approximately 4,300 square miles of Deschutes River Drainage Basin in Central Oregon. The Deschutes River Basin is defined by Jefferson Creek, the Metolius River, Deschutes River and Trout Creek on the north; the drainage divide between the Deschutes Basin and the Fort Rock and Klamath Basin on the south; and on the west by the Cascade Crest. On the east, the Deschutes River Basin is defined by the generalized geologic contact between the Deschutes Formation and the older John Day Formation (USGS, 1998).

Groundwater in the Upper Deschutes Basin occurs in aquifers comprised of a variety of volcanic rocks and sediments. However, fractured lava, interflow zones, and coarse-grained volcaniclastic sediments are particularly productive units. General groundwater flow has been interpreted from regional water well elevation data, which indicates a northeasterly groundwater flow direction in the vicinity of Bend, Oregon (USGS, 1998).

The horizontal hydraulic groundwater gradient is relatively gradual in the vicinity of Bend compared to the primary groundwater recharge areas near the Cascade Range and Newberry Volcano. Downward vertical gradients have been reported in areas of groundwater recharge. In addition to the mountainous areas, significant recharge occurs in some areas, including the Bend area due to unlined irrigation canals. Groundwater recharge from leaking irrigation canals are known to impact local groundwater gradients (USGS, 1998).

Groundwater beneath Knott Landfill is approximately 700 feet below ground surface and flows to the north-northeast. This is believed to be the uppermost regional aquifer. Based on boring logs from the installation of monitoring wells at the site, groundwater appears to be within Holocene age basalt and cinder interflow zones.

2.2 Landfill Background

2.2.1 Site Development

The landfill is operated by the Deschutes County Department of Solid Waste. Prior to 1972 the area was utilized as a quarry for sand and gravel. From 1972 to 1996 the County disposed of municipal solid waste (MSW) in a 21.65-acre disposal area. This area is called Area A2. Beginning in 1996, MSW has been disposed of into lined cells. Waste was disposed of between 1996 and 2007 in Cell 1, located in the southwest portion of the site west of Area A2. MSW disposal began Cell 2 in the summer of 2001 and was completed in the Fall of 2004. The disposal of MSW was moved to Cell 3 in the Fall of 2005. MSW began being placed in Cell 4 in August 2007. In May 2011, the County began disposal operations in Cell 5. The construction of Cell 6 was completed and disposal operations began in June 2015.

Area A2 served as the primary disposal site for municipal solid waste in Deschutes County since 1972. This unlined portion of the landfill is located within the former rock quarry, and contains refuse extending to a depth of 90 feet or more below the top of the landfill cell. The County was also permitted to dispose of non-MSW on a separate 25-acre area (Area A1) located directly north and adjacent to Area A2. Landfill operations were substantially completed in Area A1 in September 2008. A final soil cover using a water balance-type cover soil system was placed over Areas A1 and A2 in 2010. The soil cover has a thickness of at least 48 inches.

As new solid waste regulations were adopted, the County completed and began using a new lined landfill cell (Cell 1) to the west of Area A2 in 1996. A liner system was constructed in the bottom of Cell 1 and since the new landfill cell was buttressed against the old Area A2 landfill cell, a side wall liner system was also installed. This allows precipitation that falls within the footprint of the new landfill cell to be collected within Cell 1. Further expansion of the landfill system occurred in subsequent years with the construction of five additional lined cells (Cells 2 thru 6). Additional facilities at Knott Landfill include a transfer station, recycling center, wood/yard waste compost area,

maintenance shop, scale house and truck scales, household hazardous waste collection center and administrative offices. Key features of the Knott Landfill facility are depicted in Figure 2.

2.2.2 Groundwater Monitoring

Groundwater monitoring at the site began in 1995 following the installation of the first three monitoring wells (MW-1 thru MW-3) surrounding the unlined landfill area (Areas A1 and A2). Two additional wells (MW-4 and MW-5) were installed in 1996 to further assess groundwater conditions around the landfill. In 2006, three additional wells were installed to support the expansion of the landfill, with MW-6 and MW-7 being installed along the northern landfill boundary and MW-4R to replace MW-4 along the eastern landfill boundary. MW-4 was subsequently decommissioned in 2008 to allow for expansion of the landfill. During the course of landfill expansion and the development of the Central Embankment, the casing of MW-2 has needed to be extended twice (2004 and 2010) and the surface monument reset to match the new surface elevations of the surrounding ground surface. The monitoring wells are shown on Figure 3.

The monitoring wells were initially sampled in 1995 using bailers; however, that method became time consuming and cumbersome given the significant depth to groundwater. The bailer method was replaced with a pneumatically driven positive displacement piston pump, utilizing a stainless steel cylinder, check-ball assembly, stainless steel pump casing and a fiberglass rod assembly to remove water from the well. The system was powered by a trailer mounted air compressor unit. This sampling method was employed beginning in 1998. However, during the initial sampling with the piston pump equipment difficulties were encountered, which required removal and repair of the downhole pumping equipment. The removal and repair of pumping equipment may have affected early sampling results and equipment difficulties were not completely rectified until the Fall of 2000.

During the sampling events in 2008, elevated levels of chromium and nickel were detected in two monitoring wells. It was hypothesized that the operation of the piston pump assembly was causing small slivers of stainless steel to flake off into the water column. A DEQ-approved study involving the collection and analysis of the particulates collected during a normal purging event indicated the particulates exhibit an elemental spectrum consistent with Type 316 stainless steel, the type used in the manufacture of the piston pump, pump casing and rod assemblies (URS, 2008). As a result of this study and knowing that wells MW-4R and MW-7 had not been sufficiently developed when originally installed in 2006, the two wells were redeveloped in the Spring of 2009 prior to conducting further groundwater sampling. The development only marginally reduced the metal concentrations as noted by the initial sampling results conducted in early April 2009 (PBS, 2009).

The piston pump systems in both MW-4R and MW-7 were replaced with a low flow pneumatic bladder pump system in 2009, operated using compressed nitrogen gas and capable of handling the depth to groundwater and well diameter constraints. The analytical results from these two wells using the bladder pumps returned to containing no detectable chromium or nickel at or above the method detection limit. The remaining five wells were equipped with bladder pumps in the summer of 2010 and have been providing representative groundwater samples to meet the requirements of the Permit.

Depth-to-groundwater levels were previously obtained prior to purging each well using a bubbler tube system that included a dedicated in-well tubing, dry nitrogen gas as a pressurizing agent, and a pneumatic readout unit. This method did not always provide accurate bubbler readings and was replaced at the time the sampling pumps were replaced. The bubbler tubes were removed and an electronic water level meter, with an accuracy of +/- 0.01 foot, was used to obtain water level measurements prior to sample purging.

2.2.3 Landfill Gas Monitoring

In January 2001, nine LFG monitoring probes were installed in five locations around the perimeter of Area A2. The probes are located to the east, west and south of Area A2. One of the monitoring probes (GP-5) was decommissioned in 2004 to accommodate the further development of the landfill. In 2013, four additional LFG monitoring probes (two probe pairs) were installed adjacent to the landfill footprint to further assess the LFG migration potential. The new probes are located along the western and northwestern landfill footprint adjacent to Cells 3 and 6, respectively. The LFG probes are shown on Figure 6.

2.3 Previous Environmental Monitoring Plans

The previous EMP was prepared by URS (June 2002, and subsequent revisions). The plan included description and monitoring details of the groundwater, leachate and landfill gas monitoring network for the facility.

Prior to the URS plan, a previous EMP was prepared by David Evans and Associates, Inc (DEA, 1995). This EMP focused primarily on monitoring well location and installation, as well as the groundwater quality monitoring plan. At the time this plan was prepared, the monitoring network consisted of three groundwater monitoring wells.

Some significant upgrades and additions have occurred in the operating and environmental monitoring scheme at Knott Landfill since the last EMP revision in 2009. Upgrades and additions include:

- The redevelopment of monitoring wells MW-4R and MW-7.
- The installation of low-flow groundwater sampling pumps in all of the wells.
- The installation of two additional landfill gas monitoring probe pairs (4 wells).
- The expansion of the landfill gas extraction system.
- The construction and lining of disposal cells 4, 5 and 6.
- The installation of leachate collection systems in the new disposal cells.
- The installation of an automated leachate level monitoring, pumping and recirculation system.

This document builds upon the information provided in the previous EMPs, describes all existing environmental monitoring networks (groundwater, landfill gas, leachate), monitoring operations, and addresses new requirements pertaining to data analysis and reporting as specified in the *Solid Waste Guidance Document* (DEQ, 1996).

3.0 GROUNDWATER QUALITY MONITORING

This section describes the groundwater quality monitoring network at Knott Landfill. Included in this section is a description of the current monitoring network, including well construction details, sampling procedures, analytical requirements, data review procedures, and QA/QC requirements.

The objectives of the groundwater monitoring network are to provide reliable and representative sampling data and to evaluate aquifer characteristics. The existing groundwater monitoring network satisfies these objectives through the regular monitoring of seven groundwater monitoring wells which penetrate the uppermost aquifer beneath the site, approximately 700 feet below ground surface (bgs). The monitoring network has been designed to monitor groundwater conditions both upgradient (2 wells) and down gradient (5 wells) of some or all of the landfill cells. A review of historical groundwater gradient maps indicates that groundwater flow is generally to the north-northeast.

3.1 Background

In accordance with 40 CFR, Part 258, Subpart E (Groundwater Monitoring and Corrective Action), and OAR 340-094-0080, the County is required to conduct groundwater monitoring to ensure that groundwater beneath the site is not impacted by facility operations. This requirement is also stipulated in Section 15 of the Permit.

In response to the groundwater monitoring requirement, the County installed an initial monitoring network consisting of three wells (MW-1, MW-2, and MW-3) between July and September, 1994. Monitoring well MW-1 is located in the northeast comer of the property, north of the non-MSW disposal Area A1. MW -2 is located in the central portion of the site, north of the Area A2 disposal area. Monitoring wells MW-1 and MW-2 were installed as downgradient wells. Monitoring well MW-3 was installed south of the Area A2 disposal area as an upgradient well. Two additional wells (MW-4 and MW-5) were installed in June 1996 to provide more detailed groundwater assessment. Monitoring well MW-4 was installed northeast of the Area A2 disposal area, while MW-5 was installed near the intersection of SE 27th Street and Rickard Road in the southwest corner of the facility. In 2006 three additional wells were installed to support the expansion of the landfill, with MW-6 and MW-7 located along the northern landfill boundary and MW-4R located along the eastern landfill boundary. MW-4 was subsequently decommissioned in 2008 to allow for expansion of the landfill. Figure 3 depicts the location of each monitoring well. Oregon Water Resource Department's monitoring well reports are included in Appendix A.

3.1.1 Compliance Wells and Background Well

In accordance with Section 17.2 of the Permit, The compliance wells include MW-1, MW-2 and MW-3, MW-4R, MW-6 and MW-7. The background compliance well is MW-5. Wells MW-4R thru MW-7 will be monitored on semi-annually. Wells MW-1, MW-2 and MW-3 will be monitored semi-annually for groundwater levels only to assist in determining the groundwater flow direction and gradient across the site. All seven of the wells will be included in the DEQ split-sampling events.

3.1.2 Network Description

The groundwater monitoring network consists of seven monitoring wells. Monitoring wells were installed using air rotary drilling techniques to complete an 8.25-inch borehole. Each monitoring well is constructed of 4-inch diameter, flush threaded, Schedule 80 PVC casing. One well, MW-4R, was reconstructed within the existing steel conductor casing and required using 3-inch diameter well casing to accommodate the annular well seal. A

10-foot Schedule 80 PVC 0.010-inch slot well screen was installed in the bottom 10 feet of each well. Centralizers were installed at the bottom of the well screen to center the well in the borehole. Monitoring well depths range from approximately 700 feet to 735 feet, as summarized in Table 1.

3.1.3 Network Modifications

No modifications to the existing groundwater monitoring network are planned at this time. However, it is likely that modifications will be conducted in the future to meet final grading requirements. Modifications to the monitoring network may include abandonment and/or replacement of existing wells. The EMP will be updated as modifications are made to the existing monitoring network. Any new construction or modifications will comply with Section 19.3 of the Permit, and be documented in accordance with Sections 19.4 and 19.5 of the Permit.

3.1.4 System Operation and Maintenance

The physical integrity of the monitoring wells is crucial. In accordance with OAR 340-094-0100 (4), a post-closure period may extend for up to 30 years. Therefore, monitoring wells may be required to remain in place and operational for several decades after the landfill is closed. Any new construction or modifications will comply with Section 19.3 of the Permit, and be documented in accordance with Section 19.4 of the Permit.

Monitoring wells generally require little maintenance, as most of the well is below-ground, making the only portion requiring attention the security casing and its surrounding area. The security casings used on Knott Landfill monitoring wells are fabricated from steel. Since they are constantly exposed to the weather elements, rust may be a concern over time. In addition, damage from vehicular collisions may also be of concern. All wells, therefore, should be inspected periodically and the following tasks performed as needed:

- Wellheads showing evidence of deterioration should be cleaned, rust deposits removed, primed, and coated with a rust-inhibiting paint.
- Wellhead identification numbers should be repainted and kept legible at all times.
- Security locks should be kept clean and the key assembly lubricated.
- Excess vegetation should be cleared around the wells for access ease.
- Vehicular access to the well locations must be maintained.

Any physical damage to monitoring equipment or devices not associated with general normally anticipated maintenance will be documented and reported to DEQ in accordance with Section 19.2 of the Permit.

3.2 Sampling and Analysis

The following sections describe the sampling and analysis plan (SAP) for the collection of groundwater samples at Knott Landfill. This SAP has been prepared in accordance with the Permit. Any subsequent changes to the groundwater monitoring requirements outlined in the Permit will be reflected in subsequent revisions of this EMP.

3.2.1 Monitoring Schedule and Locations

According to Section 15.4 of the Permit, the County must conduct semiannual groundwater monitoring in the spring and fall of each year. The spring monitoring event will occur during the permit-designated spring quarter (between April 1 and May 31) and the fall quarter (between October 1 and November 30). Monitoring wells MW-4R, MW-5,

MW-6 and MW-7 will be sampled on a semi-annual basis, while MW-1, MW-2 and MW-3 will be sampled every four years during the DEQ split-sampling events. Monitoring well locations are depicted on Figure 3.

3.2.2 Field Preparation

For the purposes of this SAP, field preparation involves the appropriate agency notifications and equipment/material procurement for conducting semiannual groundwater monitoring. The following tasks should be completed prior to conducting field sampling activities:

- Notify the DEQ in writing of upcoming sampling events at least 10 working days prior to the scheduled event (Section 15.1 of the Permit).
- If the sampling event coincides with a scheduled DEQ split-sampling event, then notify the DEQ laboratory at least 45 days prior to the split-sampling event. According to Section 15.2 of the Permit, the split-sampling events are scheduled for Fall 2018, Fall 2022 events.
- Review the Permit and the previous groundwater sampling event reports. Analytical requirements and any pertinent field conditions should be noted and incorporated into equipment/material procurement.
- Conduct a pre-sampling event meeting. The County and the County's contractor will meet prior to each monitoring event to review the objectives of the event, the sampling and analytical requirements, field equipment operation, and key logistical factors which could affect the project.
- Procure field equipment, materials, and field data sheets. Field equipment will be calibrated and tested. The appropriate sampling containers should be obtained from the contract analytical laboratory (quantity, type, preservation). A listing of field equipment is included in the field preparation checklist (Appendix B).

3.2.3 Groundwater Monitoring Elevations

The depth to groundwater will be measured in all seven monitoring wells before each of the compliance and background wells are purged. The measurements will be collected using an electronic water level indicator capable of measuring water levels to within 0.01 feet. The reading will be collected by lowering the tape through the PVC casing of the monitoring well. The groundwater elevation at each monitoring well will be calculated from comparing the depth to water and the surveyed wellhead elevation. The procedure for determining groundwater elevation is outlined on the groundwater level form (Appendix B).

3.2.4 Purge Methods and Field Indicator Parameters

Each monitoring well is equipped with a QED Environmental Systems ST1102M pneumatic bladder pump designed to operate at the depths and pressures encountered at Knott Landfill. The bladder pump system is operated by Deschutes County personnel. Timed on/off cycles of compressed air alternately squeeze the flexible bladder to displace water out of the pump and release it to allow the pump chamber to refill by submergence. Compressed nitrogen is used as the air source because it is more efficient than air to achieve the necessary pressures. The pump is capable of discharging approximately 390 milliliters (ml) per cycle or 250 ml per minute.

Purge volumes are generally dictated by field parameter stability. Given the significant depth to groundwater at the site, a modified low-flow sampling methodology is employed.

The pump controller and compressed nitrogen are connected to the pump intake tube. The controller manages the timing of the nitrogen fill/discharge cycle. Initially the discharge tube is purged of its entire volume (ranging from about 7100 and 7300 ml). The volume of each well's tube volume is calculated by the manufacturer and included in Table 1. Field parameters are measured every alternative discharge cycle (approximately 375-390 ml per cycle) until the parameters are considered stable. Stabilization will be defined as the point in time that the last three sets of field indicator measurements are:

- Within 1° Centigrade for temperature
- Within 0.3 standard units for pH
- Within 5% for specific conductance
- Within 10% for all other parameters

Field indicator parameters (Group 1a of Attachment 1 for the Permit) include temperature, pH, specific conductance, dissolved oxygen, and oxidation-reduction potential (ORP also referred to as Eh). A YSI 566 Multi-parameter water quality meter equipped with a flow-through cell will be used to monitor field indicators. The water quality meter will be calibrated and operated according the manufacturer's operations manual. The field indicator data will be entered onto the groundwater sampling data sheet (Appendix B).

3.2.5 Sample Collection

Groundwater samples will be collected directly from the dedicated outlet hose for each monitoring well and filled into laboratory supplied containers. Discharge rates will be controlled during the filling of containers for volatile organic compounds (VOCs) at a rate of approximately 100 ml per minute to minimize volatilization.

Before collecting samples, sampling personnel will don clean, nitrile or equivalent protective gloves. Groundwater will be transferred from the well into the appropriate pre-labeled sample bottles. VOC samples will be collected first as they are the most sensitive to volatilization. While filling VOC sample bottles, sample water will be poured down the inside of the container to minimize turbulence while sampling. While filling the sample vial for VOC analysis, a positive meniscus should be formed over the mouth of the vial to eliminate the formation of air bubbles and headspace prior to capping.

For the determination of dissolved concentrations of anions, cations, and metals, groundwater will be field filtered for each analysis using a 0.45 micron filter and a peristaltic pump. New, dedicated filters and disposable pump tubing will be used for each well. The standard operating procedures (SOPs) to be used for sample documentation are specified in SOP1 in Appendix C. SOP2 details the procedures for sample packaging and shipping to the analytical laboratory.

3.2.6 Analytical Parameters and Frequency

3.2.6.1 Analytical Parameters

The analytical requirements for environmental monitoring at Knott Landfill are outlined in Attachment 1 (Parameter Groups) of the Permit. According to Attachment 1of the Permit, environmental monitoring parameters (for both groundwater and leachate) are divided into six groups (Groups 1, 2, 3, 4, 5, and 6) and include the following:

- Group 1a -field indicators (as described in Section 3.2.4)
- Group 1b - leachate indicators
- Group 2a - common anions and cations
- Group 2b - trace metals
- Group 3 - volatile organic compounds (VOCs)
- Group 4 - assessment monitoring parameters
- Group 5 - surface water and leachate
- Group 6 - other assessment monitoring parameters

Routine groundwater monitoring at Knott Landfill includes monitoring for select parameters from Groups 1 through 3 according to the schedule described in Section 3.2.6.2 below. The parameters for Groups 1 through 3 are summarized in Table 2. Table 2 includes the method reporting limit for each analyte, the reported units, and the analytical method used for each analysis.

As indicated in the description for subgroup 2b (trace metals) in Attachment 1, if the total suspended solids (TSS) concentration in groundwater for a sample exceeds 100 milligrams per liter (mg/L), both total (unfiltered) and dissolved (field-filtered) analyses will be conducted. Since TSS concentrations have always been less than 100 mg/L using the low-flow sampling methodology, only total (unfiltered) concentrations need to be analyzed. The need to analyze samples for dissolved trace metals may be necessary if analytical results show a significant increase in concentration.

Appropriate field filtering and sample container preservation guidelines will be followed for all analytical parameters. Table 3 presents the laboratory container, preservation, and holding times that will be utilized. A small amount of sample, after being introduced into the preserved containers and thoroughly mixed, will be tested in the field using pH test paper to confirm that the proper pH has been achieved. If necessary, additional preservative will be used to raise or lower the pH of the sample.

Groups 4, 5 and 6 (assessment monitoring parameters) are currently not part of the routine groundwater monitoring at Knott Landfill.

3.2.6.2 Establishing PSCLs and SSLs for Select Parameters

PBS utilized the extensive history of monitoring data and collaborated with DEQ to develop a set of parameters and wells that would be useful to provide the best indications of a release. Monitoring wells MW-1, MW-2 and MW-3 were not included in the evaluation because they were installed to monitor the original Area A landfill footprint and are subject the concentration limits specified in the permit (OAR 340-040).

Monitoring data from the Fall 2000 to the present was considered valid data for this exercise for the background well MW-5. Data from Fall 2006 to present was used for wells MW-4R, MW-6 and MW-7. This included 23 to 31 data points, depending on the particular parameter and well. The data was initially analyzed to identify candidate parameters using some of the criteria in DEQ's *Internal Management Directive for Developing Concentration Limits at Permitted Solid Waste Facilities* (DEQ, 2011). These included:

- Duplicative parameters
- Parameters with significant concentration contrast between leachate and groundwater
- Persistence of Parameters (degree of variability or percent relative standard deviation)
- Parameters with high percentage concentrations below the method reporting limits

Based on these criteria the following parameters were identified as the best candidate parameters for setting site specific concentration limits:

- Bicarbonate, calcium, magnesium, potassium, sodium and total organic carbon (parameters without Reference Levels (RLs)
- Arsenic, barium, chloride, iron, manganese, total dissolved solids (parameters with Maximum Contaminant Levels [MCLs], or RLs)

In addition to the site specific parameters, DEQ requires annual sampling for VOCs as an additional way to verify no significant change in groundwater quality. A significant change would include a confirmed detection of a parameter not present in background groundwater.

As required by Section 16.2 of the permit, an intrawell statistical analysis using methods in EPA's *Unified Guidance: Statistical Analysis of Groundwater Monitoring Data for RCRA Facilities* (EPA, 2009) was performed on the dataset described above. Using an intrawell analysis, the background for each well is determined using the historical data from each well.

Prediction Limits (PLs) were calculated for a given parameter at each well by comparing the two 2016 data points to the pre-2016 data points. Sanitas™ Statistical Software by Sanitas Technologies Inc. was used to perform the calculations. Prediction limits are constructed to contain one or more future observations or sample statistics generated from each well's background population with a specified probability equal to the confidence level of the limit. It represents the chance - over repeated applications of the limit to many similar data sets – that the prediction limit will contain future observations or statistics drawn from its background population. If there was more than 50 percent non-detect values in the background data, a non-parametric test was used in lieu of a parametric prediction limit. A non-parametric test was also used if the data was determined by the Shapiro Wilk normality test to be non-normal. The methodology adopted in this statistical analysis is consistent with 40 CFR Part 258.53(g)(2).

The prediction limits were used as an initial starting point value to develop a concentration limit for each well. This value was adjusted based on comparison to several criteria. In the case of very low percentage of parameter detections, other values (i.e. highest detection or 2nd highest detection) were used. Changes in laboratory method reporting limits (MRL) also affected the data and necessitated using other values (i.e. 50% of the RL or 50% of the MCL). In accordance with Section 16.3 of the Permit, the resulting Permit Specific Concentration Limits

(PSCLs) for arsenic and barium, and the Site Specific Limits (SSLs) for the remaining compounds are presented in Table 4.

In addition to the PSCL and SSL parameters selected above, sulfate will also be analyzed during the routine semi-annual sampling events.

3.2.6.3 Analytical Frequency

As described in Section 15.4 of the Permit, semiannual monitoring at Knott Landfill for the select parameters with PSCLs or SSLs on a semiannual basis (spring and fall) for monitoring wells MW-4R, MW-5, MW-6, and MW-7. Monitoring for Group 3 (VOCs) will occur on an annual basis (in the fall) for monitoring wells MW-4R, MW-5, MW-6, and MW-7. Water levels will be collected from all seven monitoring wells on a semi-annual basis. This information is presented in Table 5.

3.2.7 Field Quality Assurance and Quality Control

As described in Section 10.11 of the *Solid Waste Landfill Guidance* (DEQ, 1996), field quality assurance and quality control *(*QA/QC*)* provisions must be incorporated into field activities. Field QA/QC provisions for the sampling and analysis of groundwater at Knott Landfill are described below.

3.2.7.1 Field Documentation

Detailed information such as the circumstances of collection and subsequent disposition of samples results in a well-documented investigation. Accurate sample and project records and proper chain-of-custody procedures are imperative.

The purposes of establishing documentation procedures are to:

- Provide a complete record of procedures as performed in the field.
- Permit accurate identification of samples and tracking of their status.
- Facilitate chain-of-custody and traceable accountability procedures for samples.
- Facilitate retention of project records.

Verifiable sample custody will be an integral part of field and laboratory operations. Sufficient documentation will be made in the field and laboratory to document sample collection preservation, and identification. Permanently bound field logbooks with waterproof paper will be used as the field logbooks for this project because of their compact size, durability, and secure page binding. Field sampling data sheets for recording depth to groundwater, groundwater sampling, leachate sampling, and landfill gas monitoring will also be maintained. The field documentation procedures are specified in SOP1, and the field sampling sheets are in Appendix B.

3.2.7.2 QA/QC Sampling

Two QA/QC sample types will be submitted for analysis at Knott Landfill during each semi-annual groundwater monitoring event. QA/QC sample types will consist of a duplicate, and a trip blank sample. The collection of an equipment blank sample is not necessary for groundwater monitoring at Knott Landfill as

new or dedicated groundwater sampling materials are used at each monitoring well. The following is a description of the collection procedures for QA/QC samples:

- **Field Duplicate** - A duplicate sample for all analytes should be collected once per sampling day or once every 10 samples. Historically, up to 4 wells can be sampled in a single day, and therefore a single field duplicate sample will be collected during each sampling event. The field duplicate will be collected from a given monitoring well and will be submitted to the laboratory labeled as "MW-10." Collection methods will follow the procedures outlined in Section 3.2.5 of this EMP.

- **Trip Blank** - One trip blank sample for VOCs should be prepared for each sample shipment container in which multiple samples are being analyzed for VOCs. Trip blanks will be prepared by the laboratory and will accompany the sample containers to and from Knott Landfill during the sampling event.

QA/QC sample documentation procedures are provided in SOP1, and the packaging, and shipping procedures are outlined in SOP2.

3.2.8 Laboratory Quality Assurance and Quality Control

Groundwater samples will be submitted to BSK Associates of Vancouver, WA or Test America, Inc. of Tacoma, Washington for analysis of the select parameters. Parameters with short hold times (i.e. less than 48 hours) will be submitted to Umpqua Research Corporation of Bend for analysis. All three laboratories are certified under the Oregon Laboratory Accreditation Program (ORLAP) and have the quality assurance/quality control plans to perform the required laboratory analyses.

Batch analysis of method blanks, laboratory duplicates, and matrix spikes for the analytes at a frequency of once per day of analysis will be conducted by the analytical laboratory.

A detailed laboratory statement of technical qualifications and ORLAP certifications are included in Appendix D. If the laboratory is changed or a new laboratory is contracted, a new QA plan will be submitted to the DEQ as part of a revised EMP.

3.3 Data Review

A quality assurance/quality control (QA/QC) data review will be conducted on every laboratory data set and is included with each environmental monitoring report. This QA/QC review includes evaluation of representativeness, accuracy, field and analytical precision, comparability, and completeness. These are described as follows:

- Representativeness is the degree to which sample data accurately and precisely describe the characteristics of a population of samples, parameter variations at a sampling point, or environmental conditions. Representativeness is assessed by examining chain-of-custody documentation and verifying that sample analyses were performed within allowable holding times.
- Accuracy is evaluated using the analytical results for blanks, matrix spike/matrix spike duplicates (MS/MSD), and laboratory control samples (LCS).

- Precision is evaluated by comparing results of primary, field duplicate, and laboratory duplicate analyses.
- Comparability is a qualitative characteristic of the data, expressing the degree of confidence with which one data set can be compared with another.
- Completeness is evaluated by calculating the percentage of acceptable data.

Data is reviewed in accordance with the procedures specified in the United States Environmental Protection Agency (EPA) Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA, October, 1999) and Inorganic Data Review (EPA, October, 2004) as applicable. The laboratory data is provided in an electronic deliverable dataset (EDD) for direct input in an electronic laboratory database system. Both laboratory data and the field measurements are stored in this electronic database to permit reliable and accessible retrieval of the KLF groundwater dataset.

3.3.1 Initial Data Review

Review of analytical groundwater data is an important process in conducting a groundwater monitoring event as the analytical results will dictate whether resampling is required by the Permit. The analytical data review will be conducted immediately following receipt of the data. The review will be conducted according to the procedures outlined in Table 6. Table 7 presents the data review procedures and the resampling actions required by Section 17.3 of the Permit.

According to Table 6, groundwater data must be compared to both the PSCL and SSL limits in Table 4 and reviewed to determine if a significant change in water quality has occurred (See Section 3.3.2). As indicated in Section 17.3 of the Permit, an example of a significant change in water quality includes the following:

- Detection of a VOC or other hazardous constituent not detected in background.
- Exceedance of a Table 1 or Table 3 value listed in Oregon Administrative Rule (OAR) 340-040 unless the background water quality is above these numerical limits.
- Exceedance of a safe drinking water standard (EPA National Primary Drinking Water Standards [MCLs]).
- Detection of a compound in an order of magnitude higher than the well's background.

Included in Table 2 are the OAR 340-040 Table 1 and 3 values and the EPA National Primary Drinking Water Standards (i.e., Maximum Contaminant Levels [MCLs]) for which groundwater data concentrations will be compared: Based on the above, the data review conducted during a groundwater monitoring event will consist of the following:

- Determining if a VOC or other hazardous constituent is detected in background water samples.
- Comparison of reported concentrations to OAR 340-040 Table 1 and 3 values.
- Comparison of reported concentrations to the Safe Drinking Water standards.
- Comparison of reported concentrations to historical groundwater data for the respective monitoring well at Knott Landfill.

In addition to the routine sampling review discussed above, water quality data will be reviewed for significant changes during the split-sampling groundwater monitoring

events using the same data review process discussed in this section of the EMP. Table 6 and 7 list data review procedures and resampling actions required by Sections 17.3 of the Permit.

3.3.2 PSCLs and SSLs Exceedance or Significant Change in Water Quality

Data will be reviewed immediately after receiving final data from the laboratory and compared the PSCLs and SSLs (Table 5 of this EMP). If the detected concentrations exceed any of the PSCLs or three of the SSLs for a given well, the County must notify the DEQ of the exceeded value in writing within 10 days of receiving the laboratory data, and immediately resample the well for the parameters with the exceedances.

If a significant change in water quality is determined by reviewing the data for the conditions outlined in Section 3.3.1 above, the County must notify the DEQ of the exceeded value in writing within 10 days of receiving the laboratory data, and immediately resample the well.

Examples of a significant change in water quality include the following:

- Detection of a VOC or other hazardous constituent not previously detected in background for a given well.
- Determine whether a VOC or other hazardous constituent is detected in background water samples.

3.3.3 Resampling and Resampling Data Review

If the initial review of data indicates groundwater resampling at a monitoring well is necessary, then the resampling event will be conducted in accordance with the sampling procedures described in this EMP.

Review of data generated by a resampling event will be conducted in accordance with Section 17.4 of the Permit.

If the data confirms one or more PSCL exceeds a value listed in OAR 340-040 (see Table 2) in any well, then DEQ will be notified within 10 days of sample receipt (within 60 days of the sample date). Prior to submitting a workplan, monitoring wells MW-1, MW-2 and MW-3 will be sampled for the constituents that exceed a PSCL value or a Table 2 value. The sampling data will be used to assist in developing a Remedial Investigation workplan to be submitted within 90 days for DEQ review and approval.

If the data confirms a significant change in water quality or at least three (3) SSLs in any one monitoring point, then DEQ will be notified within 10 days of sample receipt (within 60 days of the sample date). Prior to submitting a workplan monitoring wells MW-1, MW-2 and MW-3 will be sampled for the constituents that exceed three SSL values. The sampling data will be used to assist in developing an assessment plan to be submitted to DEQ within 30 days.

If the resampling results do not confirm the original exceedances, then continue the routine monitoring and discuss the findings in the next annual monitoring report.

3.4 Changing PSCLs or SSLs

The County can propose to change the PSCLs or SSLs at any time and DEQ will accept a proposal to change any PSCL or SSL during the next renewal process if it can be demonstrated that:

- Background groundwater quality has changed significantly since the PSCLs or SSLs were established, and
- If the change(s) is (are) unrelated to the facility's influence.

4.0 LEACHATE MONITORING

The objective of leachate monitoring at Knott Landfill is three fold.

- First, to evaluate the existing characteristics of leachate and changes in its charateristics during landfill development,
- Second, to monitor the primary collection systems effectiveness by monitoring head level within the sump, and
- Third, to monitor the secondary system for primary liner failure as may be indicated by an increase in liquid level in the secondary sump.

The leachate collection and monitoring network was designed to meet these objectives.

4.1 Leachate Monitoring Network

This section describes the leachate monitoring network at Knott Landfill. Included in this section is a description of the current monitoring network, sampling procedures, analytical requirements, data review procedures, and QA/QC requirements.

4.1.1 Background

There are seven MSW disposal cells at Knott Landfill. The original disposal cell, known as Area A (consisting of sub-Areas A1 and A2) is an unlined cell with no leachate collection system. The remaining six cells are referred to as Cells 1 through 6. All of the refuse cells are depicted on Figure 4. Each cell was constructed as a lined disposal cell and contains separate primary and secondary leachate collection sumps at the bottom of each cell. Leachate that accumulates in each cell flows by gravity via a system of collection trenches to its respective primary leachate collection sump. Leachate is periodically removed from the primary sump by pumping to the leachate pumping station for each cell. Leachate removed from the sumps is managed primarily through on-site recirculation into Cells 3, 4, 5 and 6. Disposal of leachate at the City of Bend's wastewater treatment plant is an option if operational conditions limit on-site recirculation. The cell boundaries, collection sumps, leachate collection lines and pump stations are depicted on Figure 4.

4.1.2 Network Description

The six primary cell leachate sumps are constructed in a similar manner. Each sump consists of a series of leachate collection trenches, which divert leachate to the sump (primary and secondary) at bottom of each refuse cell. Leachate is allowed to enter the primary sump through an aggregate drainage layer and perforated piping. The sump is filled with drainage rock, and underlain by a cushioning geotextile, a geomembrane, and finally a geosynthetic clay liner (GCL). A riser pipe, containing a submersible pump extends from the leachate pump station to the bottom of the primary sump. Underlying the primary sump is a secondary sump containing a second riser pipe and submersible pump. A geotextile, geomembrane, and GCL system also underlies this secondary sump. There is a slight difference in construction between Cells 2, 5, and 6 and the other cells' secondary sumps. In Cells 2, 5 and 6, the underlying liner is welded to the bottom of the primary sump creating a "sealed envelope". This construction prevents liquids (e.g. groundwater) from entering the secondary sump, unless through a breach in the primary or secondary liner systems. Cells 1, 3, and 4 secondary sump liners are not welded to the primary liner system and can allow for groundwater intrusion. A typical cross section of a cell and leachate sump configuration is included as Figure 5.

Although groundwater at Knott Landfill is approximately 700 feet bgs, during the wet season groundwater from perched zones or seeps may potentially enter the secondary sumps. Liquid levels in both the primary and secondary sumps are automatically monitored using pressure transducers for measuring liquid levels to an accuracy of 0.1 feet. Digital meters at each pump station display sump fluid levels for both the primary and secondary sumps as well as pump rate and volume when pumps are in operation. Data generated by each pump station is transmitted via a Supervisory Control and Data Acquisition (SCADA) system located in the Central Embankment facility and to wireless data links to the Solid Waste Department's administrative office, which monitors and records the pump station parameters discussed above. Additional details on the function and operation of the SCADA system can be found in the *Knott Landfill Operations Plan* (Deschutes County, 2016).

Liquid is always present in the secondary sumps. Water was placed in the sumps during construction for purposes of testing the pumps and various sensors and to maintain pump seals. Water may be added to maintain minimum fluid level (12 inches), which must be maintained in the secondary sumps for all the cells. When the fluid level in the secondary sump of a cell rises to 24 inches, there is sufficient liquid in the sumps to pump and sample. A sample will be collected and analyzed if the fluid level reaches 24 inches.

The sample from the secondary sump will be compared to leachate from the primary sump and groundwater chemistry to assess whether the liquid in the secondary pump may be leachate.

4.1.2 Network Modifications

No modifications to the leachate monitoring network are anticipated. As new cells are constructed and begin to accept refuse, the primary sump associated with the new cell will be sampled using the same procedures as the other primary cell sumps. New secondary sumps will be monitored for liquid levels as are the other secondary sumps. If the monitoring network is modified, changes will be incorporated into future EMP updates.

4.2 Sampling and Analysis

4.2.1 Collection Methods

Leachate sampling will consist of collecting a sample from each leachate sump. Samples will be collected using the dedicated submersible pump that has been placed in each primary sump. Protocol for sample collection, handling and documentation will be the same as that outlined in Section 3.2 of this EMP for groundwater. Due to the nature of the leachate liquid and the design of the collection system it may not be possible to achieve all of groundwater sampling procedures exactly (i.e. discharge rates), so deviations will be noted in the field notebooks and field sampling sheets.

4.2.2 Field QA/QC

No Field QA/QC samples will be collected with the leachate samples.

4.2.3 Monitoring Locations

Monitoring locations for each cell's primary and secondary sumps are located at each pump station atop the Central Embankment (Figure 4). Each sampling location consists of a hose bib connected to the respective submersible pump riser. Liquid (leachate)

measurements are collected electronically from sensors located in each cell sump and reported to the SCADA system at the Central Embankment.

4.2.4 Frequency of Sample Collection

Leachate samples will be collected from each of primary containment sumps as required in Section 15.4 of the Permit based on the following schedule:

- Annually during the Fall event for the first five (5) years of operation
- Once every three (3) years thereafter with a minimum of two sumps being sampled per year during each Fall event

Per Section 10.10 of the *Solid Waste Landfill Guidance Document* (DEQ, 1996), leachate quantity (based on fluid level) is measured on a constant basis using the electronic sensors that are connected to the SCADA system.

Liquid levels in the secondary sumps are also electronically monitored by the County. By design, some liquid is always present in the sumps. Sample collection for each secondary sump will be triggered if the liquid level exceeds 24 inches. If samples are obtained from a secondary sump, the samples will be analyzed and the data will be compared to leachate from the primary sump and groundwater chemistry to assess whether the liquid in the secondary pump may be leachate.

Section 4.1.2 provides additional detail on leachate collection. Sampling results will be reported as outlined in Section 7.2. Leachate sampling frequency is summarized in Table 5.

4.2.5 Analytical Parameters

During the routine fall sampling event leachate samples will be submitted for Leachate samples will be analyzed for all parameters in Group 1b (leachate parameters), Group 2a (anions and cations), Group 2b (trace metals) and Group 3 (VOCs). All EPA Method 8260 analyses will include a library search to identify any tentatively identified compounds (TICs) present. Group 4, 5 and 6 parameters do not need to be analyzed unless groundwater conditions change and require further assessment of these parameters. Group sampling parameters are summarized in Table 2.

4.2.6 Standard Reporting Forms

A standard form will be used to record data collected during sampling events, as well as during collection of liquid level measurements. A copy of a leachate field monitoring form is included in Appendix B. Information recorded on the field form will include the following:

- Sample date and time
- Liquid level measurements
- Personnel conducting monitoring event
- Volume of leachate contained within the sumps
- Observations relative to sample quality (e.g. color, odor, etc.)
- Any problems encountered

5.0 LANDFILL GAS MONITORING

This section addresses the monitoring of landfill gas (LFG) generation as it relates to the Knott Landfill facility. In addition to the LFG monitoring network, this section also summarizes the LFG extraction system, which was installed to control offsite migration of LFG.

The generation of LFG is a common process associated with landfill operations. The primary components of LFG are methane (CH_4) and carbon dioxide (CO_2) generated from the decomposition of refuse in anaerobic conditions. During anaerobic decomposition, complex organic wastes are broken down or stabilized by microorganisms. Only wastes containing readily decomposable organic material (such as food wastes, yard wastes, paper, wood wastes, etc.) can supply the medium or substrate, for the microorganisms. Inorganic materials (such as metal, rock, and glass) cannot be biodegraded.

Many variables strongly influence the generation of LFG, the most significant being refuse moisture content. Moisture content may vary widely throughout the interior of a landfill, ranging from an average of 25 percent to completely saturated zones of 40 to 50 percent moisture by weight. In the case of Knott Landfill, moisture content is relatively low given the arid climate and significant depth to groundwater (approximately 700 feet). Other important variables include refuse placement methods, degree of compaction, refuse composition, and internal and external temperatures.

Methane and carbon dioxide, the principal components of LFG, are present in approximately equal portions. Carbon dioxide may affect groundwater quality and surface vegetation, but impacts to human health and safety are negligible. Methane, like carbon dioxide, is nontoxic to humans. However, methane is an explosive gas when present between 5 and 15 percent by volume. Both carbon dioxide and methane can displace oxygen, so they are classified as simple asphyxiants.

The primary area of concern for LFG generation at Knott Landfill is Area A. Unlike the lined new landfill cells, LFG is not necessarily contained within the unlined Area A1 and A2 cells, but can and does migrate through unconsolidated materials and fractures in the surrounding bedrock. Bedrock in the vicinity of Knott Landfill consists of multiple basalt flows interbedded with sand or gravel/cinder layers.

In accordance with Section 17.6 of the Permit methane concentrations must not exceed:

- 25 percent of methane's lower explosive limit (LEL) in on-site structures
- Methane's LEL (5 percent by volume) at the facility property boundary

If such conditions exist, the landfill operator must take corrective action measures to protect human health and comply with the concentration limits listed above.

5.1 Landfill Gas Monitoring Network

5.1.1 Background

Initially, the county conducted LFG monitoring using barhole sampling techniques over the surface of Area A. No odor problems were detected, and barhole sampling results did not detect appreciable quantities of methane gas.

In January 2001, the County installed a monitoring network consisting of nine LFG probes in five locations around the east and south boundaries of Area A. Initial monitoring was conducted to determine whether or not LFG has migrated outside of the Knott Landfill

property. Monitoring results from these probes indicated the presence of LFG leaving the landfill site at the southern property boundary. In particular, elevated LFG concentrations (greater than 5% by volume) were detected south of the Area A2 cell in monitoring probes GP-2, GP-3 and GP-4.

In response to the detection of elevated LFG concentrations outside the perimeter of Area A, the County, installed a LFG extraction system. The installation of the initial LFG extraction system represents the County's response to control landfill gas migration, as required by the Permit. The LFG extraction system was constructed in October 2001, and began operation in November 2001. The LFG extraction system has been expanded with additional extraction wells as the development and filling of new disposal cells occurs.

Four additional LFG probes (GP-6A/B and GP-7A/B) were installed in 2013 along the west and northwest facility boundary to further monitor for the presence of LFG. LFG Probe GP-5 was decommissioned in 2004 to allow for new landfill cell development.

The monitoring network installed at Knott Landfill has two objectives. The first objective is to provide accurate field measurements of methane, carbon dioxide and oxygen concentrations in the subsurface surrounding Knott Landfill (specifically the Area A cell). The current network was designed to accomplish this objective by placing monitoring probes on all sides of the landfill cell, and at multiple depths. Along the south and west sides of Area A, probe screen intervals generally correspond to the bottom of the refuse mass. As mentioned above, probe monitoring has already provided early detection of off-site LFG migration.

The second objective is to monitor the performance of the LFG control measures initially installed at the site in the Fall of 2001 and updated as subsequent cells are constructed and filled with refuse. Data collected from the monitoring network has demonstrated the effect of the LFG extraction system on LFG migration. In general, LFG concentrations in the monitoring probes have decreased to meet compliance levels since the LFG extraction system became operational.

5.1.2 Network Description

The LFG monitoring network consists of twelve monitoring probes (GP-1A, GP-1B, GP-2A, GP- 2B, GP-3A, GP-4A, GP-4B, GP-6A, GP-6B, GP-7A and GP-7B). These monitoring probes serve as the compliance points for LFG monitoring, as required by Section 17.2 of the Permit. Monitoring probes were installed using air rotary drilling techniques to advance the borehole through the underlying basalt layers. Three of the probe locations were installed south of the facility along Rickard Road, two probe locations are located along SE 27th Street and the remaining location is located along the facility boundary east of the Area A cell. Monitoring probe locations are depicted in Figure 6.

Monitoring probes were constructed of 1-inch O.D., Schedule 80 threaded PVC casing, and 0.01-inch slot PVC screen. Screens were placed to correspond to permeable (sandy/gravel and cinder) zones observed during drilling. Subsurface conditions in the vicinity of Knott Landfill consist of multiple layers of basalt interbedded with permeable gravel layers. These permeable layers act as potential conduits for the migration of LFG. Boring logs for each monitoring probe are included in Appendix A.

Deschutes County personnel installed dedicated sampling tubes in the monitoring probes. Sampling tubes were installed to correspond to the screen interval for each monitoring probe. The use of these sampling tubes results a more representative gas sample, and reduces the required purge time at each sampling location. Sampling tube lengths and corresponding screen intervals are summarized in Table 8.

5.1.3 LFG Extraction System

In October 2001, an LFG extraction system was constructed at Knott Landfill to control off-site migration of LFG as required by the Permit. The County has expanded the extraction system as needed, and it currently consists of 35 extraction wells connected to a gas flare. The wells are designed to control LFG migration and collect excess LFG. LFG is also extracted from the leachate collection system pump risers, clean-out lines and recirculation lines as well as several horizontal extraction lines. Nineteen of the extraction wells are located within Area A2 and the remaining wells are located in the southern portion of Cell 1 and throughout Cell 2.

Extraction wells were installed using bucket auger drilling techniques and were constructed of 4-inch high density Polyethylene (HDPE) pipe. Screen sections were completed with 6-inch slotted HDPE pipe. Each extraction well was completed as a dual completion well. A typical dual completion well diagram is included as Figure 7.

The extraction system operates by pulling LFG under vacuum from the wells through a header system and ultimately to a skid mounted flare unit, where it is burned.

A by-product of the LFG extraction system operation is the generation of condensate. Condensate is generated as a result of warm landfill gas (typically 80° to 90° F) coming in contact with cooler surface temperatures, which causes water vapor to condense and drop out of the LFG. Condensate is collected in sumps located along the LFG collection system header. In each sump, a pneumatically powered air displacement pump is used to remove condensate from the sump. Condensate is pumped from the sumps into a condensate line which conveys the fluid to leachate collection and cleanout pipes where the condensate is recirculated within lined cells at the facility. Approximately 35,000 gallons of condensate are recirculated annually.

A detailed description of the LFG extraction system, its components and operating procedures can be found in the *Knott Landfill Operations Plan* (Deschutes County, 2016) and the *Knott Landfill LFG Extraction System Operations Manual* (URS, 2002). The locations of the extraction wells and other system features such as the header system, condensate management and the flare unit are depicted in Figure 6.

5.1.4 Network Maintenance

5.1.4.1 Monitoring Network

The physical integrity of the gas probes is crucial. Regulatory guidelines suggest a minimum post-closure period of 30 years for gas control monitoring. This means gas probes may be required to remain in place and operational for many years.

Gas probes generally require very little maintenance. Most of the probe is below ground, making the only portion requiring attention the security casing and its surrounding area. The security casings used on Knott Landfill gas probes are at-

grade valve boxes set in concrete. Since they are constantly exposed to the weather elements, rust can be a major concern over time. All probes, therefore, should be inspected periodically and the following tasks performed as needed:

- Probes showing evidence of deterioration should be cleaned, rust deposits removed, primed, and coated with a rust-inhibiting paint.
- Probe identification numbers should be repainted and kept legible at all times.
- Excess vegetation should be cleared around the probes for access ease.
- Vehicular access to the probe locations must be maintained.

5.1.4.2 Extraction System

Maintenance associated with the extraction system encompasses a variety of tasks related to the flare/blower unit, header system, and extraction wells. These tasks are discussed in detail in the *Knott Landfill Operations Plan* (Deschutes County, 2016) and the *Knott Landfill LFG Extraction System Operations Manual* (URS, 2002). The majority of the LFG system is constructed of HDPE pipe, and is at or below ground. Portions of the lateral connections are constructed of PVC pipe, which can degrade when exposed to sunlight for long periods of time. As such, exposed portions of the header line, laterals and well heads should be inspected periodically for the following:

- PVC pipe showing evidence of ultraviolet degradation should be checked for leaks and replaced as necessary.
- Exposed piping should be checked for leaks or damage from vehicles, and portions replaced as needed.
- Excess vegetation should be cleared around the wells for access ease.
- Vehicular access to the well locations must be maintained.

5.1.5 Network Modifications

Modifications to the existing monitoring network are not anticipated at this time. However, future modification could include the installation of additional monitoring probes, and/or the removal or replacement of existing probes to meet final grading requirements for ultimate closure of the landfill. In the event that monitoring probes are installed, replaced or abandoned, the EMP will be updated to reflect those changes. All changes to the monitoring network will be conducted in accordance with Sections 19.3 through 19.5 of the Permit as applicable.

The LFG extraction system was designed to allow for the efficient layout of additional wells, as needed, to meet EPA New Source Performance Standards regulations, as well as for possible energy generation. It is anticipated that the LFG extraction system may undergo continued alteration to accommodate additional extraction wells in future. These alterations may impact the location and type of system components, but will not alter the existing extraction well locations. As such, it is not necessary to update the EMP to reflect component changes in the LFG extraction system. However, these changes will be noted in future updates to the EMP. All changes to the extraction system will be conducted in accordance with Sections 19.3 through 19.5 of the Permit as applicable.

5.2 Sampling and Analysis

5.2.1 Site Specific Information

Monitoring will consist of LFG sample collection and field testing at the nine compliance points described in Section 5.1.2 as well as on-site and off-site structures. Sampling will be conducted by Deschutes County personnel. If monitoring detects an exceedance, DEQ will be notified and further investigation will be conducted as required in section 17.7 of the permit.

5.2.2 Collection Methods

LFG monitoring is conducted in the field using a Landtec Gas Extraction Monitor (GEM) 5000 landfill gas meter. The GEM 5000 meter provides real time measurements of LFG concentrations in percent by volume for methane, carbon dioxide, oxygen, and other balance gases. In addition, the instrument provides temperature and pressure readings.

Each monitoring probe has been equipped with a dedicated drop tube for probe purging, and an air-tight quick-connect fitting for sample collection. The sampling procedure for monitoring probes is as follows:

- Calibrate LFG meter according to the manufacturer's specifications, using the necessary calibration gases.
- Record barometric pressure on the field data sheet.
- Remove monitoring probe protective cover.
- Connect LFG meter to first sampling location.
- Observe and record Pressure readings.
- Turn on sample pump.
- Allow LFG meter to run until LFG readings have stabilized.
- Record individual gas concentrations on the field data sheet.
- Disconnect LFG meter from the monitoring probe and allow the instrument to purge until gas concentrations have returned to atmospheric conditions.
- Secure monitoring probe protective cover, and repeat the steps listed above for the remaining monitoring probes.

If monitoring probe sampling indicates the presence of elevated LFG concentrations (i.e. greater than 5 percent methane by volume), sampling will be conducted at nearby structures. Specific sampling locations are described in Section 5.2.3. The sampling procedure for collecting LFG measurements from structures is as follows:

- Calibrate LFG meter according to the manufacturer's specifications, using the necessary calibration gases.
- Record barometric pressure on the field data sheet.
- Using an extended sample tube, collect air samples from the basements and crawl spaces from on-site and off-site structures. If detectable levels of LFG are encountered, further sampling may be required within the structure.
- Record LFG concentrations on the field data sheet.
- Allow the LFG meter to purge to atmospheric conditions between sampling locations.
- Repeat the steps listed above for the remaining sampling locations.

5.2.3 Monitoring Locations

Monitoring locations include the twelve LFG monitoring probes described in Section 5.1.2 as well as on-site and off-site structures. A copy of the structure sampling form is included in Appendix B. Structure monitoring locations are summarized in Table 5. Monitoring probe locations are shown in Figure 6 and both on-site and off-site structure sampling locations are depicted in Figure 2.

5.2.4 Monitoring Frequency

In accordance with the Section 10.10 of the *Solid Waste Landfill Guidance Document* (DEQ, 1996), LFG monitoring will (at a minimum) be conducted quarterly when all monitoring points are within compliance. If possible, monitoring will be conducted during periods when strong barometric lows are anticipated. Monitoring will be conducted on a monthly basis or more frequently if monitoring points show methane concentrations in exceedance of the Permit limits described in Section 5.3 of this EMP. Sampling frequency for LFG monitoring is summarized in Table 5. Reasons for more frequent monitoring may include:

- Sampling of facility and off-site structures to protect human health and safety.
- Changing site conditions which may affect gas generation and migration (e.g. barometric pressure, temperature, soil moisture, snow cover).
- Sampling to assess efficiency of LFG extraction system.

5.2.5 Data Review/Action Requirements

Following each monitoring event, LFG monitoring results will be reviewed for exceedances of methane limits. If methane levels exceed the specified limits described in Section 5.3, the County will conduct the following as required by Section 17.7 of the Permit.

- Immediately take steps to protect human health and safety, and notify the Department (DEQ). This includes initiating structure sampling.
- Within 7 days of detection (unless the DEQ approves an alternative schedule), enter the methane levels in the operating record and describe the steps taken to protect human health and safety.
- Within 60 days of detection (unless the DEQ approves an alternative schedule), implement a remediation plan for methane releases, incorporate the plan into the operating record, and notify the Department that the plan has been implemented. The plan should describe the nature and extent of the problem and the proposed remedy.

5.2.6 Standard Reporting Forms

Because the collected probe monitoring data will be used to assess site compliance, the monitoring program must include reliable and accurate records. All collected monitoring data should be field-recorded for later transfer onto permanent forms. A copy of a field data sheet is included in Appendix B. In addition to the probe data, the following data is also recorded during each monitoring session:

- Date and time of monitoring session.
- Name of person performing the monitoring.
- Instrumentation used.
- Weather conditions, including temperature and barometric pressure.

- Any problems associated with the monitoring equipment that may impact accuracy of the monitoring results.

5.3 Permit-Specified Methane Concentration Limits

As described at the beginning of this section the primary contaminant of concern in LFG is methane, which in certain concentrations can create explosive conditions. In accordance with Section 17.6 of the Permit, the methane limits for Knott Landfill must not exceed:

- 25 percent of the Lower Explosive Limit (LEL) for methane in on-site structures (excluding gas control structures or gas recovery system components); or,
- The LEL for methane at the facility boundary (5 percent by volume).

6.0 OTHER MONITORING

No surface water or vadose zone monitoring is planned at this time. The County operates the landfill, including the LFG flare unit under a Title V Air Quality Permit (ACDP 09-0040-TV-01) administered by DEQ.

7.0 DATA ANALYSIS AND REPORTING

According to Section 18 of the Permit, there are specific data analysis and reporting requirements for each sampling network. This section describes the reporting format as it relates to each monitoring network. In general, monitoring results will be summarized in an Annual Environmental Monitoring Report (AEMR). Two hard copies and one digital copy of the AEMR will be provided to DEQ prior to March 15th of each year for the duration of the Permit. The period for reporting will be from January 1st to December 31st of each year.

In addition, groundwater monitoring results from the spring sampling event will be summarized in a semi-annual report. This "data report" will contain analytical summary tables, a groundwater contour map, and a brief discussion of the results. The semi-annual report will be provided to DEQ no later than 60 days after the sampling event. The results of the fall sampling event will be incorporated into the subsequent AEMR, due March 15th of the following year.

The AEMR will cover monitoring results from of the previous year. Included with the AEMR will be a one-page compliance letter, which will be stamped by either a Geologist or a Certified Engineering Geologist, with current Oregon registration. The submittal address for the AEMR as well as other submittals is as follows:

Oregon Department of Environmental Quality
Manager, Solid Waste Program
400 E. Scenic Drive, Suite 307
The Dalles, OR 97085
Telephone: (541) 298-7255
Fax: (541) 298-7330

7.1 Groundwater Monitoring

7.1.1 Data Statistical Analysis

The groundwater monitoring data will be evaluated by comparing groundwater quality in background and compliance (i.e., downgradient) wells as described in section 17.2 of the Permit. Specifically, the constituents will be evaluated using statistical methods in accordance with 40 CPR Part 258.53(g) and (h), as appropriate. Because of the variability in many of the naturally occurring parameters in the groundwater across the site, an intrawell analysis will be used. Under an intrawell analysis, the background for each well is determined using the historical data from each well. The statistical method will utilize prediction limits to evaluate the data. Prediction limits are constructed to contain one or more future observations or sample statistics generated from the background population with a specified probability equal to the confidence level of the limit. It represents the chance, over repeated applications of the limit to many similar data sets that the prediction limit will contain future observations or statistics drawn from its background population.

The prediction limit method will be used to make comparisons between the background data for MW-5 (starting in October 2000) and background data for wells MW-4R, -6 and -7 (starting in October 2006) through the year prior to the year being evaluated. The data will be evaluated at each monitoring well independently for all of the PSCL, SSL and other parameters routinely being analyzed. The method reporting limit value will be used for analytes that are not detected.

7.1.2 Annual Reporting

The purpose of the AEMR is to provide environmental monitoring data to the DEQ in an organized and clear format. The AEMR will provide an evaluation of regulatory and Permit compliance, determination of leachate impacts (if any), assessment of any corrective actions, and monitoring of any health and environmental effects. The AEMR will be completed as required by Section 18.3 of the Permit, and in general accordance with Section 10.14 of *the Solid Waste Landfill Guidance Document* (DEQ, 1996). The following information will be included in the AEMR.

- Site background information.
- Review of all significant events that occurred at the site during the past year.
- Review of monitoring network performance and recommendations for changes.
- Summary of all data collected in the past year, including groundwater, leachate, and LFG.
- Comparison of water quality data between downgradient and background monitoring points, and existing federal and state groundwater standards.
- Comparison of LFG monitoring results to applicable state standards.
- A summary of any data problems. This information will be incorporated into a data quality review report and included as an appendix.
- Potentiometric surface maps for each sampling event.
- Time-series plots for field specific conductivity, dissolved oxygen, and all PSCL and SSL parameters.
- Box plots for field specific conductivity, dissolved oxygen, and all PSCL and SSL parameters.
- Anion-cation balance for each sampling location and event for which there is adequate data.
- Statistical analysis of laboratory data as described in Section 7.1.1.
- Copy of all field data sheets and laboratory data for the past year.
- Discussion of any impacts, data trends, any recommendations for the monitoring program, and any action requirements.
- Annual leachate summary.

7.2 Leachate Monitoring

A summary of leachate monitoring will be included in the AEMR as the annual leachate summary. The leachate monitoring system at Knott Landfill records leachate levels and volumes pumped on a continuous basis, and leachate is removed and recirculated or disposed of off-site on an as needed basis. For this reason leachate removal volumes will be reported on a monthly basis. The annual leachate summary will include the following:

- A review of significant events that occurred during the past year regarding leachate issues.
- A review of the leachate monitoring network performance and any recommendations for improvements.
- Evaluation of potential human health risk, relative to any reasonably foreseeable biological hazard.
- The monthly volume of leachate removed from each primary leachate sump.
- The monthly volume of leachate managed by each implemented leachate management method.

- The monthly volume of liquid removed from each secondary leachate collection sump, servicing any disposal unit.
- Results of the annual sampling and analysis of liquid from the secondary leachate collection sumps, as well as any other sample results (if sampling is triggered based on the criteria described in Section 4.1.2).

7.3 Landfill Gas Monitoring

Quarterly sampling results for LFG will be incorporated into the AEMR. The following information will be included in the AEMR:

- A review of significant events that occurred during the past year regarding LFG issues.
- A review of the LFG monitoring network performance and any recommendations for improvements.
- The annual volume of condensate pumped and recirculated.
- Copies of the field data sheets documenting probe and structure monitoring.
- LFG Time-Series plots for all LFG monitoring probes

7.4 Other Reporting

Other reporting may be required for specific events associated with the environmental monitoring networks at Knott Landfill. These may include, but are not limited to the following:

- Split-sampling submittal as described in Section 18.4 of the Permit.
- Damage reporting (monitoring well, gas probes) as described in Section 19.2 of the Permit.
- Construction reporting (monitoring well, gas probes) as described in Section 19.4 of the Permit.
- Recommendation to abandon (monitoring well, gas probes) as described in Section 19.5 of the Permit.

7.5 Split-Sampling Submittal

As described in Section 15.5 of the Permit, a split-sampling submittal is required to be submitted to the DEQ laboratory within 90 days of any split-sampling event. The split-sampling submittal shall include (at a minimum) all pertinent sampling information including field notes, laboratory reports, laboratory QA/QC reports, lab certifications, a groundwater contour map, and any other information requested by the DEQ. This information should be mailed to the following:

Oregon Department of Environmental Quality
Laboratory and Environmental Assessment Section
3150 NW 228th Ave., Suite 150
Hillsboro, OR 97124
Telephone: (503) 693-5700

7.6 Submittal Address

Except where otherwise noted, the AEMR and other submittals should be mailed to the following:

Oregon Department of Environmental Quality
Manager, Solid Waste Program
400 E. Scenic Drive, Suite 307
The Dalles, Oregon 97058
Telephone: (541) 298-7255

7.7 Statement of Compliance

The AEMR will summarize monitoring results from of the previous year. Included with the AEMR will be a one page compliance letter, which will be stamped by either a registered geologist or a certified engineering geologist, with current Oregon registration. The compliance letter will briefly summarize the following:

- Summarize compliance of analytical results with the relevant monitoring standards.
- List any federal or state standards that have been exceeded for sampled media.
- Identify any significant change in groundwater quality, land quality, air quality or methane levels in monitored media.

8.0 LIMITATIONS

PBS has prepared this EMP for use by Deschutes County Department of Solid Waste. This plan is for the exclusive use of the client and is not to be relied upon by other parties. It is not to be photographed, photocopied, or similarly reproduced in total or in part without the expressed written consent of the client and PBS.

PBS Engineering and Environmental Inc.

11/28/2016

N. Toby Scott, RG
Sr. Project Manager/Hydrogeologist

Date

exp 6/30/17

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Western Regional Climate Center, 2016 www.wrcc.dri.edu/cgi-binicliMAIN.pl?orbend

FIGURES

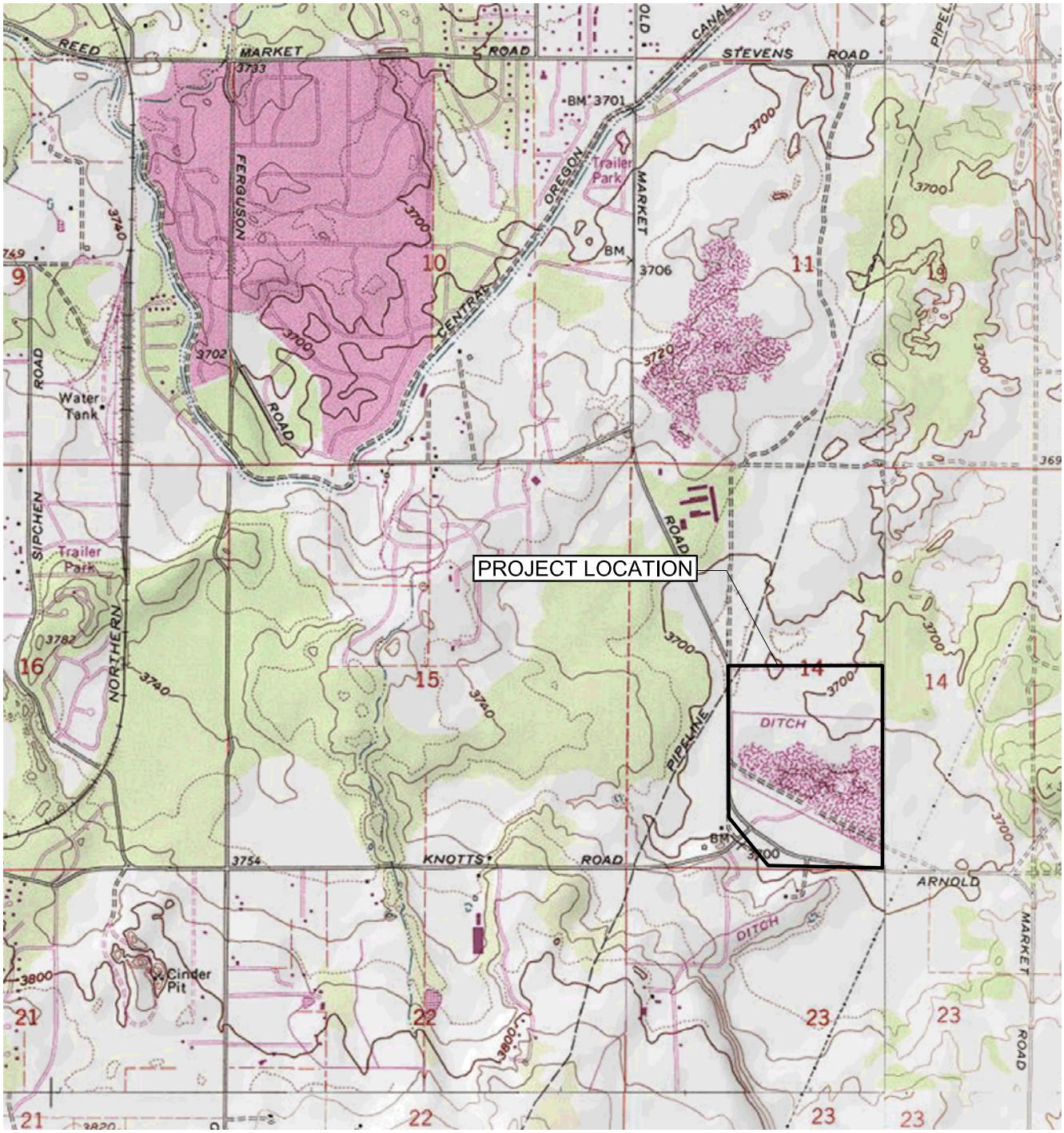

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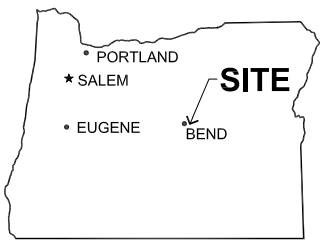
PHOTO REVISED 1981.



OREGON

0' 1000' 2000' 4000'

SCALE: 1" = 2,000'

PREPARED FOR: DESCHUTES COUNTY, DEPARTMENT OF SOLID WASTE

PBS

PROJECT # 80429.007

DATE AUG 2016

SITE VICINITY MAP

KNOTT LANDFILL - 61050 SE 27TH STREET
BEND, OREGON

FIGURE 1

L:\Projects\80000\80400-80499\80429.007_2015-16.DeschutesSolid Waste\Knott\DWG\80429.007.FIGURES.dwg Jul 26, 2016 10:12am brendam

LEGEND

1. SCALE HOUSE
2. SOLID WASTE OFFICE
3. TRANSFER STATION
4. HAZARDOUS WASTE COLLECTION FACILITY
5. RECYCLING CENTER
6. YARD DEBRIS SCALE HOUSE
7. EQUIPMENT BLDG
8. FLARE
9. LEACHATE PUMP
10. STORMWATER POND #1
11. STORMWATER POND #2
12. FORMER COMPOST AREA (PHASED OUT SUMMER, 2016)
13. COMPOST AREA (PHASED IN SUMMER, 2016)
14. COMPOST AREA STORMWATER POND

R1 MARCOTTE RESIDENCE

R2 DCSO ANIMAL RESCUE FACILITY

* STRUCTURES MONITORED FOR LANDFILL GAS

APPROXIMATE FACILITY BOUNDARY

APPROXIMATE LANDFILL BOUNDARY (EXISTING & FUTURE)

NORTH

SOURCE: © 2015 GOOGLE EARTH PRO, © 2014 GOOGLE

PREPARED FOR: DESCHUTES COUNTY, DEPARTMENT OF SOLID WASTE

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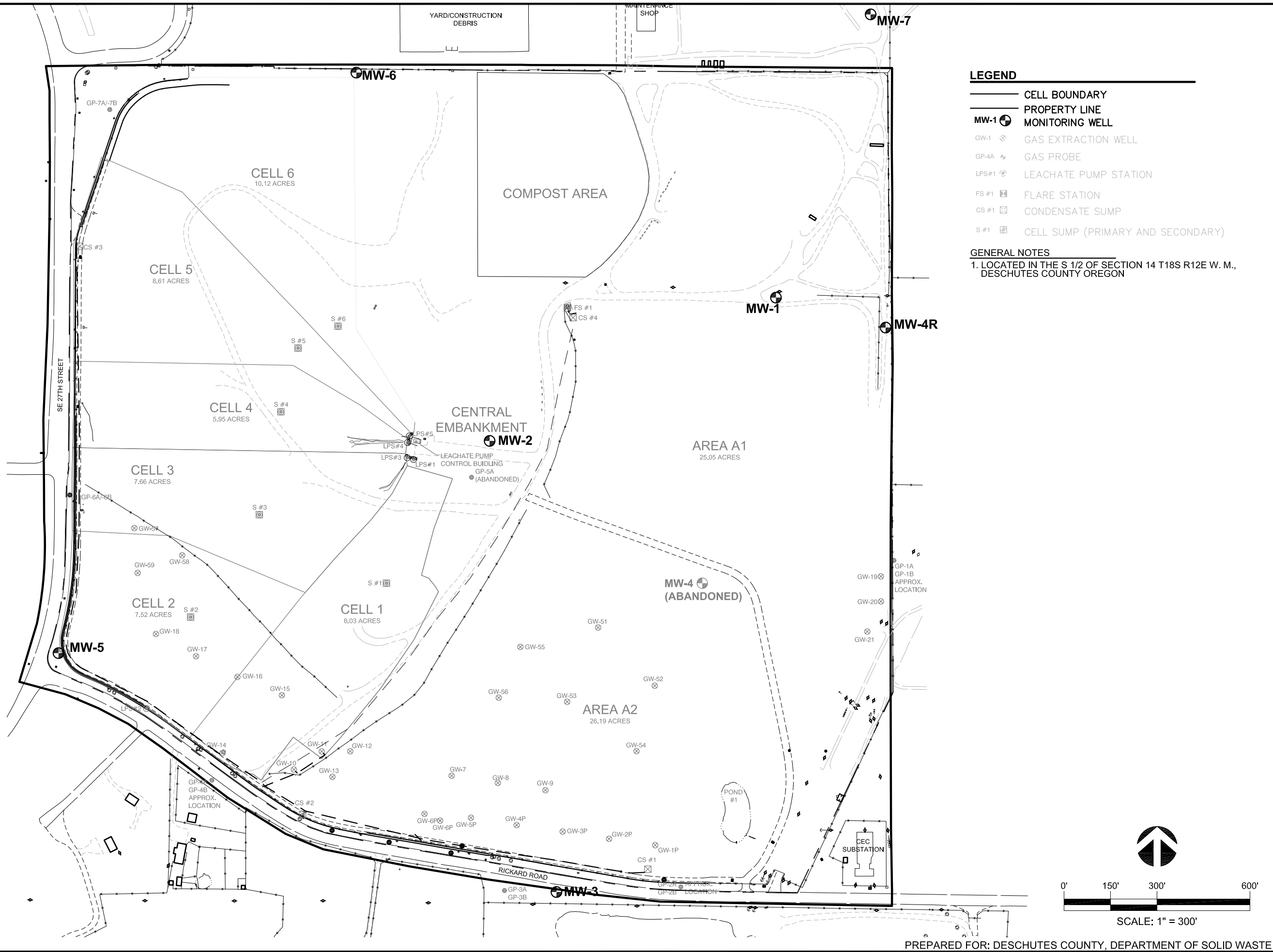
Engineering + Environmental
390 NE EMERSON AVE
SUITE 201
BEND, OR 97701
PHONE: 541.388.9290
FAX: 866.727.0140
www.pbsenv.com

FACILITY MAP
KNOTT LANDFILL
61050 SE 27TH STREET
BEND, OREGON

PROJECT:	80429.007
DATE:	AUGUST 2016
FIGURE:	2



LEGEND

- CELL BOUNDARY
- PROPERTY LINE
- MW-1 MONITORING WELL
- GW-1 GAS EXTRACTION WELL
- GP-4A GAS PROBE
- LPS#1 LEACHATE PUMP STATION
- FS #1 FLARE STATION
- CS #1 CONDENSATE SUMP
- S #1 CELL SUMP (PRIMARY AND SECONDARY)

GENERAL NOTES

1. LOCATED IN THE S 1/2 OF SECTION 14 T18S R12E W. M., DESCHUTES COUNTY OREGON

0' 150' 300' 600'

SCALE: 1" = 300'

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SUITE 201
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PHONE: 541.388.9290
FAX: 866.727.0140
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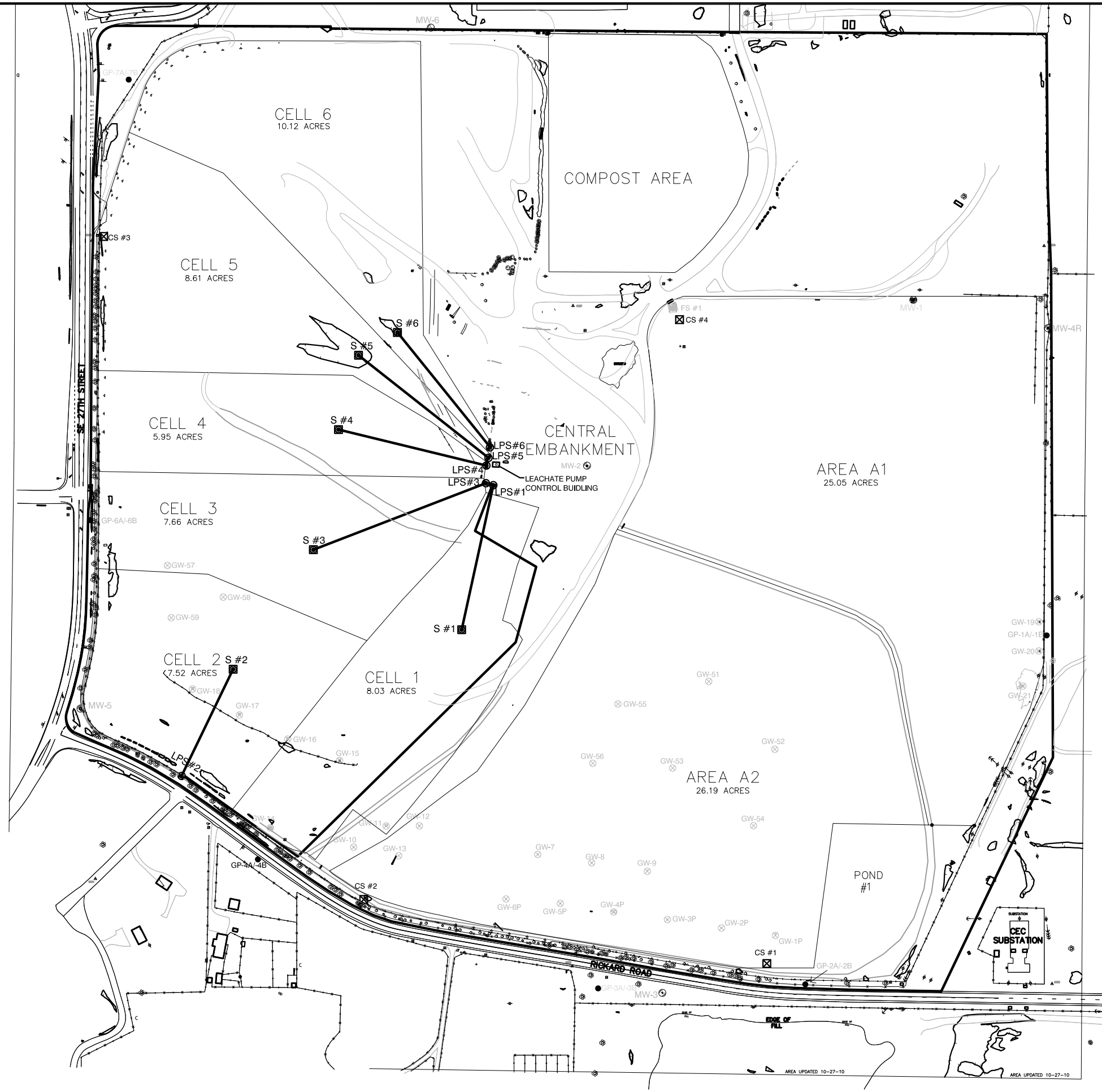
GROUNDWATER MONITORING NETWORK
KNOTT LANDFILL
BEND, OREGON

PROJECT: 80429.007

DATE: NOV 2016 REVISION 1

FIGURE: 3



LEGEND

- CELL BOUNDARY
- PROPERTY LINE
- MW-4 — MONITORING WELL
- GP-4A — GAS PROBE
- LEACHATE RISER PIPES
- LPS#1 — LEACHATE PUMP STATIONS FOR PRIMARY/SECONDARY SUMPS
- CS #1 — CONDENSATE SUMP
- S #1 — PRIMARY AND SECONDARY CELL SUMP

NOTES:
1. LOCATED IN THE S 1/2 OF SECTION 14 T18SR12E W.M., DESCHUTES COUNTY OREGON
2. BASED ON SURVEY BY JOHN THOMPSON AND ASSOCIATES, 11/11/10
3. LAST REVISION, JULY 2015

0' 150' 300' 600'

SCALE: 1" = 300'

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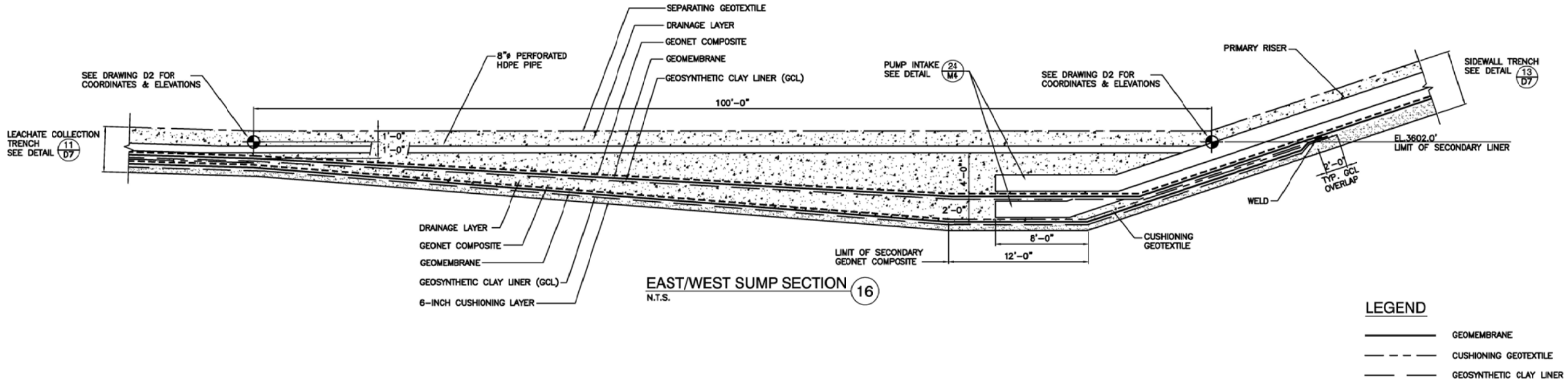
LEACHATE COLLECTION SYSTEM LAYOUT
KNOTT LANDFILL
BEND, OREGON

PROJECT: 80429.007

DATE: NOV 2016 REVISION 1

FIGURE: **4**



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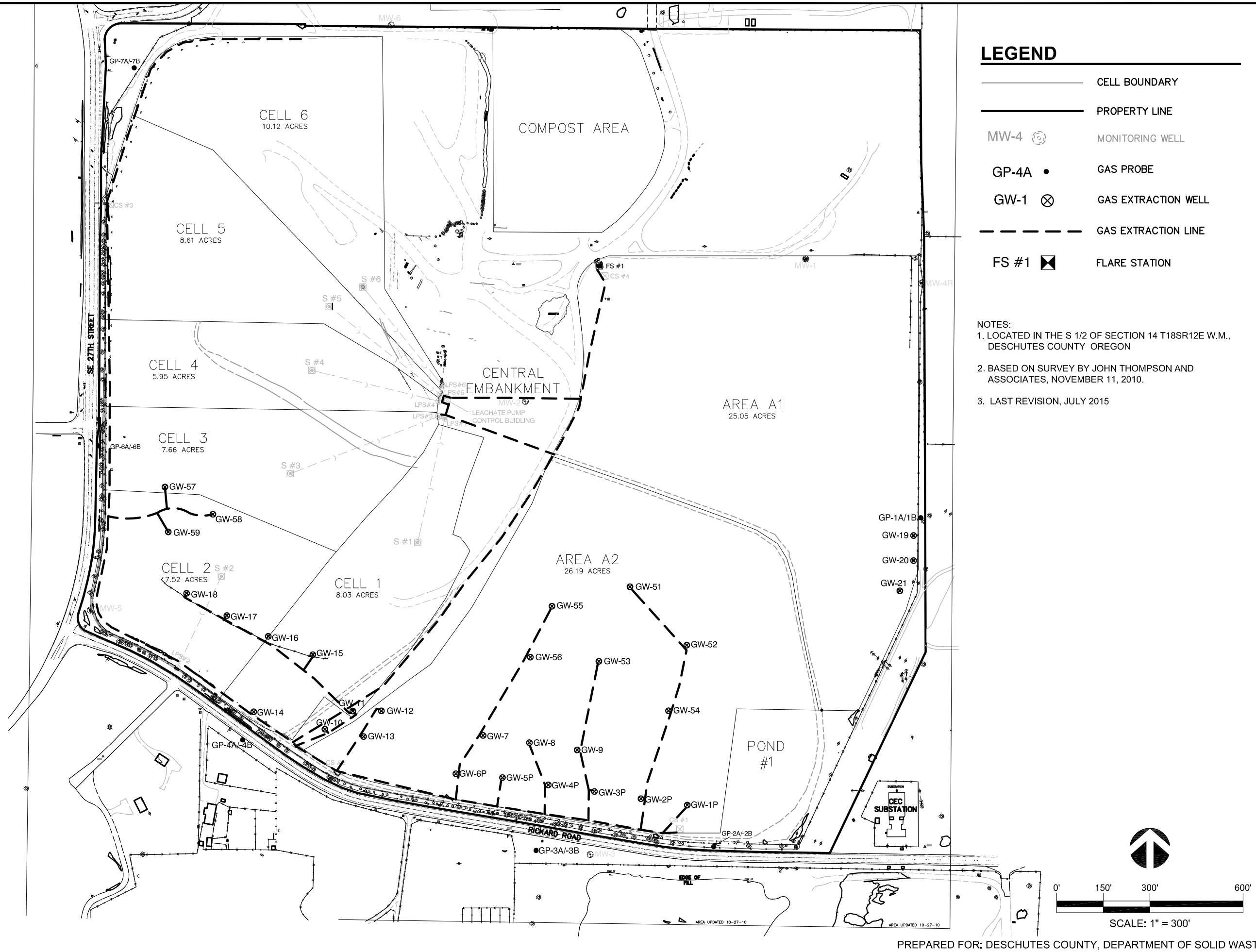
TYPICAL CELL SUMP CROSS SECTION
KNOTT LANDFILL
BEND, OREGON

PROJECT:	80429.007
DATE:	AUGUST 2016
FIGURE:	5

PREPARED FOR: DESCHUTES COUNTY, DEPARTMENT OF SOLID WASTE
SOURCE: G. FRIESEN ASSOCIATES, INC.



LEGEND

- CELL BOUNDARY
- PROPERTY LINE
- MW-4 — MONITORING WELL
- GP-4A — GAS PROBE
- GW-1 — GAS EXTRACTION WELL
- GAS EXTRACTION LINE
- FS #1 — FLARE STATION

NOTES:
1. LOCATED IN THE S 1/2 OF SECTION 14 T18SR12E W.M., DESCHUTES COUNTY OREGON
2. BASED ON SURVEY BY JOHN THOMPSON AND ASSOCIATES, NOVEMBER 11, 2010.
3. LAST REVISION, JULY 2015

0' 150' 300' 600'

SCALE: 1" = 300'

PREPARED FOR: DESCHUTES COUNTY, DEPARTMENT OF SOLID WASTE

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SUITE 201
BEND, OR 97701
PHONE: 541.388.9290
FAX: 866.727.0140
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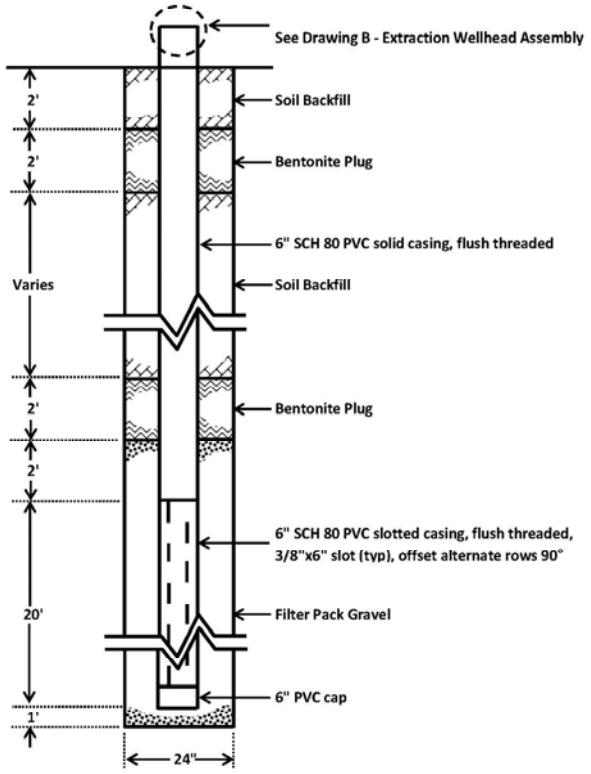
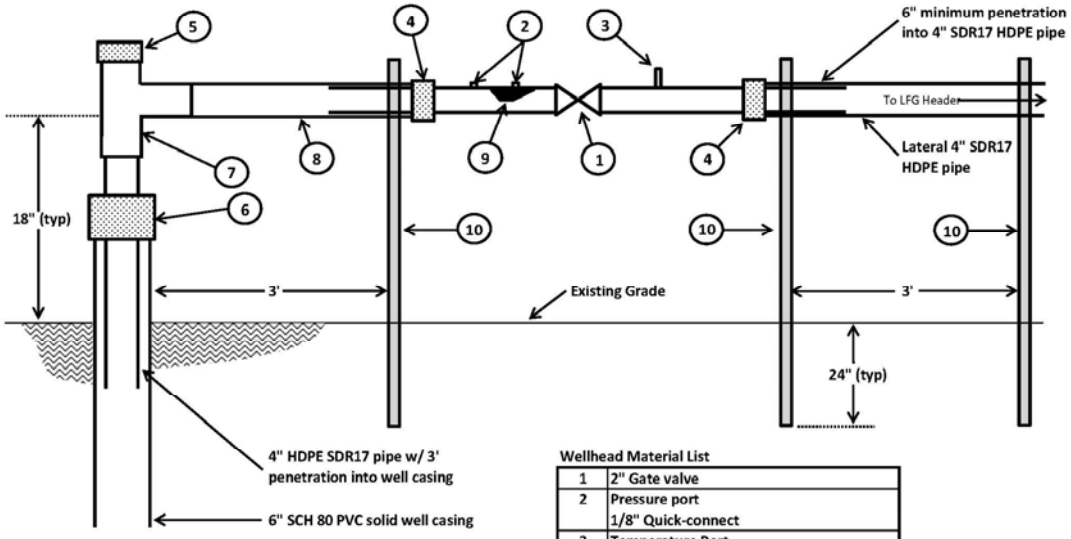
LANDFILL GAS COLLECTION / MONITORING SYSTEM LAYOUT
KNOTT LANDFILL
BEND, OREGON

PROJECT:	80429.007
DATE:	AUGUST 2016
FIGURE:	6



Drawing A. Typical LFG Extraction Well (Not to Scale)



Wellhead Material List

1	2" Gate valve
2	Pressure port 1/8" Quick-connect
3	Temperature Port 1/8" Quick-connect pass through 1/8" Ball valve
4	4"x2" Fernco w/ reducer bushing
5	4" Fernco cap
6	6"x4" Fernco w/ reducer bushing
7	4" HDPE tee
8	4" HDPE SDR 17 pipe
9	Flo-Wing eccentric venturi
10	Unistrut support w/ 4" pipe clamp

Drawing B. Typical LFG Extraction Wellhead Assembly (Not to Scale)

SOURCE: DESCHUTES COUNTY, DEPARTMENT OF SOLID WASTE

PREPARED FOR: DESCHUTES COUNTY, DEPARTMENT OF SOLID WASTE

PBS

PROJECT # 80429.007

DATE AUG. 2016

TYPICAL LFG EXTRACTION WELL / WELLHEAD ASSEMBLY

KNOTT LANDFILL

BEND, OREGON

FIGURE

7

TABLES

TABLE 1
Groundwater Monitoring Well Summary
Knott Landfill

Well Identification	Date Installed	Well Depth (feet bgs)	Screen Interval (feet bgs)	Wellhead Elevation[1] (ft above MSL)	Casing Diameter (inches)	Tubing Volume (ml)
MW-1	09/20/94	725	715-725	3705.65	4	7203
MW-2	09/27/94	731.25[2]	721-731	3730.66	4	7263
MW-3	09/22/94	716	705-715	3700.66	4	7136
MW-4R	08/22/06	729.5	719-729	3706.22	3[3]	7247
MW-5	06/28/96	710	698-707	3695.54	4	7065
MW-6	08/22/06	715.5	705-715	3701.58	4	7112
MW-7	08/22/06	735.5	725-735	3705.54	4	7302

Notes:
bgs = below ground surface
MSL = mean sea level
Summary data for MW-1, MW-2, MW-3, and MW-5 taken from the State of Oregon Monitoring Reports prepared for each well; summary data for MW-6, MW-7 taken from September 18, 2006 *Well Construction Report (URS, 2006)*. Summary data for MW-4R taken from October 2009 *Well Re-construction Report* (PBS, 2009).
[1]TOC elevations resurveyed by JTA following well pump installations and MW-2 retrofit, Fall 2010.
[2]Includes Fall 2004 retrofit added 19.48 feet to the top of casing and Summer 2010 retrofit adding 12.17 feet to the top of the casing for MW-2.
[3]MW-4R was reconstructed in July 2009 and included redrilling the borehole to its depth and installing a 3-inch Sched. 80 PVC through a temporary 5-inch steel casing.

Table 2 (Page 1 of 3)
Summary of Monitoring Parameters – Groups 1a, 1b, 2a, 2b and 3
Knott Landfill – Deschutes County, Oregon

Parameter Groups	Method Reporting Limits[1]	Method Detection Limits[1]	MCL[2]	OAR 340-40[3]
FIELD PARAMETERS (Group 1a)[4]				
pH	—	—	6.5-8.5[5]	6.5-8.5
Temperature, °C	—	—	NR	NR
Specific Conductance, uS/cm	—	—	NR	NR
Dissolved Oxygen, mg/L	—	—	NR	NR
Oxidation-Reduction Potential, mV	—	—	NR	NR
Groundwater Elev., It above MSL	—	—	--	--
LEACHATE INDICATORS (Group 1b)				
Chemical Oxygen Demand, mg/L	10	10	NR	NR
Hardness, mg/L	2.0	2	NR	NR
pH	--	--	6.5-8.5[5]	6.5-8.5
Specific Conductivity, umhos/cm	10	10	NR	NR
Tannins & Lignins, mg/L	0.2	0.05	NR	NR
Total Alkalinity, mg/L	5.0	5	NR	NR
Total Dissolved Solids, mg/L	10	10	500[5]	500
Total Organic Carbon, mg/L	1.0	0.19	NR	NR
Total Suspended Solids, mg/L	2.0	2	NR	NR
COMMON ANIONS AND CATIONS (mg/L) (Group 2a – Field Filtered)				
Ammonia NH_4)	0.2	0.06	NR	NR
Bicarbonate (HCO_3)	5.0	5	NR	NR
Calcium (Ca)	0.1	0.05	NR	NR
Carbonate (CO_3)	5.0	5	NR	NR
Chloride (Cl)	0.5	0.25	250[5]	250
Fluoride (F)	0.5	0.01	4.0	4.0
Iron (Fe)	0.04	0.01	0.3[5]	0.3
Magnesium (Mg)	0.02	0.01	NR	NR
Manganese (Mn)	0.002	0.00025	0.05[5]	0.05
Nitrate - Nitrogen (NO_3)	1.0	0.1	10.0	10.0
Potassium (K)	0.5	0.25	NR	NR
Silica (SIO_2)	2.5	0.344	NR	NR
Sodium (Na)	0.5	0.25	NR	NR
Sulfate (SO_4)	1.0	0.25	250[5]	250
TOTAL TRACE METALS (mg/L) Group 2b)				
Antimony (Sb)	0.4	0.08	0.006	NR
Arsenic (As)	1	0.27	0.010	0.05
Barium (Ba)	1	0.054	2.0	1.0
Beryllium (Be)	0.4	0.102	0.004	NR
Cadmium (Cd)	0.4	0.028	0.005	0.01
Chromium (Cr)	0.4	0.141	0.1	0.05
Cobalt (Co)	0.4	0.032	NR	NR
Copper (Cu)	2	0.603	1.3	1.0
Lead (Pb)	0.4	0.034	0.015	0.05
Nickel (Ni)	2	0.4	NR	NR
Selenium (Se)	1	0.297	0.05	0.010
Silver (Ag)	0	0.03	0.10[5]	0.05
Thallium (TI)	1	0.142	0.002	NR
Vanadium (V)	1	0.975	NR	NR
Zinc (Zn)	5	1.9	5.0[5]	5.0
VOCS (EPA 8260B (ug/L) (Group 3)				
Acetone	25	0.4	NR	NR
Benzene	0.2	0.025	5.0	5.0[5]
Bromobenzene	0.5	0.035	NR	NR
Bromochloromethane	0.5	0.025	NR	NR
Bromodichloromethane	1	0.025	NR	100.0[5,6]
Bromoform	1	0.08	NR	100.0[5,6]
Bromomethane	5	0.16	NR	NR
2-Butanone	10	2.5	NR	NR

Table 2 (Page 2 of 3)
Summary of Monitoring Parameters – Groups 1a, 1b, 2a, 2b and 3
Knott Landfill – Deschutes County, Oregon

Parameter Groups	Reporting Limits[1]	Method Detection Limits[1]	MCL[2]	OAR 340-40[3]
VOCS (EPA 8260B (ug/L) (Group 3, Continued)				
n-Butylbenzene	5	0.08	NR	NR
sec-Butyl benzene	0.5	0.07	NR	NR
tert-Butylbenzene	1	0.1	NR	NR
Carbon disulfide	10	0.025	NR	NR
Carbon tetrachloride	1	0.025	5.0	5.0([5])
Chlorobenzene	0.5	0.025	100	NR
Chloroethane	1	0.075	NR	NR
Chloroform	0.5	0.03	NR	100.0([5,6])
Chloromethane	5	0.05	NR	NR
2-Chlorotoluene	0.5	0.07	NR	NR
4-Chlorotoluene	0.5	0.05	NR	NR
1,2-Dibromo-3-Chloropropane	5	0.44	0.2	NR
Dibromochloromethane	1	0.025	NR	100.0([5,6])
1,2-Dibromoethane	0.5	0.025	NR	NR
Dibromomethane	0.5	0.025	NR	NR
1,2-Dichlorobenzene	0.05	0.5	600	NR
1,3-Dichlorobenzene	0.05	0.5	NR	NR
1,4-Dichlorobenzene	0.05	0.5	75	75([5])
Dichlorodifiuoromethane	5	0.5	NR	NR
1,1-Dichloroethane	0.5	0.025	NR	NR
1,2-Dichloroethane	0.5	0.025	5.0	5.0([5])
1,1-Dichloroethene	0.5	0.018	7.0	7.0([5])
cis-1,2-Dichloroethene	0.5	0.025	70	NR
trans-1,2-Dichloroethene	0.5	0.025	100	NR
1,2-Dichloropropane	0.5	0.025	5.0	NR
1,3-Dichloropropane	0.5	0.025	NR	NR
2,2-Dichloropropane	0.5	0.06	NR	NR
1,1-Dichloropropene	0.5	0.018	NR	NR
cis-1,3-Dichloropropene	0.5	0.09	NR	NR
trans-1,3-Dichloropropene	0.5	0.025	NR	NR
Ethylbenzene	0.5	0.03	700	NR
Hexachlorobutadiene	1	0.075	NR	NR
2-Hexanone	10	0.038	NR	NR
Isopropylbenzene	2	0.06	NR	NR
p-Isopropyltoluene	2	0.05	NR	NR
4-Methyl-2-pentanone	5	0.5	NR	NR
Methylene chloride	5	0.11	NR	NR
Naphthalene	2	0.1	NR	NR
n-Propylbenzene	0.5	0.025	NR	NR
Styrene	0.5	0.1	100	NR
1,1,1,2-Tetrachloroethane	0.5	0.025	NR	NR
1 ,1 ,2,2-Tetrachloroethane	0.5	0.025	NR	NR
Tetrachloroethene	0.5	0.07	5.0	NR
Toluene	0.5	0.025	1,000	NR
1,2,3-Trichlorobenzene	1	0.1	NR	NR
1,2,4-Trichlorobenzene	1	0.04	70	NR
1,1,1-Trichloroethane	1	0.025	200	200([5])
1,1,2-Trichloroethane	0.5	0.025	5.0	NR
Trichloroethene	0.5	0.025	5.0	5.0
Trichlorofiuoromethane	0.5	0.025	NR	NR
1,2,3-Trichloropropane	0.5	0.05	NR	NR
1,2,4-Trimethylbenzene	1	0.1	NR	NR
1,3,5-Trimethylbenzene	0.5	0.083	NR	NR
Vinyl chloride	0.5	0.013	2.0	2.0([5])
o-Xylene	0.5	0.06	10,000([4])	NR
m,p-Xylene	1	0.05	10,000([4])	NR

Table 2 (Page 3 of 3)
Summary of Monitoring Parameters – Groups 1a, 1b, 2a, 2b and 3
Knott Landfill – Deschutes County, Oregon

Notes:

NR = Not Regulated	ug/L = micrograms per liter
"--" = Not Applicable	mV = millivolts
mg/L = milligrams per liter	uS/cm = microSiemens per centimeter

1 = TestAmerica, Inc. and Umpqua Research Corp. reporting/detection limits as of May 2016, unless otherwise noted.
2 = U.S. Environmental Protection Agency Maximum Contaminant Levels for drinking water in a public water system. EPA document: 816-F-03-016, June 2003 revision.
3 = Oregon Administrative Rule 340-40, Tables 1 and 3 (Numerical Groundwater Reference/Quality Levels), November 1997.
4 = End-of-purge values, except for groundwater level data.
5 = National Secondary Drinking Water Standard (non-enforceable guideline; see above referenced EPA document).

Table 3
Laboratory Container, Preservation, and Holding Times
Knott Landfill - Deschutes County, Oregon

Analytical Parameter	Method	Volume / Container	Preservation	Hold Time	Analysis Laboratory
Group 1b: Leachate Indicators					
Hardness	SM2340B	500 mL HDPE	$HN0_3$ to pH <2.0., Cool to 4°C	6 Months	Test America/BSK
Total Alkalinity	SM2320B	250 mL HDPE	Cool to 4°C	14 Days	
Tannins & Lignins	SM5550B	125 mL HDPE		28 Days	
Chemical Oxygen Demand	SM5220D	250 mL HDPE	H_2S0_4 to pH <2.0, Cool to 4°C		
Total Organic Carbon	EPA 9060	250 mL GAJ			
Specific Conductivity	EPA 9050	250 mL HDPE	Cool to 4°C		
Total Dissolved Solids	SM2540C	1 liter HDPE		7 Days	
Total Suspended Solids	SM2540D	250 mL HDPE			
pH	150.1	250 mL HDPE		ASAP	Umpqua
Group 2a: Common Anions and Cations (Field Filtered)					
Nitrate	EPA 300.0	500 mL HDPE	Cool to 4°C	48 Hours	Umpqua
Ammonia/ Ammonium	EPA 350.1	500 mL HDPE	H_2S0_4 to pH <2.0, Cool to 4°C	28 Days	Test America/BSK
Sulfate/Fluoride/ Chloride	300.0	125 mL HDPE	Cool to 4°C		
Silica	SM4500-SIF	125 mL HDPE			
Bicarbonate	SM2320B	250 mL HDPE		14 Days	
Group 2b: Trace Metals					
Metals – non-filtered[1]	EPA 200.7/200.8	500 mL HDPE	$HN0_3$ to pH <2.0., Cool to 4°C	180 Days	Test America/BSK
Metals – filtered[1]	EPA 200.7/200.8	500 mL HDPE			
Group 3: Volatile Organic Constituents					
VOCs	EPA 8260B	3x40 ml VOA vials	HCl to pH<2.0 Cool to 4°C	14 Days	Test America/BSK

Notes:
[1]Metals include: Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn
HDPE=high-density polyethylene bottle with Teflon-lined screw cap
GAJ=glass amber jar with Teflon-lined screw cap

TABLE 4
Permit Specific Concentration Limits and Site Specific Limits
Knott Landfill, Bend, Oregon

Chemical Parameter	Maximum Contaminant Level (MCL) or Reference Level (RL)[2]	MW-4R	MW-5	MW-6	MW-7
Arsenic	0.01	0.005	0.006	0.005	0.005
Barium	1	0.01	0.038	0.010	0.013
Bicarbonate Alkalinity	NL	57	60	60	62
Calcium	NL	6	6	6	7
Chloride	250	2	5	2	4
Iron	0.3	0.12	0.1	0.1	0.1
Magnesium	NL	6	6	6	6
Manganese	0.05	0.01	0.01	0.01	0.01
Potassium	NL	2	2	2	2
Sodium	NL	11	11	12	12
Total Dissolved Solids	500	105	115	112	120
Total Organic Carbon	NL	1.5	2.3	1	1.2

Notes:
All values in milligrams per liter (mg/L)
[1] PSCLs and SSLs for wells MW-4R, MW-5, MW-6 and MW-7 based on intrawell statistical analysis.
[2] MCL and RL values to be used as concentration limits for wells MW-1, MW-2 and MW-3.
NL = No regulatory level established for this parameter

Table 5
Environmental Monitoring Locations, Parameters, and Sampling Frequencies
Knott Landfill

Monitoring Network	Compliance Monitoring Wells	Analyte Group	Monitoring Frequency	Time of Year
Groundwater	MW-4R, MW-5, MW-6, and MW-7	SSLs, PSCLs, TOC, and Sulfate	Semi-Annual	Spring and Fall
		Group 3-VOCs	Annual	Fall
	MW-1, MW-2, MW-3, MW-4R, MW-5, MW-6 and MW-7	Groups 1a, 1b, 2a, 2b and 3	DEQ Split-sampling event	Fall 2018, Fall 2022
Leachate	Cell 1, Cell 2, Cell 3, Cell 4, Cell 5, Cell 6 and future Primary Sumps[1]	Groups 1a, 1b, 2a, 2b and 3[2]	Annual[3]	Fall
Landfill Gas Probes	GP-1A, GP-1B, GP-2A, GP-2B, GP-3A, GP-3B, GP-4A, GP-4B, GP-6A, GP-6B, GP-7A, GP-7B	CH_4, CO_2, O_2, Pressure Quarterly	Quarterly[4]	Winter, Spring, Summer, and Fall
Landfill Gas Structures	Offsite (Marcott residence and DCSO animal rescue) On-Site (Pump Sta., Equip. Bldg., Recycle Shop, Yard Debris Scalehouse, Transfer Station	CH_4, CO_2, O_2, Pressure Quarterly	Quarterly	Winter, Spring, Summer, and Fall

Notes:
[1] Additional leachate samples will be collected as needed based on liquid level measurements in the secondary containment sumps.
[2] Leachate samples will not be analyzed for Groups 4, 5 and 6.
[3] Annual sampling of primary sump for first 5 years of operation and then on a once every 3-year rotation with a minimum of two leachate sump samples per year.
[4] Monitoring may be conducted more frequently to adjust LFG extraction system, or when monitoring points exceed permit threshold values (e.g. > 5 percent CH_4 by volume)

SSLs = Site Specific Limits include bicarbonate, calcium, chloride, iron, magnesium, manganese, potassium, sodium, TDS, Group 3 - VOCS
PSCLs = Permit Specific Concentration Limits – arsenic and barium

TABLE 6
Procedures for the Review of Groundwater Analytical Data

If the data shows results that…	Then…
Above any PSCL or three of the SSLs or if there is a significant change in water quality at any monitoring point. Note: Examples of significant changes • Detection of a VOC or other hazardous constituent not detected in background; • Exceedance of a Table 1 or 3 value listed in OAR 340-40 unless the background water quality is above these numerical limits; • Exceedance of a Safe Drinking Water Standard; • Detection of a compound in an order of magnitude higher than background.	1. Notify the DEQ in writing within 10 days of receipt of laboratory results; and, 2. Perform resampling immediately and evaluate results as described below. Note: • If this is a known release, previously confirmed to the department in writing, resampling is not required. The 9 constituents listed in Table 4 are known releases that do not require immediate resampling, The 9 constituents shall be monitored per Section 13 of the Permit.
None of the above,	Continue groundwater monitoring with the next scheduled sampling event.

Notes:
Table based on the table presented in Section 17.3 of the Knott Landfill Solid Waste Disposal Site Permit, dated August 21, 2016, issued by the Oregon Department of Environmental Quality.

TABLE 7
Procedures for the Review of Resampling Groundwater Analytical Data

If the resampling data indicates that…	Then…
Confirm the exceedance of at least one PSCL or a Table 1 or 2 values as listed in OAR 340-040 in any monitoring point.	1. Notify the DEQ in writing within 10 days of receipt of laboratory results, or within 60 days of the sample date and, 2. Submit within 90 days of resampling a Remedial Investigation workplan for DEQ review and approval.
Confirm the significant change in water quality results noted in routine sampling event or confirm at least three SSLs in any monitoring point.	1. Notify the DEQ in writing within 10 days of receipt of laboratory results, or within 60 days of the sample date and, 2. Submit a plan for developing an assessment program to DEQ within 30 days
Do not confirm the routine sampling results	1. Continue routine monitoring; and 2. Discuss the results of the routine sampling and resampling in the next annual environmental monitoring report.

Notes:
Table based on the table presented in Section 17.4 of the Knott Landfill Solid Waste Disposal Site Permit, dated August 21, 2016, issued by the Oregon Department of Environmental Quality.

TABLE 8
Gas Monitoring Well Construction Details
Knott Landfill – Bend, Oregon

WELL	WELL DEPTH[1]	SURFACE SEAL[2]	WELL SEAL INTERVAL[3]	FILTER PACK INTERVAL[4]	WELL SCREEN INTERVAL[5]	TUBE LENGTH
GP-1A **GP-1B**	48 9	0 - 2	11-22	22 – 48 2-11	27-47 4-9	40 8
GP-2A **GP-2B**	40 30	0 - 6	30-33	35 – 40 8 - 30	35-40 10-30	36 25
GP-3A **GP-3B**	75 54	0 - 3	56 – 62 3-25	62 – 75 25-56	65-75 29- 54	68 45
GP-4A **GP-4B**	78 23	0-3	25-44 3-9	45-80 9-25	48-78 13-23	64 20
GP-5	Decommissioned 2004					
GP-6A **GP-6B**	81 38	0 - 2	39 – 48 2-10	51 – 82 10-39	51 – 81 13-38	68 28
GP-7A **GP-7B**	74 35	0 - 2	37 – 47 2-8	47 - 75 8-37	49 – 74 10-35	63 24

Notes:
All measurements in feet below ground surface unless otherwise noted.
All wells are dual well completions within one borehole.
[1]AII wells were constructed with 1-inch diameter Schedule 80 PVC riser pipe and well screens.
[2]Surface seals are constructed with concrete cement.
[3]Well seals consist of hydrated 3/8-inch bentonite chips.
[4]Filter packs consist of 3/8-inch pea gravel.
[5]Well screens are 0.02-inch slotted Schedule 80 PVC.

APPENDIX A

Groundwater and Landfill Gas Probe Construction Logs

DESC OCT 26 1994 RECEIVED 18/12E/14dd

STATE OF OREGON MONITORING WELL REPORT

(as required by ORS 537.765 & OR 690-240-095) 9519 WATER RESOURCES DEPT JAN - 4 1995 SALEM, OREGON

State Card # 56260

WATER RESOURCES DEPT SALEM, OREGON

(1) OWNER/PROJECT:

WELL NO. MW #1

Name Deschutes County Public Works

Address 61150 SE 27th St

City Bend State OR Zip 97702

(2) TYPE OF WORK:

[X] New construction [ ] Repair [ ] Recondition

[ ] Conversion [ ] Deepening [ ] Abandonment

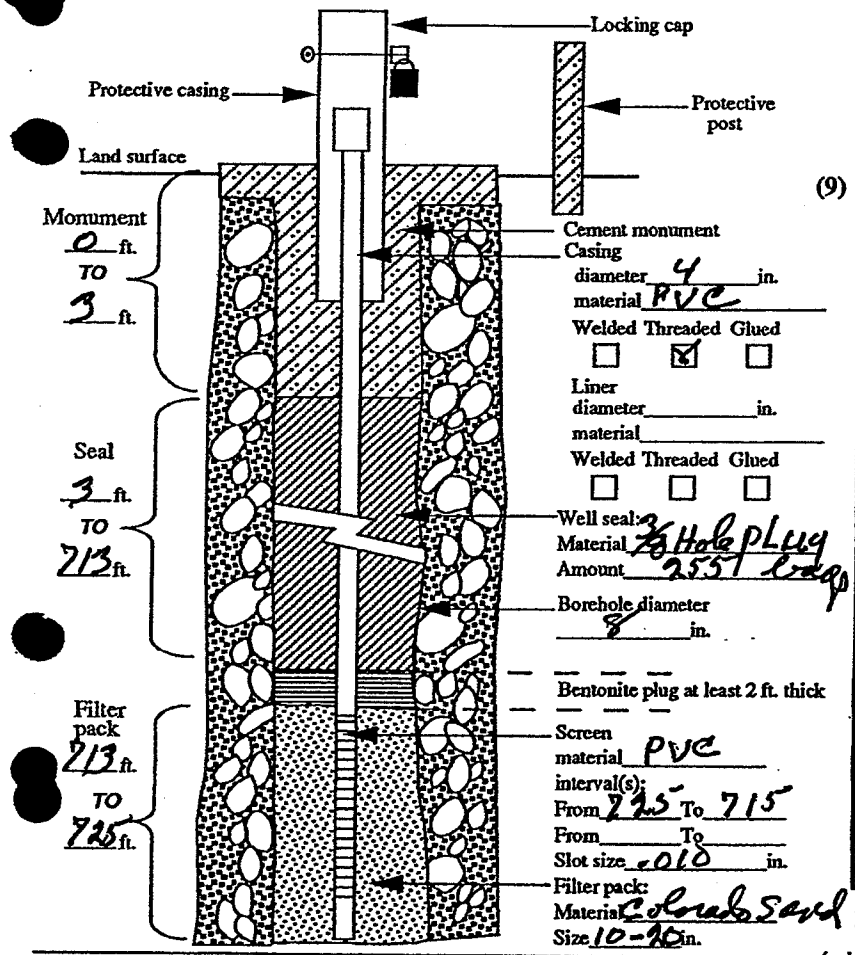
(3) DRILLING METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable

[ ] Hollow Stem Auger [ ] Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes [X] No [ ] Depth of completed well 725 ft.



(5) WELL TEST:

[ ] Pump [ ] Bailer [X] Air [ ] Flowing Artesian

Permeability ~~Air~~ Yield 5 GPM

Conductivity PH

Temperature of water 50 °F/C Depth artesian flow found ft.

Was water analysis done? [ ] Yes [X] No

By whom?

Depth of strata to be analyzed. From 225 ft. to 715 ft.

Remarks:

Name of supervising Geologist/Engineer Jon Sprecher

(6) LOCATION OF WELL By legal description

Well Location: County Deschutes

Township 18S (N or S) Range 12E (E or W) Section 14

1. NW 1/4 of SE 1/4 of above section.

2. Street address of well location Knott Land Fill SE 27th St, Bend, OR - 97702

3. Tax lot number of well location 100

4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

682 Ft. below land surface. Date 9-20-94

Artesian Pressure lb/sq. in. Date

(8) WATER BEARING ZONES:

Depth at which water was first found 720

From	To	Est. Flow Rate	SWL
720	750	?	682

(9) WELL LOG:

Ground elevation

Material	From	To	SWL
Soil	0	2	
Hard Rock	2	35	
Soft	35	95	
Harder Rock	95	405	
Softer Rock	405	420	
Harder Rock	420	600	
Softer Rock	600	705	
Harder Broken	705	760	682

Date started 7-21-94 Completed 9-20-94

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed Carl Pitcher MWC Number 10037 Date 10-12-94

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed Carl Pitcher MWC Number 10037 Date 10-12-94

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-095)

DESCH 9576

RECEIVED
OCT 20 1994
WATER RESOURCES DEPT.
SALEM, OREGON

18S/12E/14cd

Start Card # 56261

(1) OWNER/PROJECT: WELL NO. MW 2

Name Deschutes County Public Works
Address 61150 SE 27th St
City Bend State Or Zip 97702

(2) TYPE OF WORK:

- [x] New construction
- [ ] Conversion
- [ ] Repair
- [ ] Deepening
- [ ] Recondition
- [ ] Abandonment

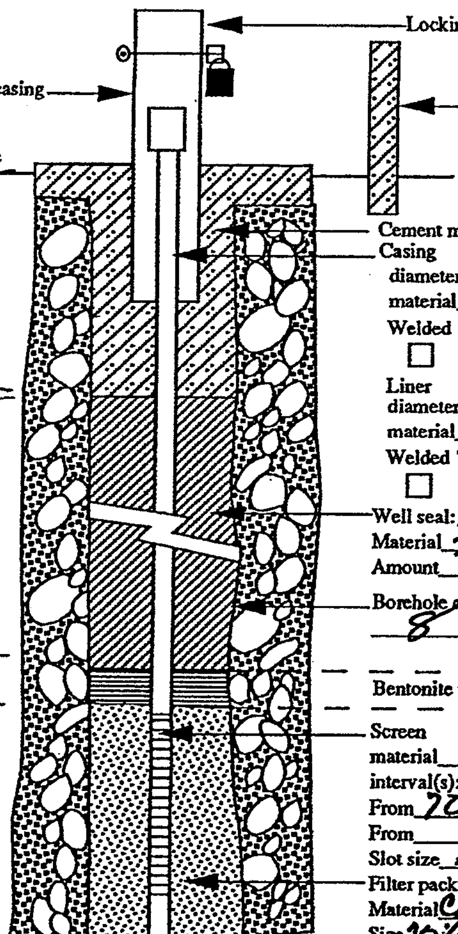
RECEIVED JAN - 4 1995 WATER RESOURCES DEPT. SALEM, OREGON

(3) DRILLING METHOD

- [x] Rotary Air
- [ ] Hollow Stem Auger
- [ ] Rotary Mud
- [ ] Other
- [ ] Cable

(4) BORE HOLE CONSTRUCTION

Special Standards Yes [x] No [ ] Depth of completed well 700 ft.



Monument 0 ft. TO 3 ft.

Seal 3 ft. TO 688 ft.

Filter pack 688 ft. TO 700 ft.

Casing diameter 4 in. material PVC
Welded [ ] Threaded [x] Glued [ ]

Liner diameter ______ in. material ______
Welded [ ] Threaded [ ] Glued [ ]

Well seal: Material 3/8 Hole Plug Amount 265 Bags

Borehole diameter 8 in.

Screen material PVC interval(s): From 700 To 690 From ____ To ____ Slot size .010 in.

Filter pack: Material Colorado Sand Size 20/40 in.

(5) WELL TEST:

- [ ] Pump
- [ ] Bailer
- [ ] Air
- [ ] Flowing Artesian

Permeability No Return Yield ______ GPM
Conductivity ______ PH ______
Temperature of water ______ °F/C Depth artesian flow found ______ ft.
Was water analysis done? [ ] Yes [x] No
By whom? ______
Depth of strata to be analyzed. From 690 ft. to 700 ft.
Remarks: ______

Name of supervising Geologist/Engineer Jon Sprecher

(6) LOCATION OF WELL By legal description

Well Location: County Deschutes
Township 18 S (N or S) Range 12 E (E or W) Section 14
1. SE 1/4 of SW 1/4 of above section.
2. Street address of well location Knott Land Fill SE 27th St, Bend, Or 97702
3. Tax lot number of well location 500
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

680 Ft. below land surface. Date 9-26-94
Artesian Pressure ______ lb/sq. in. Date ______

(8) WATER BEARING ZONES:

Depth at which water was first found ______

From	To	Est. Flow Rate	SWL
700	750	?	680

(9) WELL LOG: Ground elevation ______

Material	From	To	SWL
dirt	0	6	
Soft Rock	6	200	
Harder Rock	200	240	
Soft Rock	240	690	
S/soft Rock	690	780	
Broken Rock	700	750	680

Date started 8-2-94 Completed 9-27-94

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed Carl Pitek MWC Number 10037 Date 10-10-94

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed Carl Pitek MWC Number 10037 Date 10-10-94

11 STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OR 690-240-095)

BRS 9575 OCT 26 1994 WATER RESOURCES DEPT. SALEM, OREGON

18S/12E/14Cd

Start Card # 56274

(1) OWNER/PROJECT: WELL NO. MW #3
Name Deschutes County Public Works
Address 61150 SE 27th St
City Bend State OR Zip 97702

(2) TYPE OF WORK:
[X] New construction [ ] Repair [ ] Recondition
[ ] Conversion [ ] Deepening [ ] Abandonment

RECEIVED JAN - 4 1995 WATER RESOURCES SALEM, OREGON

(3) DRILLING METHOD
[X] Rotary Air [ ] Rotary Mud [ ] Cable
[ ] Hollow Stem Auger [ ] Other

(4) BORE HOLE CONSTRUCTION
Special Standards Yes [X] No [ ] Depth of completed well 716 ft.

Land surface
Vault 0 ft. TO 1 ft.
Water-tight cover
Surface flush vault
Locking cap
Casing diameter 4 in. material PVC
Welded [X] Threaded [ ] Glued [ ]
Liner diameter ____ in. material ____
Welded [ ] Threaded [ ] Glued [ ]
Seal 1 ft. TO 703 ft.
Well seal: Material 3/8 Holeplug Amount 3 1/2 Bags
Borehole diameter 8 in.
Bentonite plug at least 2 ft. thick
Filter pack 703 ft. TO 716 ft.
Screen material PVC interval(s): From 715 To 705 From ____ To ____ Slot size .010 in.
Filter pack: Material Colorado Sand Size 20/40 in.

(5) WELL TEST:
[ ] Pump [ ] Bailer [ ] Air [ ] Flowing Artesian
Permeability ____ Yield No Returns GPM
Conductivity ____ PH ____
Temperature of water ____ °F/C Depth artesian flow found ____ ft.
Was water analysis done? [ ] Yes [X] No
By whom? ____
Depth of strata to be analyzed. From 706 ft. to 715 ft.
Remarks: ____
Name of supervising Geologist/Engineer Jon Specker

(6) LOCATION OF WELL By legal description
Well Location: County Deschutes
Township 18S (N or S) Range 12E (E or W) Section 14
1. SE 1/4 of SW 1/4 of above section.
2. Street address of well location Knott Land Fill 5627 Ave Bend, OR 97702
3. Tax lot number of well location 500
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:
675 Ft. below land surface. Date 9-22-94
Artesian Pressure ____ lb/sq. in. Date ____

(8) WATER BEARING ZONES:
Depth at which water was first found 720

From	To	Est. Flow Rate	SWL
720	725	?	675

(9) WELL LOG: Ground elevation ____

Material	From	To	SWL
dirt	0	23	
Rock	23	95	
Pumice	95	105	
Soft rock	105	200	
Hard Rock	200	240	
Soft Rock	240	500	
Hard Rock	500	670	
Soft Rock	670	710	675
Broken Rock	710	730	675

Date started 8-4-94 Completed 9-22-94

(unbonded) Monitor Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.
Signed Carl Peterson MWC Number 10037 Date 10-10-94

(bonded) Monitor Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.
Signed Carl Peterson MWC Number 10037 Date 10-10-94

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

STATE OF OREGON DESC 51007 **RECEIVED** WELL I.D.# _____

MONITORING WELL REPORT JUL 24 1997 Start Card # 89003 **RECEIV**

(as required by ORS 537.765 & OAR 690-240-095)

Instructions for completing this report are on the last page of this form. WATER RESOURCES DEPT. SALEM, OREGON SEP 24 199

(1) OWNER/PROJECT: WELL NO. MW-4?

Name Knotts Landfill

Address 60600 27th St

City Bend State OR Zip 97702

(2) TYPE OF WORK:

☒ New construction ☐ Alteration (Repair/Recondition)

☐ Conversion ☐ Deepening ☐ Abandonment

(3) DRILLING METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Hollow Stem Auger ☐ Other _____

(4) LOCATION OF WELL By legal description

Well Location: County Deschutes

Township 18S (N or S) Range 12E (E or W) Section 10

1. NW 1/4 of SE 1/4 of above section.

2. **Either** Street address of well location 60600 27th St

or Tax lot number of well location _____

3. **ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow.**

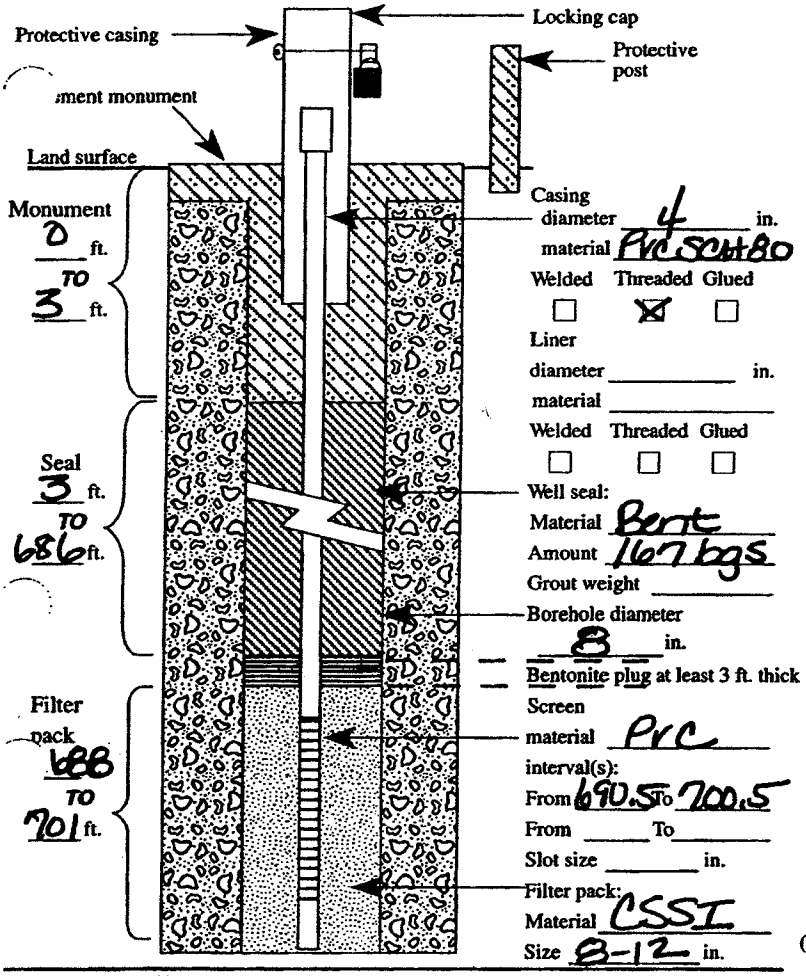
(7) STATIC WATER LEVEL:

675 Ft. below land surface. Date 5/30/96

Artesian Pressure _____ lb/sq. in. Date _____

BORE HOLE CONSTRUCTION

Special Standards Yes ☒ No ☐ Depth of completed well 701 ft.



(8) WATER BEARING ZONES:

Depth at which water was first found 675

From	To	Est. Flow Rate	SWL
675	719	N/A	675

(9) WELL LOG: Ground elevation _____

Material	From	To	SWL
See Attached			

Date started 5/20/96 Completed 6/28/96

(5) WELL TEST:

☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Permeability _____ Yield N/A GPM

Conductivity _____ PH _____

Temperature of water 52 °F/C Depth artesian flow found _____ ft.

Was water analysis done? ☐ Yes ☒ No

By whom? _____

Depth of strata to be analyzed. From _____ ft. to _____ ft.

Remarks: _____

Name of supervising Geologist/Engineer Terry Sprecher

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number 1358

Signed _____ Date 7/22/97

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 1358

Signed _____ Date 7/22/97

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

Knotts Landfill
Start Card #89003

(12) Well Log

MW-4

Material	From	To	SWL
Sand firm brown	0	10	
Basalt hard dark gray	10	20	
Cinders red brown	20	25	
Sand with some gravel and silt	25	80	
Basalt hard dark gray	80	100	
Cinders red brown	100	112	
Basalt hard dark gray	112	121	
Basalt dark gray	121	150	
Cinders and basalt red brown	150	160	
Basalt hard dark gray	160	238	
Cinders red brown	238	240	
Basalt dark gray	240	245	
Cinders red brown	245	260	
Basalt hard dark gray	260	302	
Cinders red brown	302	311	
Basalt hard dark gray	311	360	
Basalt dark gray with red black	360	371	
Cinders red brown	371	380	
Basalt black - red black	380	387	
Basalt hard	387	444	
Cinders red brown	444	457	
Basalt hard	457	473	
Basalt dark gray	473	605	
Cinders red brown	605	615	
Basalt dark gray	615	630	
Cinders red brown	630	635	
Volcanic sediment sandy gravel red brown	635	655	
Pumice off white med loose	655	665	
Basalt dark gray with red brown	665	674	
Basalt dark gray with red black	674	700	
Cinders red brown	700	701	

STATE OF OREGON

MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-095)

DESC 51008

RECEIVED
JUL 24 1997
WATER RESOURCES DEPT.
SALEM, OREGON

WELL I.D.# _____

Start Card # 89002

Instructions for completing this report are on the last page of this form.

(1) OWNER/PROJECT WELL NO.

Name Knotts Landfill

Address 60600 27th St

City Bend State OR Zip 97702

(2) TYPE OF WORK:

- [X] New construction
- [ ] Alteration (Repair/Recondition)
- [ ] Conversion
- [ ] Deepening
- [ ] Abandonment

(3) DRILLING METHOD

- [X] Rotary Air
- [ ] Rotary Mud
- [ ] Cable
- [ ] Hollow Stem Auger
- [ ] Other MWS?

(4) LOCATION OF WELL By legal description

Well Location: County Deschutes

Township 18S (N or S) Range 12E (E or W) Section _____

1. SW 1/4 of SW 1/4 of above section.
2. Either Street address of well location 60600 27th St

or Tax lot number of well location _____

3. ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow. OK

(7) STATIC WATER LEVEL:

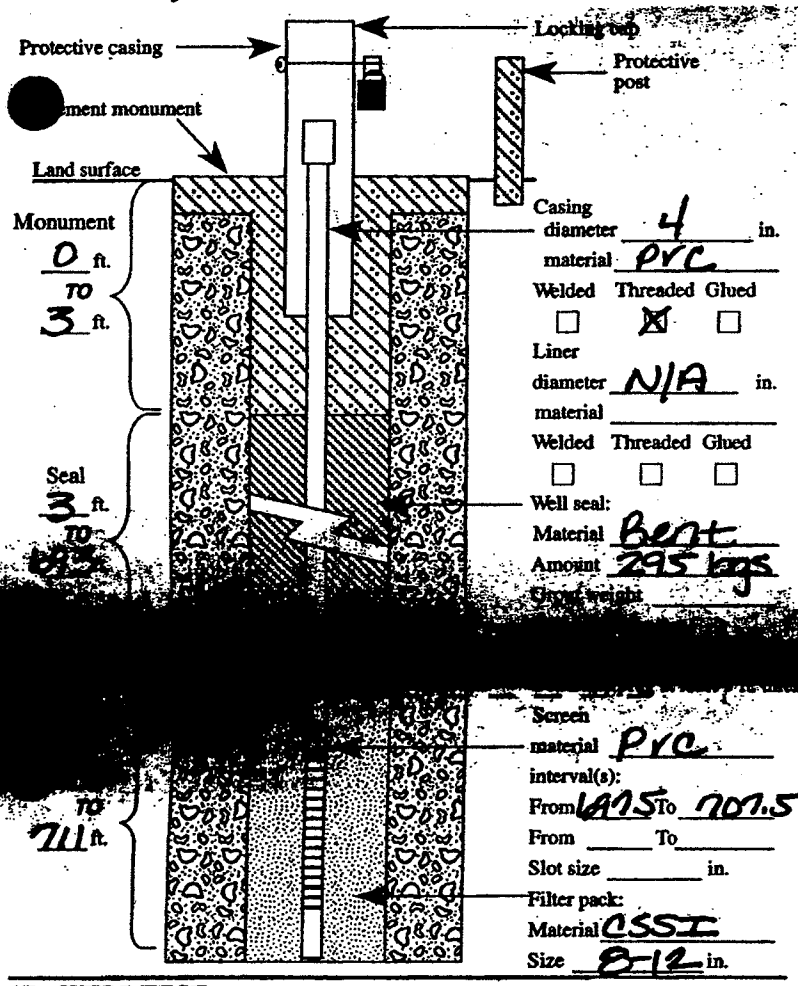
685 Ft. below land surface. Date 10/5/96

Artesian Pressure _____ lb/sq. in. Date _____

BORE HOLE CONSTRUCTION

Special Standards Yes [X] No [ ]

Depth of completed well 710 ft.



Casing diameter 4 in. material PVC

Welded [ ] Threaded [X] Glued [ ]

Liner diameter N/A in. material _____

Welded [ ] Threaded [ ] Glued [ ]

Well seal: Material Bent. Amount 295 bgs

Screen material PVC

interval(s): From 685 To 707.5

From _____ To _____

Slot size _____ in.

Filter pack: Material CSSI

Size 8-12 in.

(8) WATER BEARING ZONES:

Depth at which water was first found 685

From	To	Est. Flow Rate	SWL
685	711	N/A	685

(9) WELL LOG: Ground elevation _____

Material	From	To	SWL
See attached			

RECEIVED
SEP 24 1997
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 5/29/96 Completed 6/28/96

(5) WELL TEST:

- [ ] Pump
- [ ] Bailer
- [X] Air
- [ ] Flowing Artesian

Permeability _____ Yield N/A GPM

Conductivity _____ PH _____

Temperature of water 52 °F/C Depth artesian flow found _____ ft.

Was water analysis done? [ ] Yes [X] No

By whom? _____

Depth of strata to be analyzed. From _____ ft. to _____ ft.

Remarks: _____

Name of supervising Geologist/Engineer Terry Sprecher

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best of my knowledge and belief. MWC Number 10098

Signed _____ Date 7-22-97

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief. 10098 1358

MWC Number _____

Signed _____ Date 7/22/97

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

Knotts Landfill
Start Card #89002

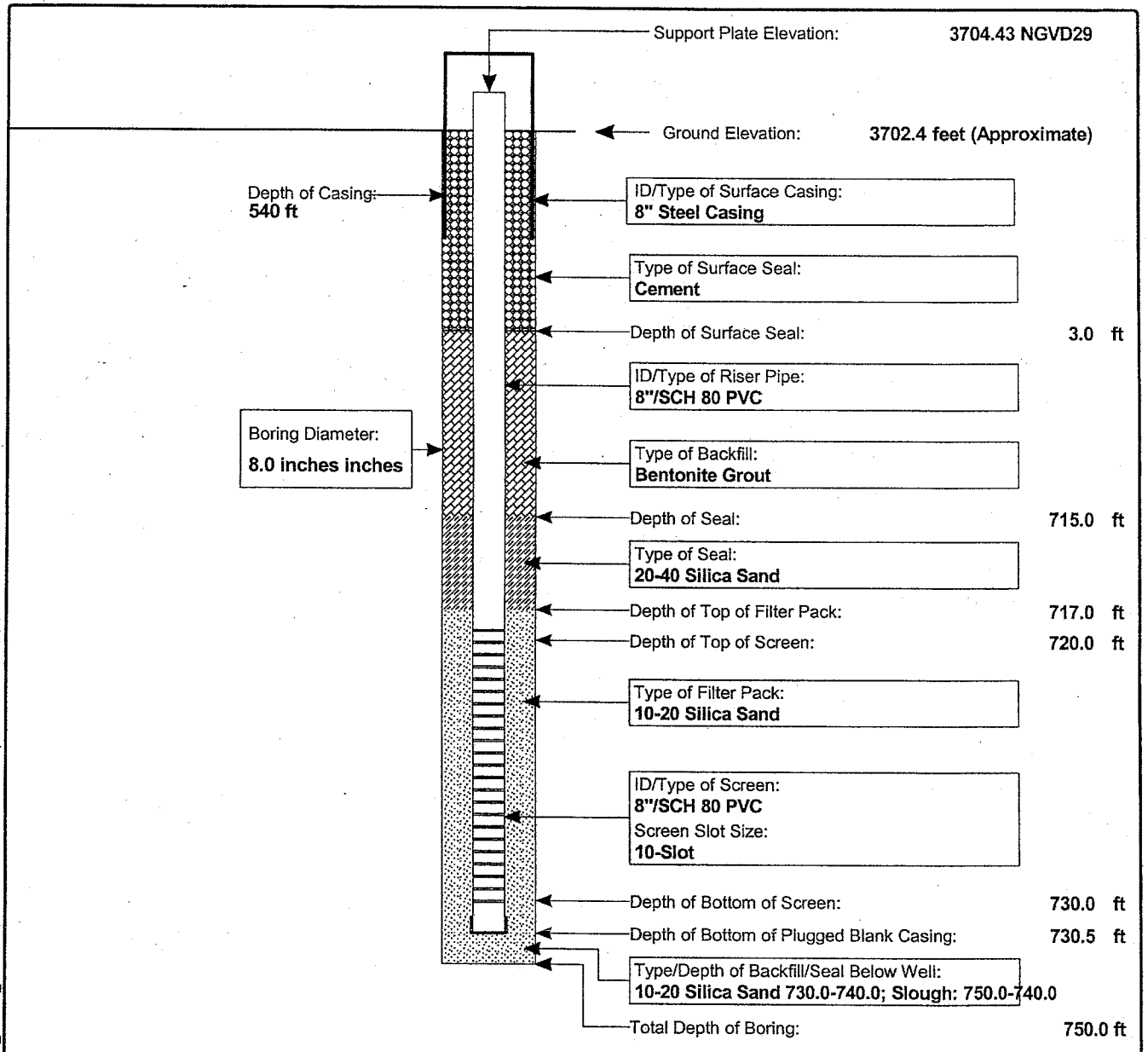
MW-5

(12) Well Log

Material	From	To
Sand with silt brown	0	2
Sand with gravel brown	2	8
Sand with silt & gravel brown	8	15
Sand with gravel & silt med	15	23
Sand with some gravel brown	23	58
Sand with gravel soft brown	58	66
Sand with gravel yellow brown to brown	66	86
Sandy gravel yellow brown to brown	86	94
Basalt dark gray	94	115
Cinders brick red to red brown	115	135
Pumice light gray	135	140
Basalt dark gray	140	198
Cinders red brown to yellow brown	198	206
Bsalt dark gray	206	277
Pumice yellow brown	277	299
Silt with fine sand lt yellow brown	299	311
Basalt dark gray	311	330
Pumice yellow brown	330	343
Basalt dark gray	343	685
Cinders red brown	685	710

Project: Knott Landfill Project Location: Bend, Oregon Project Number: 25696118	MONITORING WELL CONSTRUCTION LOG FOR WELL MW-4R

Well Location	East property boundary			Date Completed	8/22/2006
Installed By	Tacoma Pump & Drilling	Observed By	BPM	Total Depth	750.0 feet
Method of Installation	Pump/Hoist Truck				
Screened Interval	730.0-720.0 feet bgs	Completion Zone	Volcaniclastic Sediments		
Remarks	N/A				



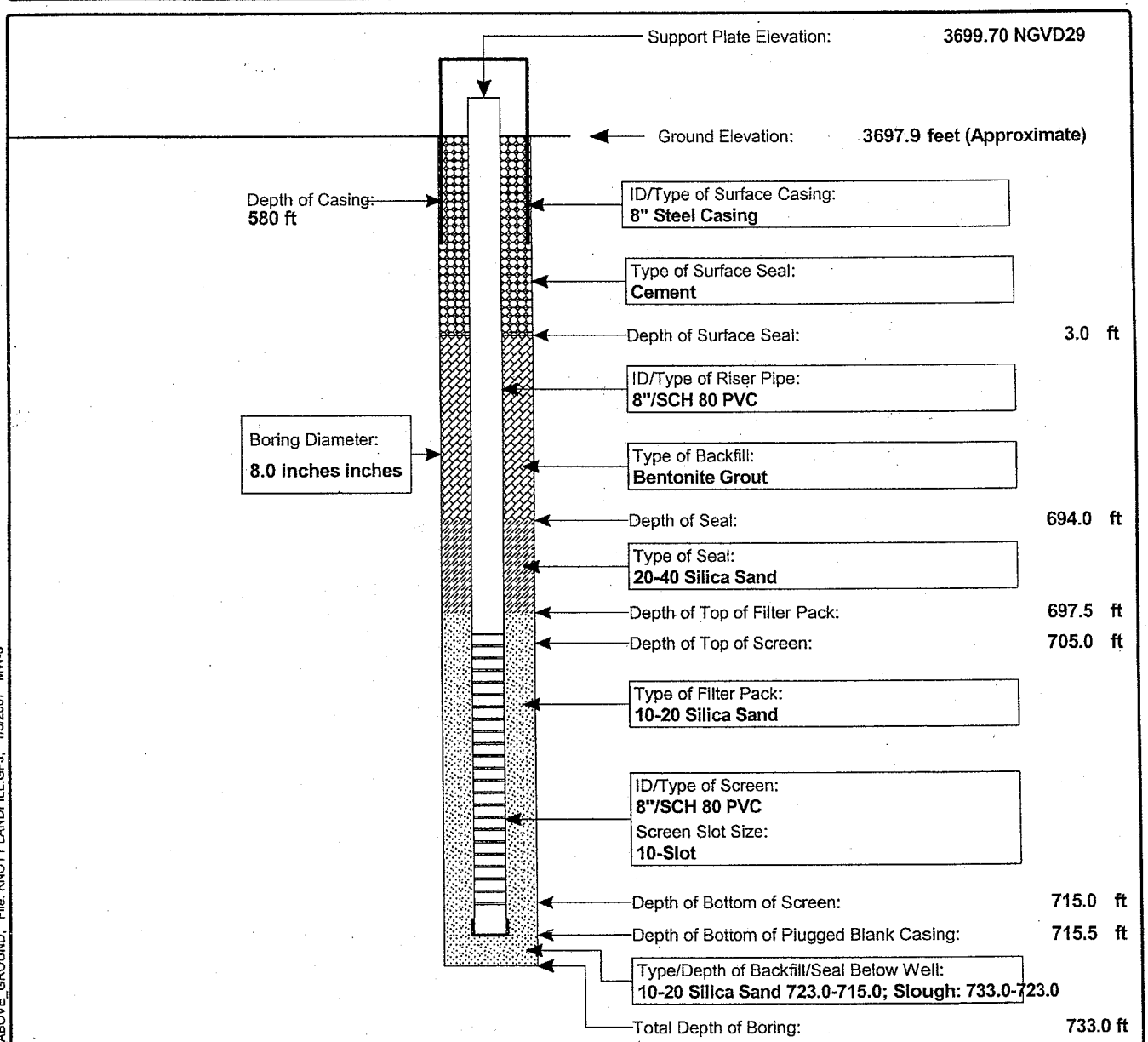
NOTE: DIAGRAM IS NOT TO SCALE

URS

Report: PORT_ENV_WELL_ABOVE_GROUND; File: KNOTT LANDFILL.GPJ; 1/3/2007 MW-4R

Project: Knott Landfill Project Location: Bend, Oregon Project Number: 25696118	MONITORING WELL CONSTRUCTION LOG FOR WELL MW-6

Well Location	North property boundary			Date Completed	8/22/2006
Installed By	Tacoma Pump & Drilling	Observed By	BPM	Total Depth	733.0 feet
Method of Installation	Air Rotary Drill Rig				
Screened Interval	715.0-705.0 feet bgs	Completion Zone	Volcaniclastic Sediments and Basalt		
Remarks	N/A				



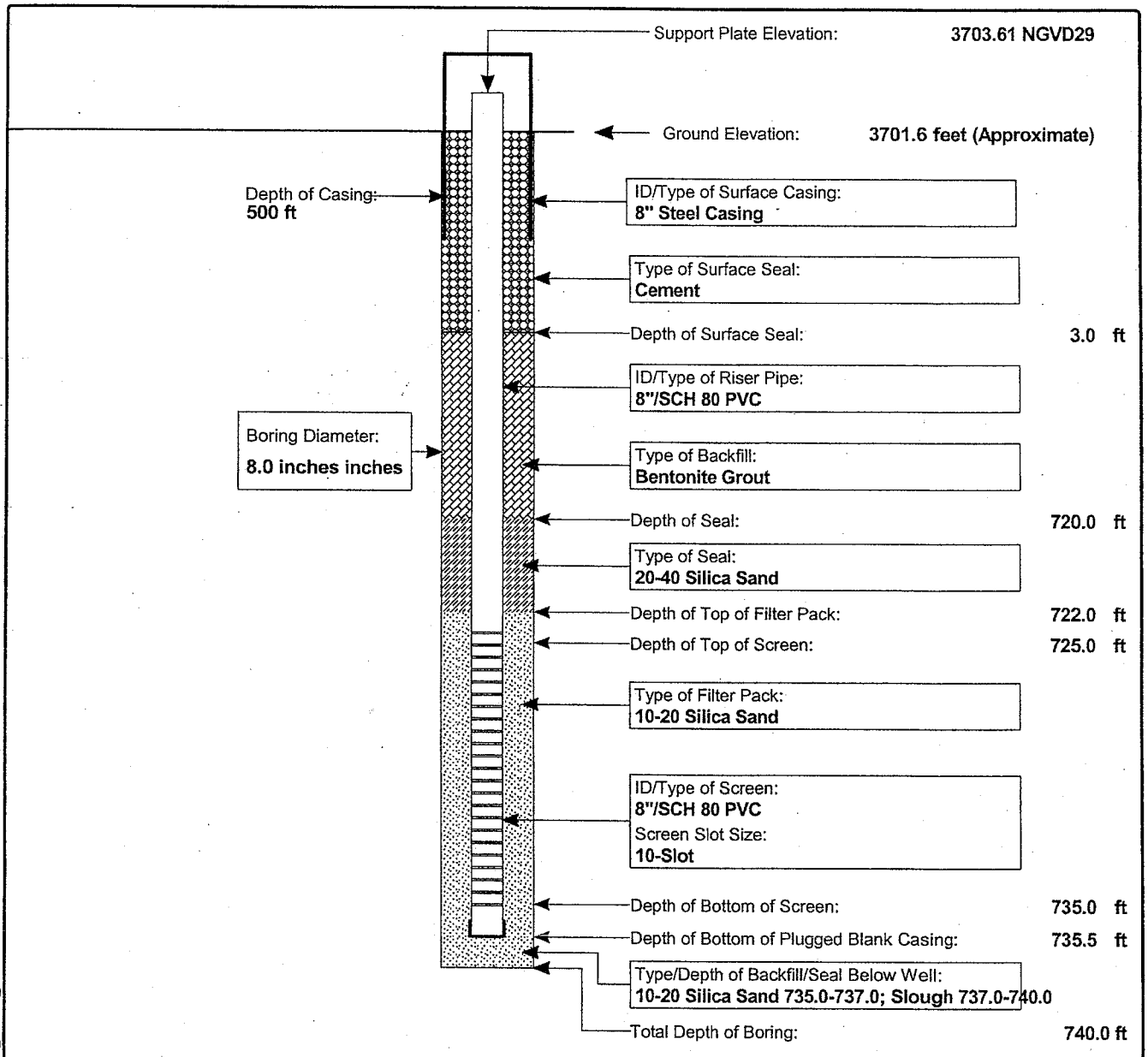
NOTE: DIAGRAM IS NOT TO SCALE

URS

Report: PORT_ENV_WELL_ABOVE_GROUND; File: KNOTT LANDFILL.GPJ; 1/3/2007 MW-6

Project: Knott Landfill Project Location: Bend, Oregon Project Number: 25696118	MONITORING WELL CONSTRUCTION LOG FOR WELL MW-7

Well Location	NE Corner of Knott Landfill			Date Completed	8/22/2006
Installed By	Tacoma Pump & Drilling	Observed By	BPM	Total Depth	740.0 feet
Method of Installation	Pump/Hoist Truck				
Screened Interval	735.0-725.0 feet bgs	Completion Zone	Volcaniclastic Sediments and Basalt		
Remarks	N/A				



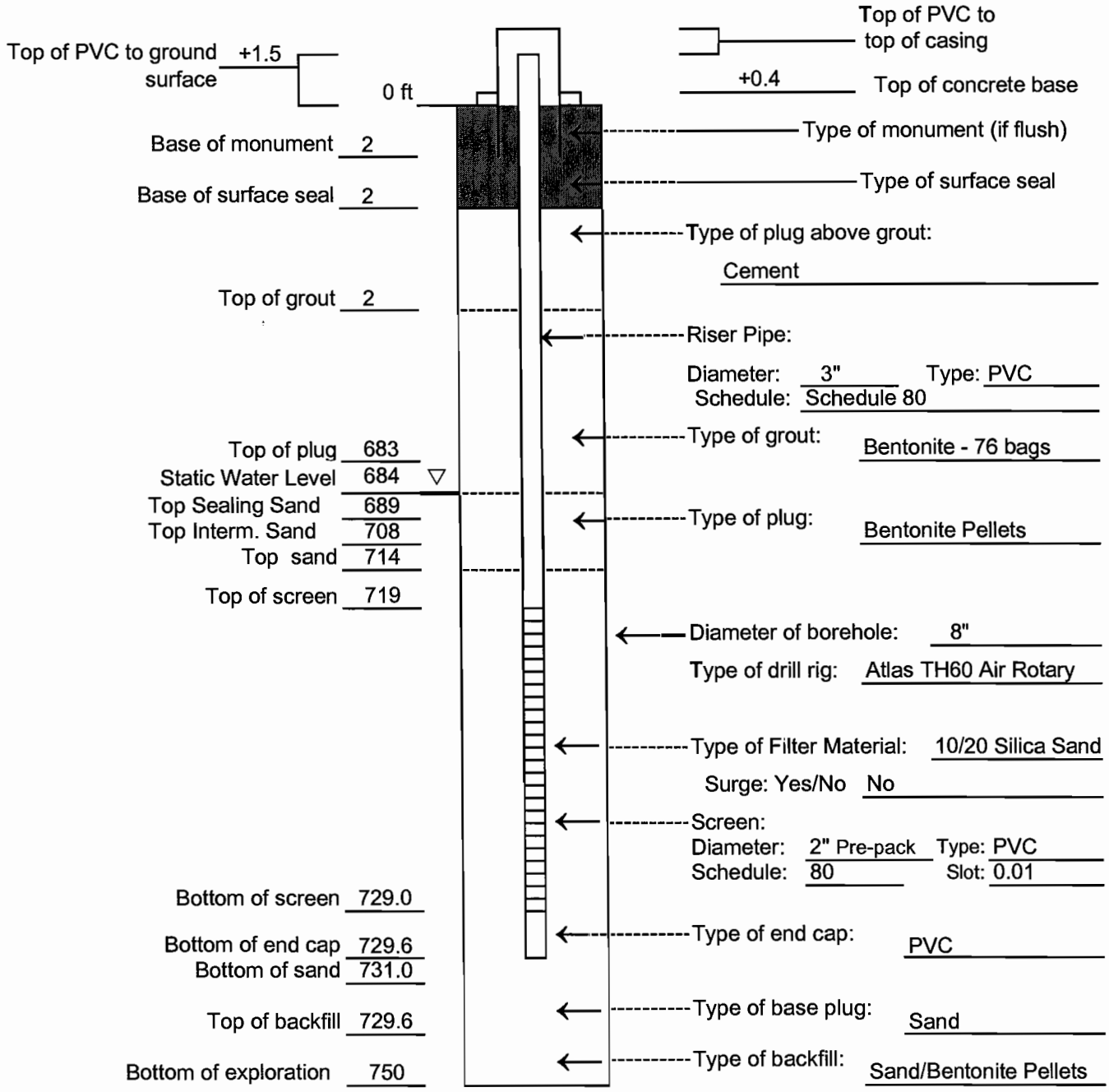
NOTE: DIAGRAM IS NOT TO SCALE

URS

Report: PORT_ENV_WELL_ABOVE_GROUND; File: KNOTT LANDFILL.GPJ; 1/3/2007 MW-7

PBS	PBS Engineering + Environmental MONITORING WELL INSTALLATION	PROJECT: Deschutes County PROJECT NO: 80429.000 EVENT: DATE: July 27, 2009

Field Personnel:	T. Scott	**Borehole ID:**		**Monitoring Well ID: MW-4R**
Weather Conditions:	Sunny	**Well Tag ID:**	**L074920**	**Start Card Number: 185739**



Comment:

Tally: 750 lbs - 20/40; 700 lbs 30 mesh;

Sand: 3100 lbs - 10/20.

Bentonite: 500 lbs pellets; 3800 lbs Ben Seal grout

Cement:

Other:

Notes: Bentonite grout: (8.55-9.5-10.45)
Cement/Grout: (12.69-14.1-15.51)

Volume: ([diameter inches/2]*[1ft/12inches])^2 * 3.14 * 7.48gal/ft3 * length feet

6"= 0.0625ft^2 * 23.4872gal/ft3 * length feet
= 1.46795gal/ft * length feet

1.5"=	0.09	5.5"=	1.23	8"=	2.61		
2"=	0.16	6"=	1.47	8.5"=	2.95		
3"=	0.37	6.5"=	1.75	9"=	3.30		
4"=	0.65	7"=	2.00	9.5"=	3.68		
5"=	1.02	7.5"=	2.29	10"=	4.08		

Original MW-4R

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

WELL LABEL # L 074920

START CARD # 185739

(1) LAND OWNER

Owner Well I.D. MW-4R

First Name _____ Last Name _____

Company COUNTY OF DESCHUTES; LANDFILL

Address 61000 SE 27TH ST

City BEND State OR Zip 97700

(2) TYPE OF WORK

[X] New [ ] Deepening [ ] Conversion [ ] Alteration (repair/recondition) [ ] Abandonment

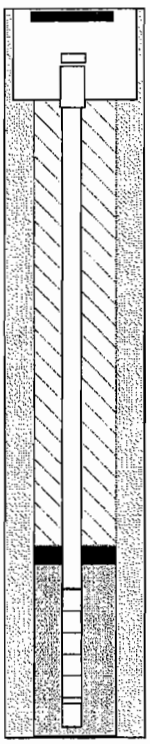
(3) DRILL METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable [ ] Hollow Stem Auger [ ] Cable Mud [ ] Reverse Rotary [ ] Other

(4) CONSTRUCTION

Piezometer Well [ ]

Depth of Completed Well 730 ft. Special Standard [X]



MONUMENT/VAULT Above Ground
From +2 To 3+

BORE HOLE
Diameter 8" From 0' To 740'

CASING
Dia. 4" From [ ] +1.5' To 720'
Gauge SCH 80 Wld Thrd
Material (O) Steel (●) Plastic [ ] [X]

LINER
Dia. N/A From [ ] _____ To _____
Gauge _____ Wld Thrd
Material (O) Steel (O) Plastic [ ] [ ]

SEAL
From 0' To 715'
Material Bentonite
Amount 161 S Grout weight 9.75

SCREEN
Casing/Liner _____ Material SCH 80 P.V.C
Diameter 4" From 720' To 730'
Slot Size .010

FILTER
From 717' To 740' Material Silica Sand Size of pack 10-20

(5) WELL TESTS

(O) Pump (O) Bailer (O) Air (O) Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature 52 °F Lab analysis [ ] Yes By _____

Supervising Geologist/Engineer Brian McNamara / URS Corporation

Water quality concerns? [ ] Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County DESCHUTE Twp 18 S N/S Range 12 E E/W WM
Sec 14 NW 1/4 of the SE 1/4 Tax Lot 500
Tax Map Number _____ Lot _____
Lat ° 0 ' " or _____ DMS or DD
Long ° 0 ' " or _____ DMS or DD
(●) Street address of well (O) Nearest address

61000 SE 27TH ST

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening				
Completed Well				

Flowing Artesian? [ ] Dry Hole? [ ]

WATER BEARING ZONES Depth water was first found 683

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
8/1/2006	683	747	.5 GPM	683		683'

(8) WELL LOG

Ground Elevation 3702

Material	From	To
Fill / silty sand	0	3
Basalt	3	35
Volcaniclastic sediments	35	85
Basalt	85	113
Volcaniclastic sediments	113	132
Pumice	132	158
Volcaniclastic sediments	158	207
Basalt / basaltic cinders	207	240
Basalt	240	265
Basalt / basaltic cinders	265	273
Basalt	273	318
Volcaniclastic sediments	318	340
Basalt	340	365
Basalt / Basaltic cinders	365	392
Basalt / basaltic cinders	392	406
Basalt	406	413
Basalt / basaltic cinders	414	442
Basalt	442	487
Basalt / basaltic cinders	487	503

Date Started 7/17/2006 Completed 8/23/2006

(unbonded) Monitor Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon monitoring well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number _____ Date _____
Password : (if filing electronically) _____
Signed _____

(bonded) Monitor Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon monitoring well construction standards. This report is true to the best of my knowledge and belief.

License Number 10067 Date _____
Password : (if filing electronically) _____
Signed _____
Contact Info (optional)

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version: 0.26

MONITORING WELL REPORT -
continuation page

WELL I.D. # L 0

START CARD # 185739

(4) CONSTRUCTION

BORE HOLE

Dia	From	To
12	0	18
8	18	740

FILTER PACK

From	To	Material	Size
717	740	Silica	10/20
715	717	Silica	20/40

SEAL

Material	From	To	Amt	sacks/ lbs	grout weight
Bentonite Grout	40	715	161	S	9.75
Bentonite Chips	0	40	26	S	-

CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd

SCREENS

Perf/ Screen	Casing/ Liner	Screen Dia	From	To	Scrn size/ slot width	Slot length	# of slots	Tele/ pipe size

(5) WELL TESTS

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Water Quality Concerns

From	To	Description	Amount	Units

(7) STATIC WATER LEVEL

Water Bearing Zones

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(8) WELL LOG

Material	From	To
(Continued)		
Basalt	506	650
Volcaniclastic sediments	650	737
Basalt	737	740

Comments/Remarks

Used 2 1/2 yards of cement to stabilize hole from 544' to 710'.

Reconstructed MW-4R

DESC 58817

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

08-27-2009

WELL LABEL # L 98921

START CARD # 1007009

(1) LAND OWNER

Owner Well I.D. MW-4R

First Name _____ Last Name _____

Company County of Deschutes, Landfill

Address 61050 SE 27th St.

City Bend State OR Zip 97700

(2) TYPE OF WORK

☐ New ☐ Deepening ☐ Conversion
☒ Alteration (repair/recondition) ☐ Abandonment

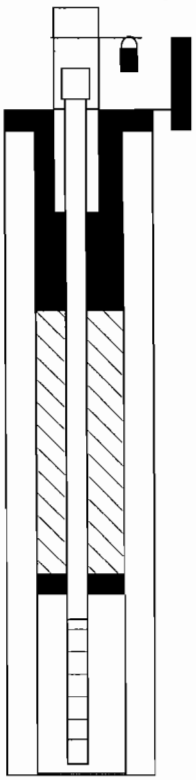
(3) DRILL METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud
☐ Reverse Rotary ☐ Other _____

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 729.5 ft. Special Standard ☒



MONUMENT/VAULT Above Ground
From -3 To 3

BORE HOLE
Diameter 8 From 0 To 729

CASING
Dia. 3 From ☒ 0 To 719
Gauge sch 80 Wld Thrd
Material ◯ Steel ◉ Plastic ☐ ☐

LINER
Dia. _____ From ☐ _____ To _____
Gauge _____ Wld Thrd
Material ◯ Steel ◯ Plastic ☐ ☐

SEAL
From 0 To 683
Material Bentonite Grout
Amount 76.00 S Grout weight 10.2

SCREEN
Casing/Liner _____ Material PVC Sch 80
Diameter 2 From 719 To 729
Slot Size .010

FILTER
From 690 To 730 Material CSSI Size of pack 10/20

(5) WELL TESTS

◯ Pump ◯ Bailer ◯ Air ◯ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature 56 °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Deschutes Twp 18.00 S N/S Range 12.00 E E/W WM
Sec 14 NW 1/4 of the SE 1/4 Tax Lot 500
Tax Map Number _____ Lot _____
Lat ° 0 ' _____ " or _____ DMS or DD
Long ° 0 ' _____ " or _____ DMS or DD
◉ Street address of well ◯ Nearest address

61050 SE 27th St., Bend, OR

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening	07-29-2009		698
Completed Well			

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found 698

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation _____

Material	From	To
See original well log - SC 185739	0	729.5

Date Started 06-20-2009 Completed 07-29-2009

(unbonded) Monitor Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon monitoring well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number 10426 Date 08-27-2009

Electronically Submitted
Signed TODD L MECHAM (E-filed)

(bonded) Monitor Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon monitoring well construction standards. This report is true to the best of my knowledge and belief.

License Number 10357 Date 08-27-2009

Electronically Submitted
Signed TERRENCE JACQUES (E-filed)
Contact Info (optional)

ORIGINAL - WATER RESOURCES DEPARTMENT

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

MONITORING WELL REPORT - continuation page

DESC 58817

08-27-2009

WELL I.D. # L 98921

START CARD # 1007009

(4) CONSTRUCTION

BORE HOLE

Dia	From	To

FILTER PACK

From	To	Material	Size

SEAL

Material	From	To	Amt	sacks/ lbs	grout weight

CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
●	○	8	☒	3	544	.322	●	○	☒	☐

SCREENS

Perf/Screen	Casing/ Liner	Screen Dia	From	To	Scrn size/slot width	Slot length	# of slots	Tele/ pipe size

(5) WELL TESTS

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Water Quality Concerns

From	To	Description	Amount	Units

(7) STATIC WATER LEVEL

Water Bearing Zones

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(8) WELL LOG

Material	From	To

Comments/Remarks

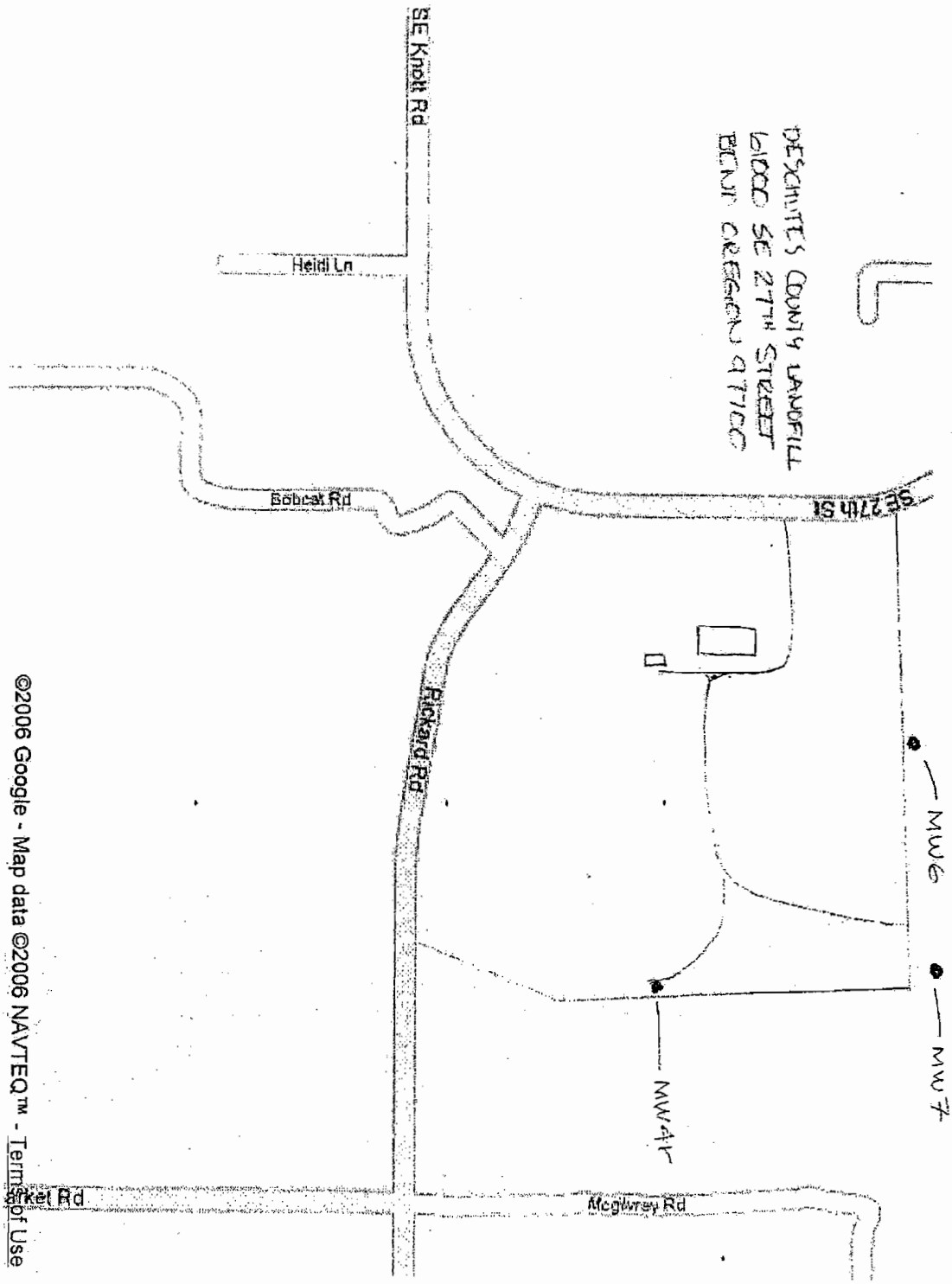
Repaired broken 4-inch PVC well. Removed all existing well materials by drilling 8-inch diameter through existing 8-inch steel casing to 544'. Continued to drill out well materials using 8-inch bit open hole method to 730 feet. Installed 2-inch prepacked well screen with 3-inch sch 80 riser. Original well ID tag 074920 was missing. Installed new well ID tag L98921

MONITORING WELL REPORT -
Map with location identified must be attached and shall include an approximate scale and north arrow

DESC 58817
08-27-2009

WELL I.D. # L 98921
START CARD # 1007009

Map of well



P09088-3588

Map of well

Oregon

Theodore R. Kulongoski, Governor

Water Resources Department
North Mall Office Building
725 Summer Street NE, Suite A
Salem, OR 97301-1266
503-986-0900
FAX 503-986-0904

July 28, 2009

TERRENCE JACQUES #10357
CASCADE DRILLING INC
13600 SE AMBLER RD
CLACKAMAS OR 97015

FINAL ORDER

Dear Terry:

The Special Standard request you submitted for owner: Deschutes County Landfill, Start Card number 1007009, is hereby approved for the following: You may construct this well with the filter pack seal as described on your Special Standard Request Form. This is necessary due to your concern about grout infiltration into the screen interval. Your Special Standard request form is enclosed. All other standards must be adhered to.

The Well Construction Standards serve to protect ground water resources. By approving and issuing this special construction standard the Oregon Water Resources Department is not representing that a well constructed in accordance with this condition will maintain structural integrity or that it meets engineering standards. The well constructor/or landowner is responsible for ensuring that a well is constructed in a manner that protects ground water resources as required under Oregon Administrative Rules 690-200 through 690-240.

If you have any questions regarding this letter, I may be contacted at (503) 986-0851, or by e-mail at Kristopher.R.Byrd@wrd.state.or.us.

Sincerely,

Kristopher Byrd, Coordinator
Well Construction Program
Well Construction and Compliance Section

enclosure

cc: Larry Carey, SC Region Well Inspector
File

This is a final order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60 day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080 you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

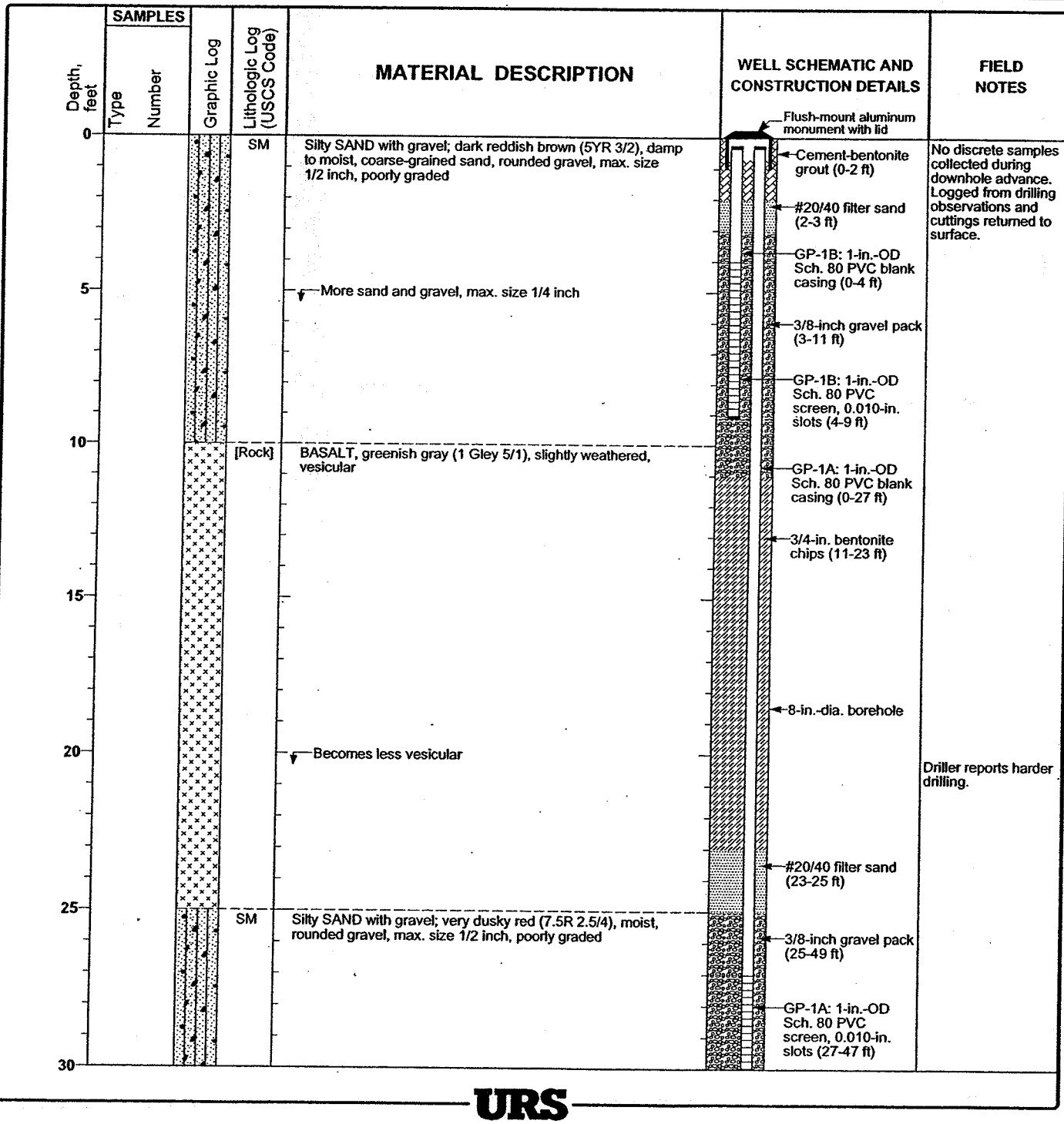
JUL 3 0 2009 1007009 - 35588

Project: Knott Landfill
Project Location: Bend, Oregon
Project Number: 52-00040053.11

Log of Boring / Gas Probe GP-1

Sheet 1 of 2

Date(s) Drilled	1/9/01	Logged By	C. Moody	Reviewed By	J. Peale
Drilling Method	Air Rotary	Drilling Contractor	Geotech Drilling	Total Depth of Borehole	49.0 feet
Drill Rig Type	Not recorded	Drill Bit Size/Type	Downhole hammer with button bit	Top of Casing Elevation	Not available
Water Level and Date Measured	Not measured	Sampling Method	No samples collected	Ground Surface Elevation	Not available
Size and Type of Well Casing	1-inch-OD Schedule 80 PVC	Seal or Backfill	Cement-bentonite grout (upper) and 3/4-inch bentonite chips (lower)	Screen Perforation	0.010-inch slots



Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001 GP-01

URS

Project: Knott Landfill
Project Location: Bend, Oregon
Project Number: 52-00040053.11

Log of Boring / Gas Probe GP-1

Sheet 2 of 2

Depth, feet	SAMPLES Type	SAMPLES Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
30				SP-SM	SAND with silt and gravel; dark reddish brown (5YR 2.5/2), moist, subrounded to rounded gravel, max. size 1 inch	8-in.-dia. borehole	
35				SW/GW	Gravelly SAND, trace silt; dark brown (10YR 3/3), moist, hard subrounded gravel, max. size 1-1/2 inches, some red gravel	3/8-inch gravel pack (25-49 ft)	
40						GP-1A: 1-in.-OD Sch. 80 PVC screen, 0.010-in. slots (27-47 ft)	
45				SM	Silty SAND, trace gravel; very dark grayish brown (10YR 3/2), moist		
50					End of boring at 49.0 feet		
55							
60							
65							

URS

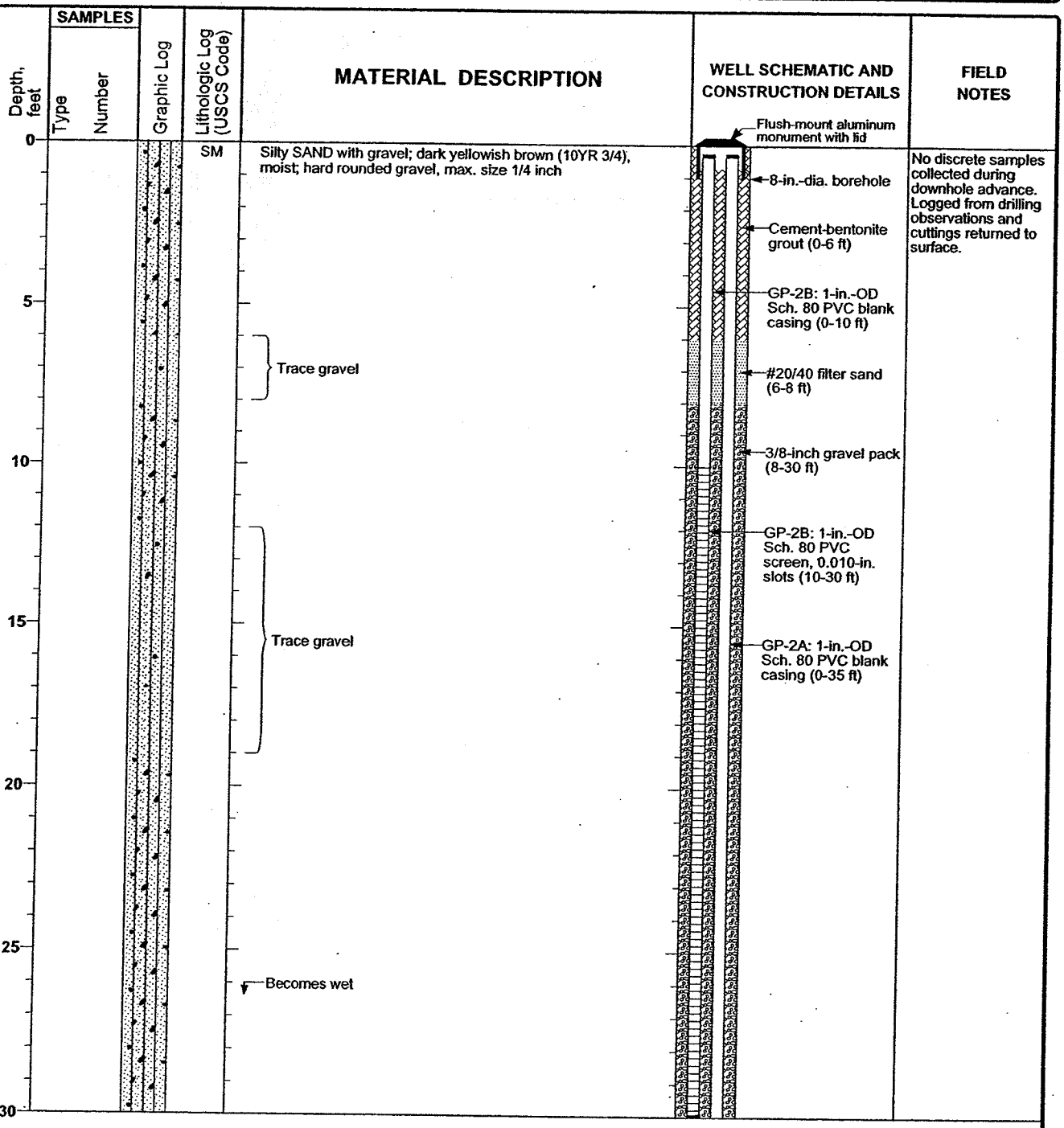
Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001. GP-01

Project: Knott Landfill
Project Location: Bend, Oregon
Project Number: 52-00040053.11

Log of Boring / Gas Probe GP-2

Sheet 1 of 2

Date(s) Drilled	1/10/01	Logged By	C. Moody	Reviewed By	J. Peale
Drilling Method	Air Rotary	Drilling Contractor	Geotech Drilling	Total Depth of Borehole	40.0 feet
Drill Rig Type	Not recorded	Drill Bit Size/Type	Downhole hammer with button bit	Top of Casing Elevation	Not available
Water Level and Date Measured	Not measured	Sampling Method	No samples collected	Ground Surface Elevation	Not available
Size and Type of Well Casing	1-inch-OD Schedule 80 PVC	Seal or Backfill	Cement-bentonite grout (upper) and 3/4-inch bentonite chips (lower)	Screen Perforation	0.010-inch slots



Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001 GP-02

URS

Project: Knott Landfill
Project Location: Bend, Oregon
Project Number: 52-00040053.11

Log of Boring / Gas Probe GP-2

Depth, feet	SAMPLES Type	SAMPLES Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
30				SC	Clayey SAND; dark yellowish brown (10YR 3/4), moist to wet, slightly plastic fines	8-in.-dia. borehole; 3/4-in. bentonite chips (30-33 ft)	
35				[Rock]	BASALT, dark greenish gray (1 Gley 3/1), fresh to slightly weathered, vesicular; Becomes more vesicular, some sand [interflow]	#20/40 filter sand (33-34 ft); 3/8-inch gravel pack (34-40 ft); GP-2A: 1-in.-OD Sch. 80 PVC screen, 0.010-in. slots (35-40 ft)	
40					End of boring at 40.0 feet		
45							
50							
55							
60							
65							

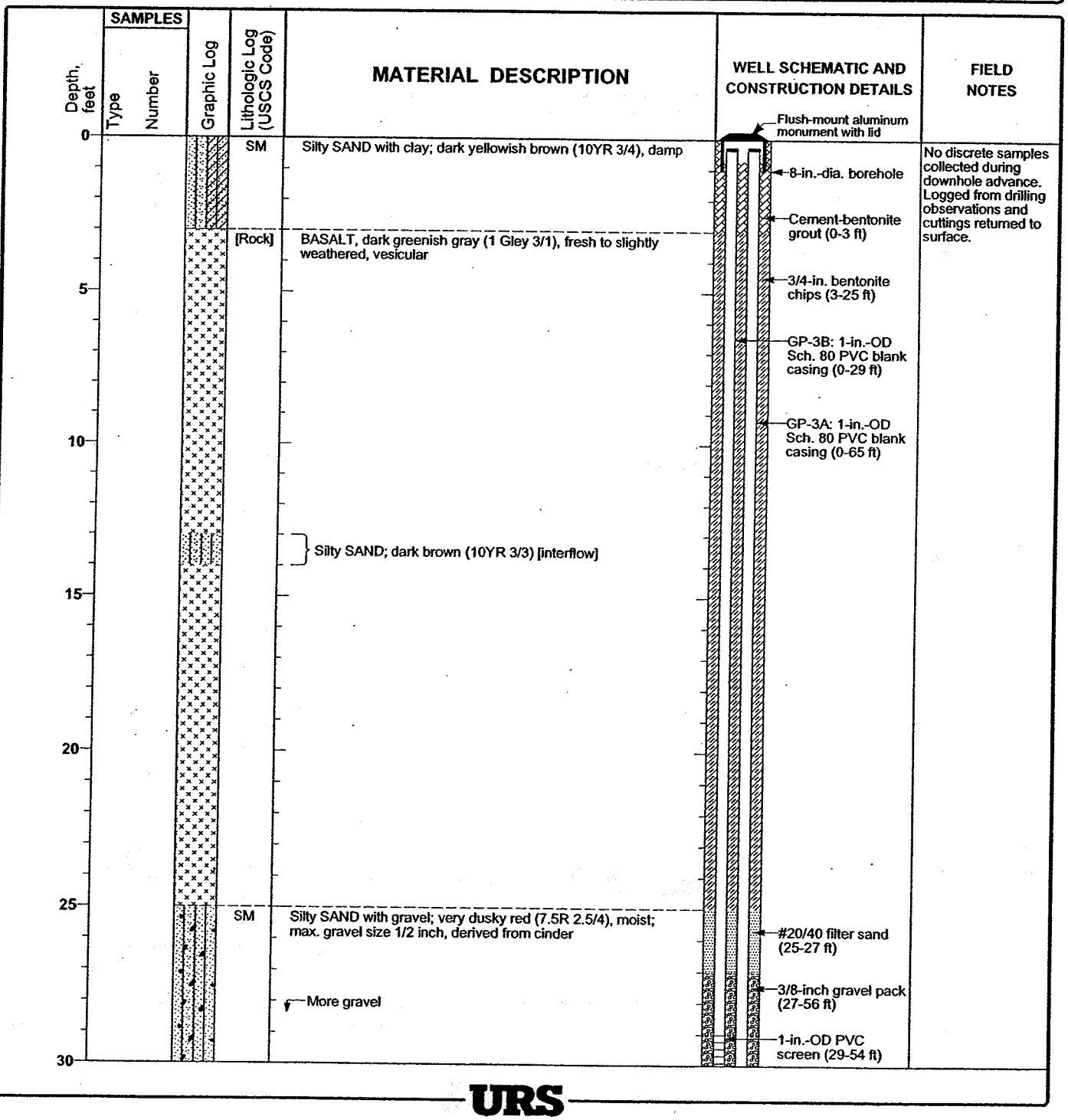
Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001 GP-02

URS

Project: Knott Landfill
Project Location: Bend, Oregon
Project Number: 52-00040053.11

Log of Boring / Gas Probe GP-3

Date(s) Drilled	1/11/01	Logged By	C. Moody	Reviewed By	J. Peale
Drilling Method	Air Rotary	Drilling Contractor	Geotech Drilling	Total Depth of Borehole	75.0 feet
Drill Rig Type	Not recorded	Drill Bit Size/Type	Downhole hammer with button bit	Top of Casing Elevation	Not available
Water Level and Date Measured	Not measured	Sampling Method	No samples collected	Ground Surface Elevation	Not available
Size and Type of Well Casing	1-inch-OD Schedule 80 PVC	Seal or Backfill	Cement-bentonite grout (upper) and 3/4-inch bentonite chips (lower)	Screen Perforation	0.010-inch slots

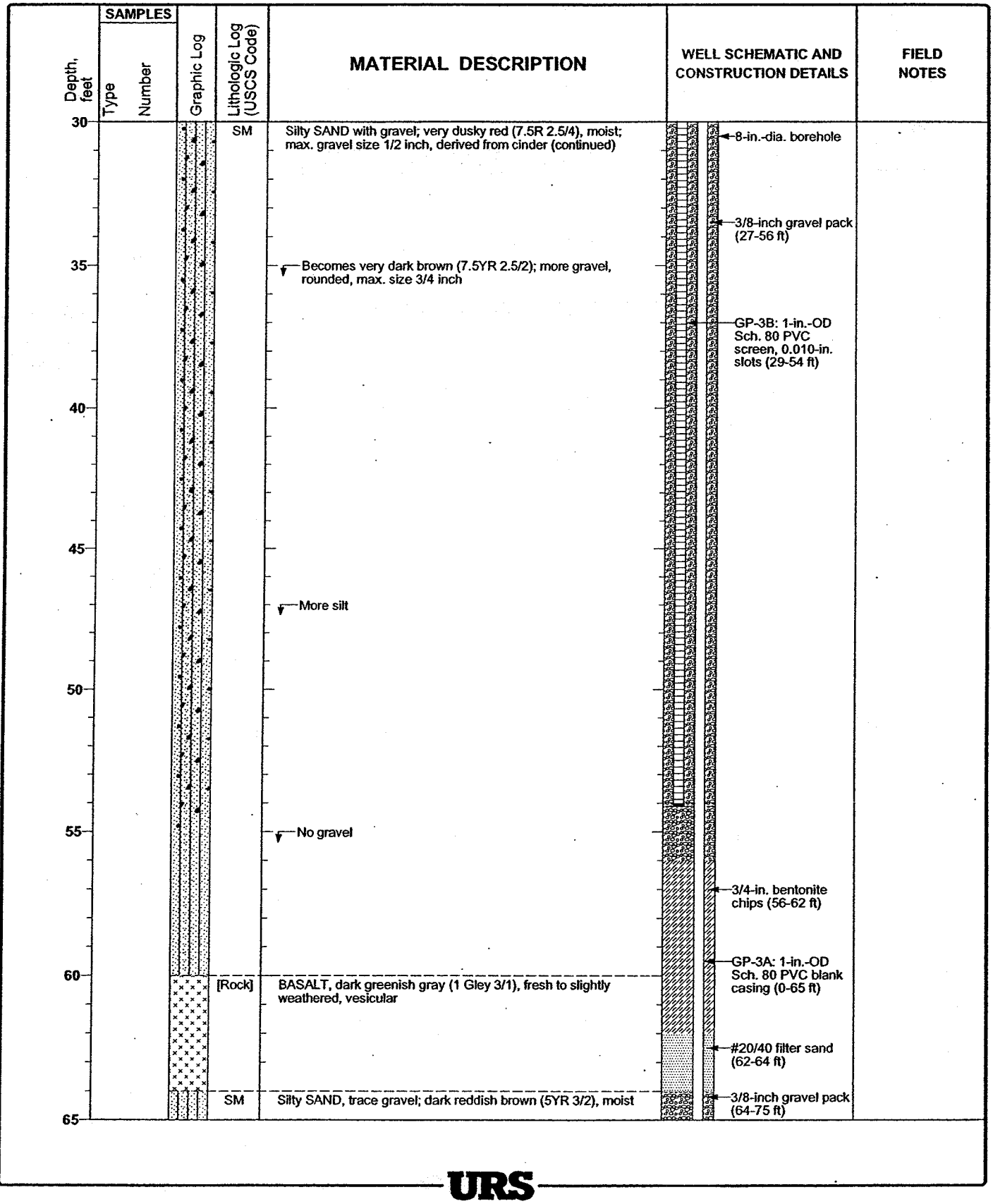


Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001 GP-03

URS

Project: Knott Landfill
Project Location: Bend, Oregon
Project Number: 52-00040053.11

Log of Boring / Gas Probe GP-3



Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001 GP-03

URS

Project: Knott Landfill
Project Location: Bend, Oregon
Project Number: 52-00040053.11

Log of Boring / Gas Probe GP-3

Depth, feet	SAMPLES Type	SAMPLES Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
65				SM	Silty SAND, trace gravel; dark reddish brown (5YR 3/2), moist, fine-grained, poorly graded (continued)	8-in.-dia. borehole; 3/8-inch gravel pack (64-75 ft)	
70				[Rock]	BASALT, dark greenish gray (1 Gley 3/1), fresh to slightly weathered, vesicular	GP-3A: 1-in.-OD Sch. 80 PVC screen, 0.010-in. slots (65-75 ft)	
				SM	Silty SAND; dark brown (7.5YR 3/2), moist, very fine-grained, poorly graded		
75				[Rock]	BASALT, dark greenish gray (1 Gley 3/1), fresh to slightly weathered, vesicular		
					End of boring at 75.0 feet		
80							
85							
90							
95							
100							

Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001 GP-03

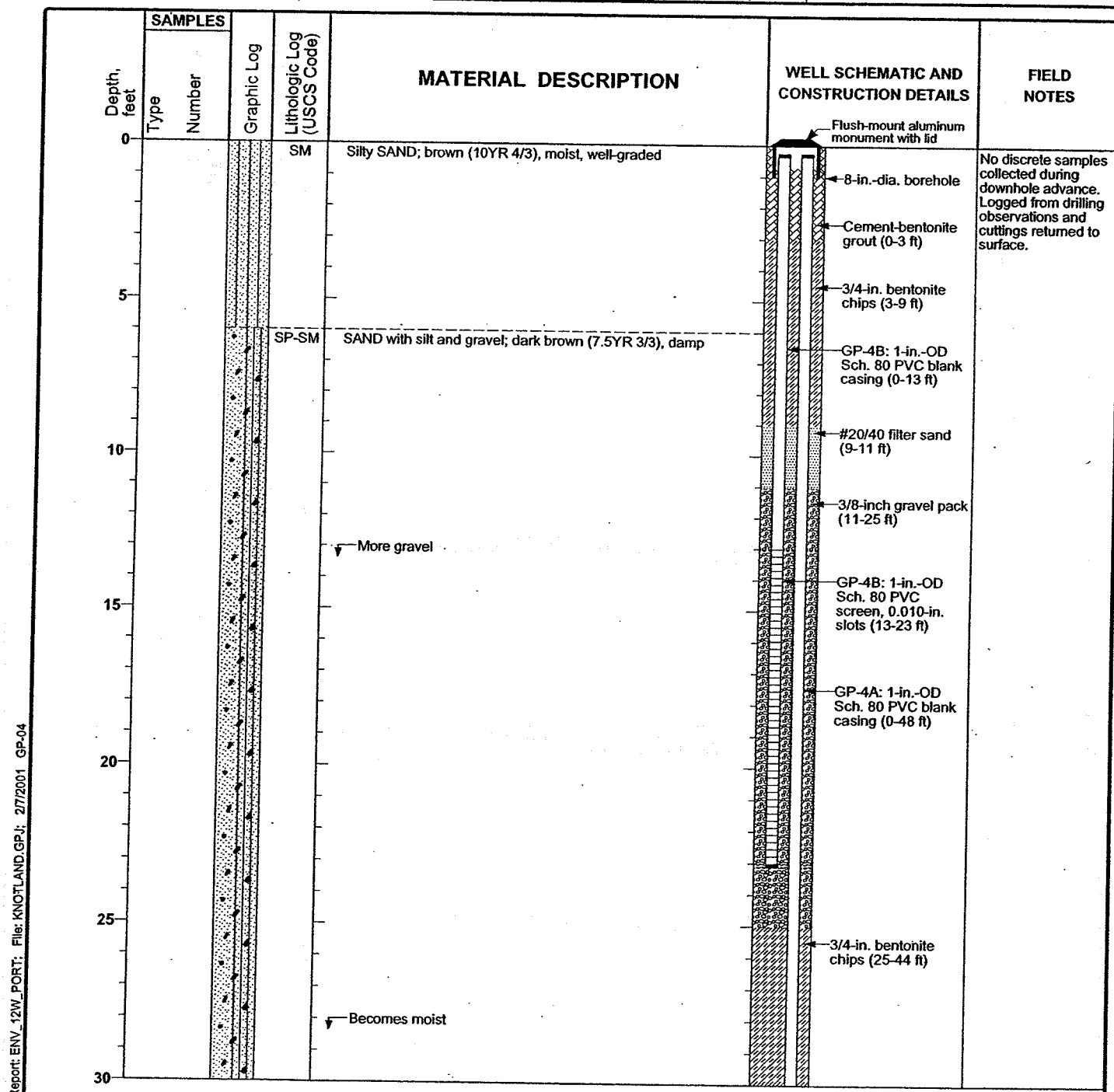
URS

Project: Knott Landfill
Project Location: Bend, Oregon
Project Number: 52-00040053.11

Log of Boring / Gas Probe GP-4

Sheet 1 of 3

Date(s) Drilled	1/12/01	Logged By	C. Moody	Reviewed By	J. Peale
Drilling Method	Air Rotary	Drilling Contractor	Geotech Drilling	Total Depth of Borehole	80.0 feet
Drill Rig Type	Not recorded	Drill Bit Size/Type	Downhole hammer with button bit	Top of Casing Elevation	Not available
Water Level and Date Measured	Not measured	Sampling Method	No samples collected	Ground Surface Elevation	Not available
Size and Type of Well Casing	1-inch-OD Schedule 80 PVC	Seal or Backfill	Cement-bentonite grout (upper) and 3/4-inch bentonite chips (lower)	Screen Perforation	0.010-inch slots



Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001 GP-04

URS

Project: Knott Landfill Project Location: Bend, Oregon Project Number: 52-00040053.11	Log of Boring / Gas Probe GP-4 Sheet 2 of 3

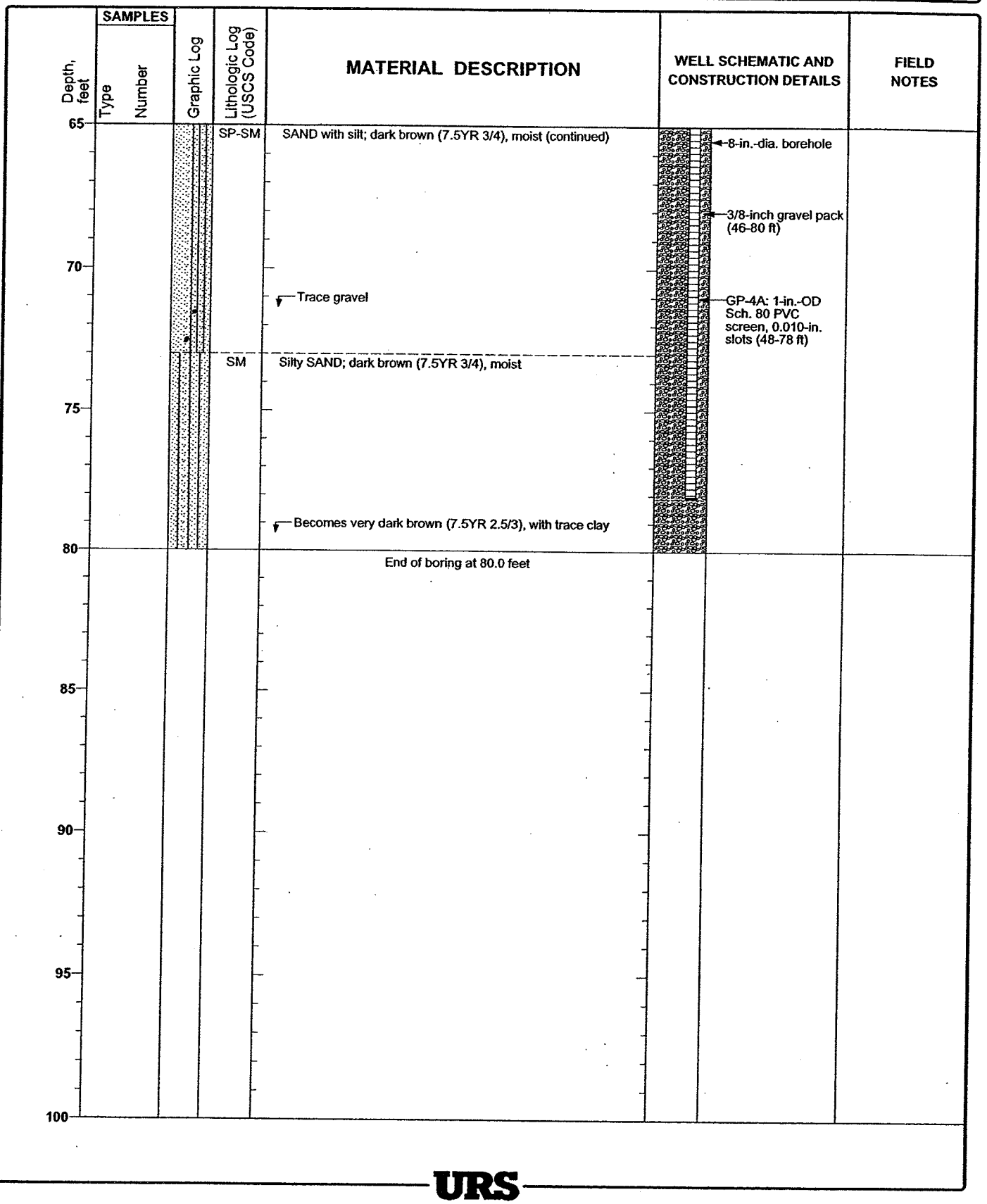
Depth, feet	SAMPLES Type	SAMPLES Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
30				SP-SM	SAND with silt and gravel; dark brown (7.5YR 3/3), moist (continued)	8-in.-dia. borehole	
				SM	Silty SAND with gravel; dark brown (7.5YR 3/3), moist, well-graded	3/4-in. bentonite chips (25-44 ft)	
35						GP-4A: 1-in.-OD Sch. 80 PVC blank casing (0-48 ft)	
40							
45						#20/40 filter sand (44-46 ft)	
						3/8-inch gravel pack (46-80 ft)	
50				SP/GP	Gravelly SAND, trace silt; black (10YR 2/1), moist, max. gravel size 1 inch	GP-4A: 1-in.-OD Sch. 80 PVC screen, 0.010-in. slots (48-78 ft)	
55				SP	SAND; very dark brown (7.5YR 2.5/2), damp, fine- to medium-grained, poorly graded		
60				SP-SM	SAND with silt; dark brown (7.5YR 3/4), moist		
65							

Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001 GP-04

URS

Project: Knott Landfill
Project Location: Bend, Oregon
Project Number: 52-00040053.11

Log of Boring / Gas Probe GP-4



Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001 GP-04

URS

Project: Knott Landfill
Project Location: Bend, Oregon
Project Number: 52-00040053.11

Log of Boring / Gas Probe GP-5

Sheet 1 of 1

Date(s) Drilled	1/8/01	Logged By	C. Moody	Reviewed By	J. Peale
Drilling Method	Air Rotary	Drilling Contractor	Geotech Drilling	Total Depth of Borehole	8.0 feet
Drill Rig Type	Not recorded	Drill Bit Size/Type	Downhole hammer with button bit	Top of Casing Elevation	Not available
Water Level and Date Measured	Not measured	Sampling Method	No samples collected	Ground Surface Elevation	Not available
Size and Type of Well Casing	1-inch-OD Schedule 80 PVC	Seal or Backfill	Bentonite-cement grout	Screen Perforation	0.010-inch slots

Depth, feet	SAMPLES Type	SAMPLES Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
0				SM	Silty SAND, trace gravel; dark reddish brown (5YR 3/2), damp, rounded basalt gravel, max size 3/8 inch	Flush-mount aluminum monument with lid; Cement-bentonite grout (0-2 ft); 1-in.-OD Sch. 80 PVC blank casing (0-3 ft)	No discrete samples collected during downhole advance. Logged from drilling observations and cuttings returned to surface.
5					Becomes dark reddish brown (2.5YR 3/4); more sand and gravel	3/8-inch gravel pack (2-8 ft); 1-in.-OD Sch. 80 PVC screen, 0.010-in. slots (3-8 ft)	
				[Rock]	BASALT, dark gray (1 Gley 4/4), fresh to slightly weathered, vesicular, phaneritic crystals of olivine		
					End of boring at 8.0 feet		
10							
15							
20							
25							
30							

URS

Report: ENV_12W_PORT; File: KNOTLAND.GPJ; 2/7/2001 GP-05

PBS Engineering + Environmental

BOREHOLE LOG

Project Number:	80429.004, P4	Date: 3/18/2013 Boring#:	GP-6 A/B
Project Name:	Knott LF	Surface Elevation: 3693	(ft/above MSL)
Project Location:	Bend	Start/End Date:	
Driller/Equipment:	WWD/T-2	Final Boring Depth: 84 FT	
Geologist/Engineer:	T. Scott	Outer Hole Diameter: 1"	
Sample Method:	Grab	Sheet: 1 of 3	

Depth (feet bgs)	Sample Data				Blows/ft.	Groundwater Level	Soil Description
	Interval	Percent Recovery	CH4 Reading (ppm)	Sample ID			
1							0-3.0 FILL-mulch, top soil, fine, angular gravel
2							
3							
4							
5							
6							
7							
8							
9							
10							
1							
2							
3							
4							
5							
6							
7							
8							
9							
20			0				20.0 SILTY SAND-with fine gravel and cinder
1							subrounded
2							
3							
4							
5							
6							
7							
8							
9							
30							

PBS Engineering + Environmental

BOREHOLE LOG

Project Number:	80429.004, P4	Date: 3/18/2013	Boring#: GP-6 A/B
Project Name:	Knott LF	Surface Elevation: 3693	(ft/above MSL)
Project Location:	Bend	Start/End Date:	
Driller/Equipment:	WWD/T-2	Final Boring Depth: 84 FT	
Geologist/Engineer:	T. Scott	Outer Hole Diameter: 1"	
Sample Method:	Grab	Sheet: 2 of 3	

Depth (feet bgs)	Sample Data: Interval	Sample Data: Percent Recovery	Sample Data: CH4 Reading (ppm)	Sample Data: Sample ID	Blows/ft.	Groundwater Level	Soil Description
31							30.0 SANDY SILT/SILTY SAND-light brown with
2							fine reddish brown cinder
3							
4							
5							
6							
7							
8							
9							
40							40.0 SILTY SAND-light brown with fine gravel,
1							subrounded cinder, pumice
2							
3							
4			0				
5							
6							
7							
8							
9							
50							50.0 SILTY SAND-light brown with fine gravel
1							subrounded cinder, pumice
2							
3							
4							
5							
6							
7							
8							
9							
60							

PBS | Engineering + Environmental

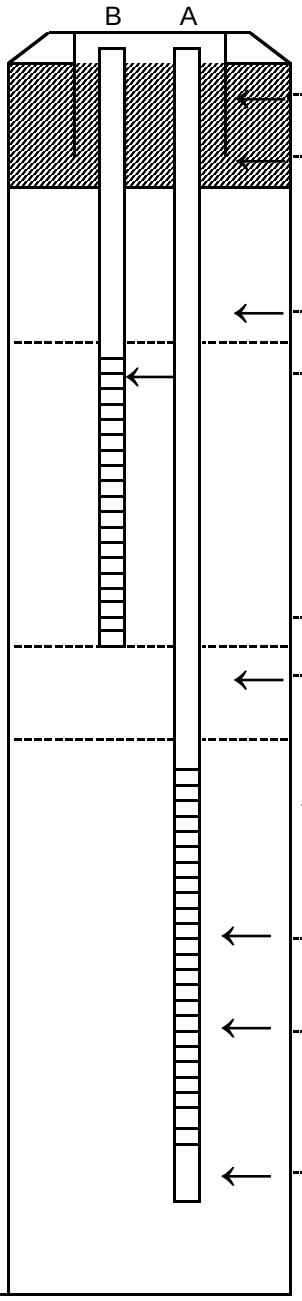
BOREHOLE LOG

Project Number:	80429.004, P4	Date: 3/18/2013	Boring#: GP-6 A/B
Project Name:	Knott LF	Surface Elevation: 3693	(ft/above MSL)
Project Location:	Bend	Start/End Date:	
Driller/Equipment:	WWD/T-2	Final Boring Depth: 84 FT	
Geologist/Engineer:	T. Scott	Outer Hole Diameter: 1"	
Sample Method:	Grab	Sheet: 3 of 3	

Depth (feet bgs)	Sample Data: Interval	Sample Data: Percent Recovery	Sample Data: CH4 Reading (ppm)	Sample Data: Sample ID	Blows/ft.	Groundwater Level	Soil Description
61							60.0 SILTY SAND-light brown with fine gravel,
2							subgrounded cinder and pumice
3							
4			0				
5							
6							
7							
8							
9							
70							70.0 SILTY SAND-light brown with increasing fine
1							gravel, subrounded to subangular pumice and cinder
2							some basalt
3							
4							
5							
6							
7							
8							
9							
80			0				80.0 SILTY SAND-light brown with fine gravel
1							increasing percentage of basalt gravel subangular
2							to subrounded
3							
4							
5							TD=84 FT
6							Construct LFG Probes
7							
8							
9							
90							

PBS	**PBS Engineering + Environmental** **GAS PROBE INSTALLATION** Form Revised: 6-22-09	**PROJECT:** DCSW KNOTT LF **PROJECT NO:** 80429.004, Phase 4 **EVENT:** Perimeter Gas Probes **DATE:** 3/18/2013

Drilled By: Western Water Development **Monitoring Probe ID:** GP-6 A/B



0.0 ft. Top of concrete base
8" flush steel Type of monument
concrete Type of surface seal
Base of surface seal 2.0 ft.
bentonite chips
Top of sand 10.0 ft.
Top of screen 13.0 ft.
Screen:
Diameter: 1" Type: PVC
Schedule: 80 Slot: 0.02
Bottom of screen 38.0 ft.
Bottom of end cap 38.5 ft.
Bottom of Sand / Top of Plug 39.0 ft.
Top of sand 48.0 ft.
Top of screen 51.0 ft.
Type of sand: pea gravel
Type of plug: bentonite chips
Diameter of borehole: 10" O.D.
Type of drill rig: IR T-2
Type of Filter Material: pea gravel
Screen:
Diameter: 1" Type: PVC
Schedule: 80 Slot: 0.02
Bottom of screen 81.0 ft.
Bottom of end cap 81.5 ft.
Bottom of sand 82.0 ft.
Type of end cap: threaded
Bottom of exploration 84.0 ft.

Comment:

Sand: pea gravel 25 cu. ft. Bentonite: 3/8 chips 400 lbs.

Cement: 100 lbs. Other:

Notes:

1.5"=	0.09	5.5"=	1.23	8"=	2.61
2"=	0.16	6"=	1.47	8.5"=	2.95
3"=	0.37	6.5"=	1.75	9"=	3.30
4"=	0.65	7"=	2.00	9.5"=	3.68
5"=	1.02	7.5"=	2.29	10"=	4.08

PBS Engineering + Environmental

BOREHOLE LOG

Project Number:	80429.004, P4	Date: 3/4/2013	Boring#: GP-7 A/B
Project Name:	Knott LF	Surface Elevation: 3692	(ft/above MSL)
Project Location:	Bend	Start/End Date: 3/4 - 3/5/13	
Driller/Equipment:	WWD/T-2	Final Boring Depth: 75 FT	
Geologist/Engineer:	T. Scott	Outer Hole Diameter: 10"	
Sample Method:	Grab	Sheet: 1 of 3	

Depth (feet bgs)	Sample Data: Interval	Sample Data: Percent Recovery	Sample Data: CH4 Reading (ppm)	Sample Data: Sample ID	Blows/ft.	Groundwater Level	Soil Description
1							0-3.0 FILL-mulch, top soil, fine, angular gravel
2							
3							3.0-11.0 SILTY SAND-light brown with occasional
4							gravel
5							
6							
7							
8							
9							
10							
1							11.0-28.0 BASALT-Dark Grey fine and wet
2							
3							
4							
5							
6							
7							
8							
9							
20			0				
1							
2							
3							
4							
5							
6							
7							
8							28.0-55.0 SANDY GRAVEL-fine angular gravel
9							with subrounded cinder black and red
30							

PBS Engineering + Environmental

BOREHOLE LOG

Project Number:	80429.004, P4	Date: 3/4/2013	Boring#: GP-7 A/B
Project Name:	Knott LF	Surface Elevation: 3692	(ft/above MSL)
Project Location:	Bend	Start/End Date: 3/4 - 3/5/13	
Driller/Equipment:	WWD/T-2	Final Boring Depth: 75 FT	
Geologist/Engineer:	T. Scott	Outer Hole Diameter: 10"	
Sample Method:	Core	Sheet: 2 of 3	

Depth (feet bgs)	Sample Data: Interval	Sample Data: Percent Recovery	Sample Data: CH4 Reading (ppm)	Sample Data: Sample ID	Blows/ft.	Groundwater Level	Soil Description
31							31.0 SANDY GRAVEL-fine angular gravel, fine to
2							medium sand, subrounded cinder, pumice, basalt
3							with fine to course sand
4							
5							
6							
7							
8							
9							
40							
1							
2							
3			0				
4							
5							
6							
7							
8							
9							
50							
1							
2							
3							
4							
5							55.0-73.0 GRAVELLY SAND-light brown with fine to
6							coarse gravel, pumice, cinder, basalt
7							
8							
9							
60							

PBS | Engineering + Environmental

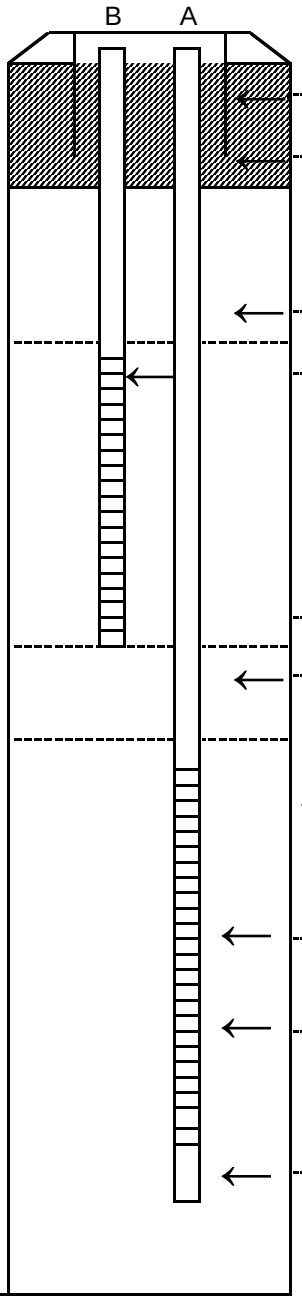
BOREHOLE LOG

Project Number:	80429.004, P4	Date: 3/4/2013	Boring#: GP-7 A/B
Project Name:	Knott LF	Surface Elevation: 3692	(ft/above MSL)
Project Location:	Bend	Start/End Date: 3/4 - 3/5/13	
Driller/Equipment:	WWD/T-2	Final Boring Depth: 75 FT	
Geologist/Engineer:	T. Scott	Outer Hole Diameter: 10"	
Sample Method:	Core	Sheet: 3 of 3	

Depth (feet bgs)	Sample Data: Interval	Sample Data: Percent Recovery	Sample Data: CH4 Reading (ppm)	Sample Data: Sample ID	Blows/ft.	Groundwater Level	Soil Description
61							61.0 GRAVELLY SAND con't.
2							
3			0				
4							
5							
6							
7							
8							
9							
70							
1							
2							
3			0				73.0 BASALT-Dark Grey, solid
4							
5							
6							TD=75 FT
7							Construct LFG Probes
8							
9							
80							
1							
2							
3							
4							
5							
6							
7							
8							
9							
90							

PBS	**PBS Engineering + Environmental** **GAS PROBE INSTALLATION** Form Revised: 6-22-09	**PROJECT:** DCSW KNOT **PROJECT NO:** 80429.004, Phase 4 **EVENT:** Perimeter Bas Probes **DATE:** 3/4/2013

Drilled By: Western Water Development **Monitoring Probe ID:** GP-7 A/B



		0.0 ft.	Top of concrete base
		8" flush steel	Type of monument
		concrete	Type of surface seal
Base of surface seal	2.0 ft.		
		bentonite chips	
Top of sand	8.0 ft.		
Top of screen	10.0 ft.	Screen:	
		Diameter: 1"	Type: PVC
		Schedule: 80	Slot: 0.02
Bottom of screen	35.0 ft.	Type of sand:	pea gravel
Bottom of end cap	35.5 ft.		
Bottom of Sand / Top of Plug	37.0 ft.	Type of plug:	bentonite chips
Top of sand	47.0 ft.		
Top of screen	49.0 ft.		
		Diameter of borehole:	10" O.D.
		Type of drill rig:	IR T-2
		Type of Filter Material:	pea gravel
		Screen:	
		Diameter: 1"	Type: PVC
		Schedule: 80	Slot: 0.02
Bottom of screen	74.0 ft.		
Bottom of end cap	74.5 ft.	Type of end cap:	threaded
Bottom of sand	75.0 ft.		
Bottom of exploration	75.0 ft.		

Comment:

Sand: pea gravel 30 cu. ft. Bentonite: 3/8 chips 400 lbs.

Cement: 100 lbs. Other:

Notes:

1.5"=	0.09	5.5"=	1.23	8"=	2.61
2"=	0.16	6"=	1.47	8.5"=	2.95
3"=	0.37	6.5"=	1.75	9"=	3.30
4"=	0.65	7"=	2.00	9.5"=	3.68
5"=	1.02	7.5"=	2.29	10"=	4.08

APPENDIX B

Monitoring Forms and Checklist

Groundwater Level Form
Knott Landfill - Deschutes County, Oregon

Job No.: _____

Date: _____

Personnel: _____

Well Identification	Wellhead Elevation[1](ft)	Measured Depth to Water[2] (ft)	Groundwater Elevation[3] (ft)
MW-1	3705.65		
MW-2	3730.66		
MW-3	3700.29		
MW-4R	3706.51		
MW-5	3695.54		
MW-6	3701.58		
MW-7	3705.54		

Notes:

[1]Referenced from top of the PVC casing from JTA Surveying (2010).

[2]Measured depth to groundwater using electric water level meter prior to sample purging.

[3]Groundwater Elevation= wellhead elevation - depth to water.

ft - feet above mean sea level.

PBS

PBS Engineering & Environmental

GROUNDWATER SAMPLING FIELD FORM

Revised: 7/27/16

PROJECT: Knott Landfill
Dechutes County, Oregon
PROJECT NO:
Date:

Field Personnel: **Weather Conditions:**

INITIAL WELL DATA & WELL PURGING INFORMATION

Monitoring Well ID: **Well Dia.** inches **Start Time:**

Well Condition/Additional Notes:

Total Depth _____ ft. Below **Initial Purge Vol.** _____ **ml** **Purge Method** Bladder Pump
Water Depth _____ ft. Below **Sample Method** Bladder Pump
Feet of Water _____ feet **Water Disposal** Ground
Stick-up Height:

Field Param. Meters: **Calibration**

Time (0.00 - 24:00)	Water Temperature (+/-0.50C)	Specific Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Water pH	ORP (mV)	Turbidity (NTUs)	Water Level (feet TOC)	Volume Purged (units ml)

Initial DTW = Time: Final DTW = Time: **Total Purged =**

Purge Pumping Rate (specify gpm or lpm): _____
Gal/Ft Factor (2in=0.165, 4in=0.65)

WELL SAMPLING DETAILS

Sample ID: KT **Time Sampled:**

Parameter Group	Parameters	Preser-vative	No. of Bottles	Bottle size	Filtered Yes/No	Destination Laboratory	Collection Compl. 'x'	
1b-Lechate Indicators	TDS	None	1	250-Poly	N			
	COD	H2SO4		250-Poly	N			
	TOC	H2SO4	1	250-Amber	N			
2a-Anions&Cations	HCO3	None	1	250-Poly	**Y**			
	Chloride,Sulfate	None	1	125-Poly	**Y**			
	Ca,Fe,Mg, Mn (see 2b)							
	Silica	None		125-Poly	**Y**			
	Ammonia	H2SO4		250-Poly	**Y**			
2b-Trace Metals (Total)	As,Ba,Cr,Co,Cu,Cd,Pb,Se Ni,Ag,V,Zn,Sb,Be,Tl, hardness	HNO3	2	250-Poly	N			
2b-Trace Metals* (Dissolved) &	As,Ba,Cr,Co,Cu,Cd,Pb,Se,Ni,Ag,V	HNO3	1	250-Poly	**Y**			
2a-cations/anions	Zn,Sb,Be,Tl, Ca,Fe,Mg,Mn,Na,K							
3-VOC	8260	HCl	3	40-Glass	N			

QA/QC Sample (circle one): None Duplicate Other (Specify)

Method of Transportation of samples:
All samples were immediately placed into a cooler and packed with ice or "Blue Ice" YES / NO

Field Observations/Notes of Sampling Event:

***Notes for COC - Include TICs on VOC Analysis, Dissolved Metals if TSS > 100 mg/l**

*****Trip Blank for VOCs -**

Signature of Field Personnel:

Initial Purge Volumes (ml):
MW-1: 7,203 MW-2: 7,263 MW-3: 7,136 MW-4R:7,247 MW-5: 7,065 MW-6: 7,112 MW-7: 7,302

Approximate Well Depths (ft):
MW-1: 725 MW-2: 731.25 MW-3: 718 MW-4R: 729.7 MW-5: 710 MW-6: 715.5 MW-7: 732.2

PBS

PBS Engineering & Environmental

LEACHATE SAMPLING FIELD FORM

Revised: 7/27/16

PROJECT: Knott Landfill
Dechutes County, Oregon
PROJECT NO:

Date:

Field Personnel: **Weather Conditions:**

Sample Observations/Liquid level Measurement

Sample Location: **Landfill Cell Sump:** **Sample Matrix:** **Start Time:**

Additional Notes:

Color: **Odor:** **Sheen:**

Solids: **Additional Comments:**

Liquid Primary Sump Thickness (in): **Secondary SumpThickness (in):**

Field Param. Meters: **Calibration**

Time (0.00 - 24:00)	Leachate Temperature (+/-0.50C)	Specific Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Leachate pH	ORP (mV)	Turbidity (NTUs)	Other Field Measurements

LEACHATE SAMPLING DETAILS

Sample ID: KT **Time Sampled:**

Parameter Group	Parameters	Preservative	No. of Bottles	Bottle size	Filtered Yes/No	Destination Laboratory	Collection Compl. 'x'	
1b-Lechate Indicators	TSS,TDS	None	2	250-Poly	N			
	COD	H2SO4	1	250-Poly	N			
	TOC	H2SO4	1	250-Amber	N			
2a-Anions&Cations	HCO3/Clhoride, Sulfate	None	1	250-Poly	**Y**			
2b-Trace Metals (Total)	Trace metals	HNO3	2	250-Poly	N			
		HNO3	1	250--poly	**Y**			
3-VOC	VOCs	HCl	3	40-Glass	N			
4-Assessment Monitoring	SVOC	None		1000-Glass	N			
	Cyanide	NaOH		250-Poly	N			
	Mercury **(See Grp. 2b)**				N			
	Nitrate/nitrate/T. Phos	None		250-Poly	N			
	TKN	H2SO4		250-Poly	N			
5-Surface Water & Leachate	Orthophosphate	None		500-Poly	N			
	Biological Oxygen Demand	None		1000-Poly	N			
	Total Coliform Bacteria, Fecal Coliform Bacteria, E. Coli	None		150-PS	N			

QA/QC Sample (circle one): None Duplicate Other (Specify)

Method of Transportation of samples:

All samples were immediately placed into a cooler and packed with ice or "Blue Ice" YES / NO

Field Observations/Notes of Sampling Event:

****Notes for COC - Include TICs on VOC & SVOC Analysis**

Signature of Field Personnel:

BSK ASSOCIATES
2517 E. Evergreen Blvd.
Vancouver, WA 98661
P 360.750.0055
F 360.750.0057
www.bskassociates.com

Page ____ of ____

Turnaround Time Request
☐ Standard - 10 business days
☐ Rush (Surcharge may apply)
Date needed:

ANALYTICAL CHAIN OF CUSTODY

*Required Fields Temp:

Company/Client Name*:	Report Attention*:	Invoice To*:	Phone*:	Fax*:
	Additional cc's:	PO#:	E-mail*:	
Address*:	City*:	State*:	Zip*:	
Project:	Project #:	Reporting Options: ☐ E-Mail ☐ Fax ☐ Mail ☐ Trace (J-Flag) ☐ Swamp ☐ EDD Type:		
Sampler Name (Printed/Signature)*:				

Compliance?: ☐ Yes ☐ No State: ☐ WA ☐ OR System/PWS ID: _____ DOH Source/Source ID: _____

Water System Name: _____ County: _____

Sample Composition: ☐ Single Source ☐ **Blended ☐ **Composite ☐ Distribution Sample

**List sources in Source ID field

Sample Taken: ☐ Before Treatment ☐ After Treatment ☐ No Treatment Group (WA only): ☐ A ☐ B

Matrix Types: SW=Surface Water BW=Bottled Water GW=Ground Water WW=Waste Water STW=Storm Water DW=Drinking Water SO=Solid

#	Sample Description/Location*	Sampled* Date	Sampled* Time	Matrix*	Comments	# of cont.

Receipt Conditions in Vancouver: Temp: Received Via: UPS WALK-IN FED EX Courier: _____

Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received for Lab by: (Signature and Printed Name)	

Payment Received at Delivery: Check / Cash Date: Amount: PIA#: Init.

Shipping Method: ONTRAC UPS GSO WALK-IN FED EX Alaskan Airlines Courier: _____ Custody Seal: Y / N

Cooling Method: Wet Blue None Chilling Process Begun: Y / N

TestAmerica Seattle
5755 8th Street East

Tacoma, WA 98424-1317
phone 253.922.2310 fax 253.922.5047

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc.

Client Contact	**Project Manager: Sarah Murphy**	**Site Contact:**	**Date:**	COC No:
Your Company Name here	**Tel/Fax: 503.906.9233**	**Lab Contact:**	**Carrier:**	_____ of _____ COCs
Address	**Analysis Turnaround Time**			Sampler:
City/State/Zip	☐ CALENDAR DAYS ☐ WORKING DAYS			**For Lab Use Only:**
( ) Phone	TAT if different from Below _____			Walk-in Client:
( ) FAX	☐ 2 weeks			Lab Sampling:
Project Name:	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)															Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

QUARTERLY LFG PROBE / SITE INSPECTION FIELD FORM
KNOTT LANDFILL – BEND, DESCHUTES COUNTY, OREGON

Meter: Landtec GEM 5000		**Weather:**	
Sample Date:		**BP Start:**	**BP Finish:**
Technician:		**Start Time:**	
Calibration Date:		**Finish Time:**	
Calibrated By:			

Station	% LEL CH^4	% CH^4 By Vol.	% CO^2 By Vol.	% O^2 By Vol.	%Balance	Comments
GP-1A (deep)						
GP-1B (shallow)						
GP-2A						
GP-2B						
GP-3A						
GP-3B						
GP-4A						
GP-4B						
GP-6A						
GP-6B						
GP-7A						
GP-7B						

Perimeter Control (fencing, locks, signage, etc.)
Landfill Cover (settlement, erosion, surface cracks, etc.)
Surface Drainage (blockage, ponding, etc.)
Vegetative Cover (plant health, noxious weeds, etc.)

STRUCTURE LFG MONITORING FIELD FORM

KNOTT LANDFILL – BEND, DESCHUTES COUNTY, OREGON

Meter: Landtec GEM 5000		**Weather:**	
Sample Date:		**BP Start:**	**BP Finish:**
Technician:		**Start Time:**	
Calibration Date:		**Finish Time:**	
Calibrated By:			

Structure	% LEL CH^4	% CH^4 By Vol.	% CO^2 By Vol.	% O^2 By Vol.	%Balance	Comments
Marcott residence						
DCSO animal rescue facility						
Pump Station						
Equipment Bldg						
Recycle Center Shop						
Yard Debris Scalehouse						
MRF / Transfer Station						
Comments:						

APPENDIX C

Standard Operating Procedures

The following SOP describes the field documentation procedures that will be implemented for groundwater sampling events at Knott Landfill.

Field Logbooks
Permanently bound field logbooks with waterproof paper will be used as the field logbooks for this project because of their compact size, durability, and secure page binding. The pages of the logbook should be numbered consecutively and should not be removed for any reason. Entries will be made in black or blue waterproof indelible ink.

Logbooks will document the procedures performed by field personnel. Each entry will be dated, will be legible, and will contain accurate and complete documentation of the individual's activities. Documentation in the field logbook will be in sufficient detail to explain and reconstruct field activities without relying on recollection by the field team members. Because the logbook is a complete documentation of field procedures, it should contain only facts and observations. Language will be objective, clear, concise, and free of personal interpretation or terminology.

No erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark and the change initialed and dated by the team member making the change.

Field logbooks will be identified by the project name and a project-specific number (e.g., Knott Landfill, Project Number), and stored in the field project files when not in use. After field activities are complete, logbooks will be stored in the permanent project file.

Photographs
Representative photographs will be taken during the field investigation to help identify and locate monitoring wells and to document field activities or field observations.

Sample Numbering System
Groundwater samples collected at Southwest Landfill will be identified by the following numbering scheme:

- "SW" to designate the Southwest Landfill facility
- Month, Day and Year (MMDDYY) of sampling
- Three identifiers will designate the monitoring well location (e.g., "MW01" for monitoring well MW-1, "MW04R" for monitoring well MW-4R, etc).
- The quality assurance and quality control (QA/QC) samples collected during routine monitoring will be labeled with a similar numbering scheme (e.g. "MW10") and recorded in the logbook as to the type QA/QC sample collected and methodology used in its collection.

Sample Labels
Sample containers will be labeled before a sample is collected using a permanent waterproof marker. The following information will be recorded on each sample label:

- Site name
- Sampling data
- Sampling time
- Sample identification number
- Preservation used, if applicable
- Initials of sampling personnel
- Requested analysis

Chain-of-Custody Records
The primary purpose of a chain of custody (COC) form (see Appendix B) is to document sample custody and to request appropriate analysis from the laboratory. A separate COC form will accompany each shipping cooler, and will contain sample information for only the samples in the cooler. Each COC form will contain the following information:

- Sample identification number
- Date and time of sampling
- Sample matrix
- Number of sample containers and or volume of sample
- Requested chemical analysis
- Names and signatures of sampling personnel
- Project number
- Any additional notes regarding sample collection or preservation (e.g., field-filtered)

Each shipping cooler will be sealed with custody seals showing the sampler's signature and date. Custody seals will be attached to the left front and right rear side of the cooler so that they will break if the cooler is opened.

The following SOP describes the sample packaging and shipping procedures that will be implemented for groundwater sampling events at Knott Landfill.

Packaging

The procedure and material used for sample packaging must adequately protect the sample containers from accidental breakage during shipment. Glass containers will be placed in plastic bags and will be wrapped and cushioned inn inert packing material, such as foam or bubble wrap. Plastic samples do not require individual cushioning, but they should be packed well to minimize movement during transport. Caps will be screwed on tightly, and containers will be placed in individual, resealable bags, which will then be sealed. Ice or ice-substitute will be placed in the container so as to promote adequate and equal cooling for all samples.

If ice is used as the cooling medium, it will be packaged in the following manner. Approximately on-half bag of cubed ice will be transferred into a 1-gallon resealable plastic bag.

Shipping

Sample containers will be placed inside a strong shipping container, such as a metal or plastic picnic cooler with a hard plastic liner. The shipping container should be sufficient quality to minimize the potential for leaks or spills of ice water or broken sample containers. The drain plug at the bottom of the cooler will be taped shut so that the contents from any broken containers of prepackaged ice, ice substitute, or sample will not escape. The completed COC form (minus the sampler's copy) will be placed inside a resealable plastic bag and secured with duct tape to the inside lid of the cooler. The shipping container lid will be adequately secured with tape to prevent opening during shipping. A custody seal showing the sampler's signature and date will be attached to the cooler so the seal will be broken if the cooler is opened. The shipping container will be adequately cleaned between shipments to prevent cross-contamination of samples.

In general, samples will be shipped from the project site to the project analytical laboratory by sampling personnel or couriered by the analytical laboratory staff. In the likely event that the samples need to be shipped by overnight courier, field personnel will transport sample shipments from the field to the appropriate courier office. COC forms do not require the signature of the shipping agent.

When possible, samples will be shipped the same day as collection. Because of the project's location and time constraints for overnight shipping, some shipments may not be sent until the following day. Samples will be shipped on Fridays only if required by field circumstances and if sampling personnel have received approval for Saturday delivery from the laboratory.

APPENDIX D

Laboratory Quality Assurance

BSK Associates
Engineers & Laboratories

Statement of Qualifications

Analytical Laboratory Testing Services

Environmental | Geotechnical | Construction Services | Analytical Testing
An Employee Owned Company | www.bskassociates.com | 1.800.669.3201

Organic & Inorganic Analyses

Drinking Water Wastewater

Groundwater Soil Hazardous Waste

Introduction

About Us

BSK Associates' Analytical Laboratory Services (BSK Labs) was established in 1967 as a support service for our geotechnical and engineering division. Over the last half century BSK Labs has grown to become one of the top analytical testing firms in the country. With four laboratory locations and multiple service centers along the West Coast, BSK Labs is a full-service, environmental laboratory network. We offer a broad spectrum of organic and inorganic analyses for groundwater, wastewater, drinking water, soil, and hazardous waste. BSK supports a vast array of clients that include consulting engineers, large and small municipalities, private water systems, wastewater treatment facilities, industrial dischargers, biomass energy providers, and private homeowners.

Our Approach to Service & Success

BSK Labs' customers vary considerably in size and complexity. In all cases, BSK takes great care in providing the same personal attention to all of these clients, regardless of their size or the sophistication of their projects. To that end, BSK dedicates a project manager matched by skill set to the unique needs of our clients. In training our project managers, we emphasize service in terms of the understanding our clients' businesses as much as our own. BSK's staff looks beyond the simple task of providing a laboratory test and, instead, seeks to understand the reasons and driving force behind the request. In achieving this level of understanding, we are better positioned to identify what our clients truly value and those things which we can do as a laboratory to ultimately fulfill their needs.

BSK Labs employs technical professionals with degrees in chemistry, biology and microbiology. Our staff understands and appreciates the significance of the results they produce, recognizing their importance to the environment in which we live. We take a consultative approach to service, striving to be experts in our field so that we may better assist our clients in satisfying their testing requirements.

Finally, with our evolving web and electronic data, BSK simplifies our clients' needs throughout the analytical process – from bottle order, to sample submission, to reporting, and data management. BSK Labs provides great service, simplified, so that every step of your project is successful.

BSK Great Service, Simplified.

Laboratory Certifications

BSK's laboratories maintain a number of accreditations through numerous state agencies. The Fresno laboratory is accredited nationally under the 2009 NELAC/TNI Standard through the Oregon Environmental Laboratory Accreditation Program (ORELAP). In addition, Fresno is certified in the States of California, Hawaii, Nevada, Oregon and Washington. The Sacramento laboratory is certified under the California Environmental Laboratory Accreditation Program (ELAP). Our Vancouver laboratory is also accredited by ORELAP for work performed in Oregon and maintains reciprocal accreditation in Washington through this national accreditation standard. Lastly, BSK is one of the few laboratories in the country to have been certified by the EPA for all test methods for all three rounds of the Unregulated Contaminant Monitoring Rule (UCMR).

NELAC was established in 1995, with the mission to develop laboratory accreditation standards and implement a certification program - the National Environmental Accreditation Program (NELAP).

Fresno Analytical Lab

- Foreign Soil Permit
- State of California
- State of Hawaii
- State of Nevada
- State of Oregon-NELAC
- State of Washington
- Unregulated Contaminant Monitoring Rule 3 (UCMR3)

Sacramento Microbiology Lab

- State of California

Southern California Microbiology Lab

- State of California

Vancouver Analytical Lab

- State of Oregon-NELAC
- State of Washington

Laboratory Facilities

BSK Associates operates three laboratories and three sample receiving facilities in California and one laboratory and two sample receiving facilities in the Pacific Northwest, one in Oregon and one in Washington.

Fresno Analytical Laboratory

Our Fresno-based laboratory spans four buildings and 16,000 square feet in the downtown area, where it is easily accessible to the local major highways (CA Highways 99, 41 and 180). As our primary laboratory, BSK's Fresno facility offers hundreds of analytical methods using state of the art equipment, operated by our experienced and highly trained scientific staff. Working in close coordination with our additional locations, the Fresno facility serves all of BSK's clients up and down the West Coast.

Sacramento Microbiology Laboratory

Our Sacramento-based laboratory occupies approximately 1,500 square feet in Rancho Cordova, CA. This location provides convenient access to Highways 5, 99, 50 and 80. At the lab, our staff performs microbiological analyses on a variety of matrices from clients in the Northern California region. This laboratory also serves as a drop-off location for our Sacramento-region clients and as base for our Northern Valley samplers and couriers.

Southern California Microbiology Laboratory

Our Southern California laboratory occupies approximately 2,100 square feet in San Bernardino, CA. This location provides convenient access to Highways 10 and 215, located less than mile from their junction. At the lab, our will staff perform microbiological analyses on a variety of matrices from clients in the region. This location will serve as a drop-off location for our clients and as base for our Southern California operations.

Vancouver Analytical Laboratory

Our Vancouver-based laboratory occupies approximately 2,500 square feet in Vancouver, WA. This location provides convenient access to Highways 5 and 205 and the Portland International Airport. At the lab, our staff performs quick turnaround chemical and microbiological analyses on a variety of matrices from the Pacific Northwest (PNW) region. Like the Sacramento and Southern California locations, the Vancouver laboratory works in close coordination with the Fresno laboratory to provide a comprehensive set of testing services for all the markets we serve. This laboratory also serves as a drop-off location for our Portland and Southwestern Washington clients and as a base for our regional samplers and couriers.

Corporate Headquarters
550 W. Locust Avenue
Fresno, CA 93650
Local: (559) 497-2880
Toll-Free: (800) 669-3201

Additional Locations

Along with the fixed laboratory facilities, BSK can receive samples at two additional locations. Our Livermore, CA office serves as the receiving center for our San Francisco Bay area customers. Samples dropped off at this location will be packaged and shipped via overnight delivery to the Fresno laboratory for analysis.

Additionally, BSK operates a self-service, drop off kiosk in Visalia, CA that is co-located with one of BSK's long term business partners, Barnes Welding Supply / Fresno Oxygen. At this location, our customers have access to chains of custodies, shipping containers and an ice machine, allowing them to pack their samples and leave onsite for delivery to the Fresno laboratory. BSK's regional courier stops by the center on a daily basis to pick up samples and route them to the lab for analysis.

Laboratory Addresses

Fresno Analytical Lab
1414 Stanislaus Street
Fresno, California 93706
Local: (559) 497-2888

Sacramento Microbiology Lab
3140 Gold Camp Drive #160
Rancho Cordova, CA 95670
Local: (916) 853-9293

Southern California Microbiology Lab
Address
Address

Vancouver Analytical Laboratory
2517 East Evergreen Blvd.
Vancouver, WA 98661
Local: (360) 750-0055

Drop-Off Locations

Livermore, California
324 Earhart Way
Livermore, CA 94551
Local: (925) 315-3151

Visalia California
Barns Welding Supply
2239 E. Main Street
Visalia, CA 93292

Laboratory Facilities

Our Delivery

BSK recognizes that time is the one resource that cannot be replaced, purchased or recaptured if lost. We understand that one of the hallmarks of a great laboratory is the ability to deliver on time, every time. To that end, BSK uses on time delivery as one of our primary business metrics in gauging our performance. It is a topic discussed at all management meetings, it is a question asked on our annual client survey and it is a metric displayed for all staff to see throughout the laboratory facilities.

BSK Labs sets internal milestones for all turnaround schedules and each department has an on time delivery goal for the year. Our project management group is included in our metrics and we have set standards for on time delivery of reports to our clients. At BSK, we strive to provide our clients the right data, on time, every time.

Our Ethical Standards

For all the importance placed on delivering our results on time to our clients, BSK's staff understands that this goal does not come at the cost of quality in a laboratory setting. As a laboratory, the work we perform goes to assuring the preservation of our environment and the protection of human health. Where this is concerned, there is no substitute for quality and ethical decision making. BSK's staff is trained on how to make the correct choices where data quality is concerned. These choices are discussed in our annual ethics training and all staff attests to following these guidelines when they sign our Ethics and Data Integrity Agreement. In this agreement, BSK's staff asserts our commitment to ethical laboratory practices and agrees to be intolerant of anyone who chooses otherwise. Ethical behavior, above all, is our greatest value and the basis for all the work that we perform.

The BSK Values

Service
Professionalism
Employee Development
Personal Accountability
Teamwork
Safety

Qualifications

Quality Assurance

BSK's Quality Assurance Program (QAP), our "guiding light" for decision making, is a comprehensive ISO-based (ISO 17025) quality assurance plan built on documented standard operating procedures and technical competence. BSK's QAP addresses all aspects of our laboratory operations – everything from sample handling, to chemical analysis, to data review and report generation.

Our QAP provides the basis for all decision points, ensuring that we provide legally defensible data that are of known and documented quality. All our data undergoes three levels of review and periodic internal audits so that our clients can rest assured that BSK's data will withstand the highest level of scrutiny in even the most litigious situations.

Professional Expertise

BSK Labs employs more than 75 chemists, microbiologists, technicians, and support staff, most of which hold degrees in chemistry, biology or microbiology. Our management team is comprised of a group of individuals having well over 150 years combined experience. This team includes staff members having been with the company for as many as 30 years, with others coming from different laboratories within the industry and bringing a set of collective experience that many of our clients find invaluable.

For our clients, BSK offers an internal network of experts, each tasked with knowledge in certain aspects of our industry. We have identified expertise in the area of waste characterization and disposal, wastewater permits and regulations, drinking water compliance, storm water runoff, biomass fuel testing and many other industry topics. As our clients present us with their challenges, we can work through this network to provide them the information needed to ensure successful projects that satisfy the regulatory drivers necessitating our analytical services.

Our Resources

Client Support

BSK Labs offers extensive resources to help our clients with their more challenging analytical problems.

First, BSK employs a full time project consultant that can assist our clients with complex project plans and requirements. Our project consultant has over 30 years' experience in the industry and often provides our clients cost effective alternatives for their projects that can save thousands of dollars in analytical costs and project overruns.

Second, BSK Labs maintains a Technical Services Department that can help address unique problems or provide forensic support for investigations that may go outside the normal course of environmental testing. Our Technical Services Manager has consulted with clients on everything from identifying manufacturing contaminants in final products to identifying the cause of corrosion in a cooling system for a local firm.

Analytical Equipment

BSK recognizes two universal truths about the environmental laboratory industry. Regulations will constantly push our clients for lower reporting limits and we will need to provide results on increasingly shorter time lines in order to meet our clients' needs. With that, BSK continues to add to and upgrade our equipment inventory on a regular basis. We do so to ensure that we have adequate capacity, redundancy and sensitivity to deliver data on time, at the reporting limits needed, regardless of our workload. With this, BSK Labs maintains an extensive list of equipment to meet our analytical needs. We have invested over $1.5M in new equipment over the last 5 years and expect to continue this level of investment.

As we have found and our clients have experienced, regular investment in new technologies results in better on time delivery of results with improved quality control and greater operational efficiency.

Our equipment list includes but is not limited to:

(3) Agilent 5975 Quadrapole MS (VOA)
(2) Agilent 5971/5975 Quadrapole MS (SVOA)
(3) Varian Saturn Ion Trap MS (SVOA)
(1) AB Sciex 4000 QTrap LC-MS/MS
(1) Varian 1200 UHPLC-MS/MS
(9) GCs- FID, ECD
(3) HPLCs – UVD, FLD, PDA
(2) PE ELAN 6000 ICP-MS
(1) PE ELAN 9000 ICP-MS (DRC)
(2) PE ICP
(7) Dionex Ion Chromatographs
(1) Westco SmartChem Discrete Analyzer
(2) Thomas Cain DEENA Autodigesters

Information Technology

LIMS

One of the main differentiators for laboratories today is their ability to provide electronic data solutions for their clients. Beginning with the implementation of our first Laboratory Information Management System (LIMS) in 1996, BSK has continued to invest heavily in information technology in order to provide these Information Services to an ever evolving market. In February 2010, BSK made the transition to our next generation LIMS, an event that continues our evolution as a laboratory.

With this new system, BSK recognized three significant advances in our ability to provide data solutions for our clients. First, BSK introduced ClientConnect, our web portal for analytical results, electronic reports (Adobe PDF) and Electronic Data Deliverables (EDDs). Through this portal, our clients can monitor the status of their projects as samples move through the laboratory process. Statuses are updated real-time and, once the data has undergone the tertiary or "rightness" review by the project manager, the results can be view directly on screen. Finally, once the report has been spooled through our automated delivery system, the report and any associated EDDs are available for download within a short time.

With the implementation of the LIMS, BSK greatly expanded our EDD offering. As of today, we have over 95 common EDD formats in our library and maintain the ability to provide custom EDD formats for those clients with proprietary or "home grown" data formats and custom valid value lists (VVLs). Some of the more common ones that we produce on a daily basis include: CA WriteOn, CA GeoTracker (EDF 1.2i), ERPIMS, EQUiS™, WaterTrax™, GIS/Key™, LOCUS EIM™, EXCEL, SWAMP, and CIWQS.

With the added sophistication included in this new LIMS, BSK now can provide higher levels of data deliverables to our clients who wish to receive a greater extent of the quality control data produced by the laboratory. In addition to the industry standard "Level II" deliverable (Sample results with Batch Preparation QC), BSK can now provide summary data associated with the analytical instrumentation, sometimes referred to as a data validation package. This allows our more sophisticated clients the ability to perform their own independent review of the analytical data to ensure it meets the standards and requirements set forth in their Quality Assurance Project Plans (QAPPs).

Our web and electronic data delivery services simplify our clients' needs throughout the analytical process – from bottle order, to sample submission, to reporting, and results delivery.

PROMIUM

OREGON

Environmental Laboratory Accreditation Program

NELAP Recognized

BSK Associates

4021

1414 Stanislaus St.

Fresno,CA 93706

IS GRANTED APPROVAL BY ORELAP UNDER THE 2009 TNI STANDARDS, TO PERFORM ANALYSES ON ENVIRONMENTAL SAMPLES IN MATRICES AS LISTED BELOW :

Air	*Drinking Water*	*Non Potable Water*	*Solids and Chem. Waste*	*Tissue*
	Chemistry	Chemistry	Chemistry	
	Microbiology	Microbiology		
	Radiochemistry			

AND AS RECORDED IN THE LIST OF APPROVED ANALYTES, METHODS, ANALYTICAL TECHNIQUES, AND FIELDS OF TESTING ISSUED CONCURRENTLY WITH THIS CERTIFICATE AND REVISED AS NECESSARY.

ACCREDITED STATUS DEPENDS ON SUCCESSFUL ONGOING PARTICIPATION IN THE PROGRAM AND CONTINUED COMPLIANCE WITH THE STANDARDS.

CUSTOMERS ARE URGED TO VERIFY THE LABORATORY'S CURRENT ACCREDITATION STATUS IN OREGON.

Gary K. Ward, MS

Oregon State Public Health Laboratory

ORELAP Administrator

3150 NW. 229th Ave, Suite 100

Hillsboro, OR 97124

ISSUE DATE: 01/30/2016

EXPIRATION DATE: 01/29/2017

Certificate No: 4021 - 005

Oregon

Environmental Laboratory Accreditation Program

Department of Agriculture, Laboratory Division
Department of Environmental Quality, Laboratory Division
Oregon Health Authority, Public Health Division

NELAP Recognized

ORELAP Fields of Accreditation

ORELAP ID: 4021
EPA CODE: CA00079
Certificate: 4021 - 005

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Issue Date: 01/30/2016 ***Expiration Date:*** 01/29/2017

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MATRIX : Drinking Water

Reference	Code	Description
ASTM D4374-06 Kelada-01	**30031250**	**Standard Test Methods for Cyanides in Water-Automated Methods for Total Cyanide, Weak Acid Dissociable Cyanide, and Thiocyanate**

Analyte Code	*Analyte*
1645	Total cyanide
2074	Weak Acid Dissociable Cyanide

EPA 200.2	**10013000**	**Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements - Revision 2.8**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 200.7 5	**10014003**	**ICP - metals**

Analyte Code	*Analyte*
1000	Aluminum
1015	Barium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1055	Copper
1760	Hardness (calc.)
1070	Iron
1085	Magnesium
1090	Manganese
1105	Nickel
1125	Potassium
1990	Silica as SiO2
1150	Silver
1155	Sodium
1190	Zinc

EPA 200.8 5.5	**10014809**	**Metals by ICP-MS**

Analyte Code	*Analyte*
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1040	Chromium
1055	Copper

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Analyte Code	*Analyte*
1075	Lead
1095	Mercury
1105	Nickel
1140	Selenium
1150	Silver
1165	Thallium
3035	Uranium
1190	Zinc

EPA 218.6 3.3 **10028009** **Dissolved Hexavalent Chromium by Ion Chromatography**

Analyte Code	*Analyte*
1045	Chromium VI

EPA 218.7 1 **10268414** **Determination of Hexavalent Chromium in Drinking Water by Ion Chromatography with Post-column Derivatization and UV-VIS Spectroscopic Determination**

Analyte Code	*Analyte*
1045	Chromium VI

EPA 300.0 2.1 **10053200** **Methods for the Determination of Inorganic Substances in Environmental Samples**

Analyte Code	*Analyte*
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1820	Nitrate-nitrite
1840	Nitrite as N
1870	Orthophosphate as P
2000	Sulfate

EPA 300.1 **10053608** **Ion chromatography - anions.**

Analyte Code	*Analyte*
1540	Bromide
1570	Chlorate
1595	Chlorite

EPA 314.0 **10277006** **Perchlorate in Drinking Water by Ion Chromatography**

Analyte Code	*Analyte*
1895	Perchlorate

EPA 317.0 2.0 **10237602** **Inorganic Oxyhalide Disinfection Byproducts in Drinking Water**

Analyte Code	*Analyte*
1535	Bromate

EPA 504.1 1.1 **10082801** **EDB/DBCP/TCP micro-extraction, GC/ECD**

Analyte Code	*Analyte*
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)

EPA 505 2.1 **10083406** **Organohalide pesticides/PCBs (Drinking Water)**

Analyte Code	*Analyte*
7005	Alachlor
7025	Aldrin
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)

ORELAP Fields of Accreditation

ORELAP ID: 4021
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Analyte Code	*Analyte*
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
7065	Atrazine
7250	Chlordane (tech.)
7470	Dieldrin
7540	Endrin
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7685	Heptachlor
7690	Heptachlor epoxide
6275	Hexachlorobenzene
6285	Hexachlorocyclopentadiene
7810	Methoxychlor
8870	PCBs
8125	Simazine
8250	Toxaphene (Chlorinated camphene)

EPA 515.3 1 **10088401** **Chlorinated acids Liquid/Solid and GC/ECD**

Analyte Code	*Analyte*
8655	2,4,5-T
8545	2,4-D
8560	2,4-DB
8600	3,5-Dichlorobenzoic acid
6500	4-Nitrophenol
8505	Acifluorfen
8530	Bentazon
8540	Chloramben
8550	Dacthal (DCPA)
8555	Dalapon
8595	Dicamba
8605	Dichloroprop (Dichlorprop)
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
6605	Pentachlorophenol
8645	Picloram
8650	Silvex (2,4,5-TP)

EPA 515.4 1 **10088503** **Chlorinated acids Liquid/Solid and GC/ECD**

Analyte Code	*Analyte*
8655	2,4,5-T
8545	2,4-D
8560	2,4-DB
8600	3,5-Dichlorobenzoic acid
6500	4-Nitrophenol
8505	Acifluorfen
8530	Bentazon
8540	Chloramben
8550	Dacthal (DCPA)
8555	Dalapon
8595	Dicamba
8605	Dichloroprop (Dichlorprop)
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
6605	Pentachlorophenol
8645	Picloram
8650	Silvex (2,4,5-TP)

ORELAP Fields of Accreditation

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EPA 524.2 4.1 **10088809** **Volatile Organic Compounds GC/MS Capillary Column**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4535	2-Chlorotoluene
4860	2-Hexanone (MBK)
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
9375	Di-isopropylether (DIPE)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4900	Isopropylbenzene
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4435	n-Butylbenzene
5090	n-Propylbenzene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4420	tert-Butyl alcohol
4445	tert-Butylbenzene

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Analyte Code	*Analyte*
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
5205	Total trihalomethanes
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5235	Vinyl chloride
5260	Xylene (total)

EPA 525.2 2 **10090003** **Semi-Volatile by SPE extraction and GC/MS**

Analyte Code	*Analyte*
5500	Acenaphthene
5505	Acenaphthylene
7005	Alachlor
5555	Anthracene
7065	Atrazine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
6062	bis(2-Ethylhexyl)adipate
7130	Bromacil
7160	Butachlor
5670	Butyl benzyl phthalate
7300	Chlorpyrifos
7310	Chlorthalonil (Daconil)
5855	Chrysene
8550	Dacthal (DCPA)
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
7410	Diazinon
5895	Dibenz(a,h) anthracene
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
7835	Metolachlor
7845	Metribuzin
7875	Molinate
5005	Naphthalene
6615	Phenanthrene
8035	Prometon
8040	Prometryn
8045	Propachlor (Ramrod)
6665	Pyrene
8125	Simazine
8220	Thiobencarb
8295	Trifluralin (Treflan)

EPA 525.3 1 **10287500** **Determination of Semivolatile Organic Chemicals in Drinking Water by Solid Phase Extraction and Capillary Gas Chromatography/Mass Spectrometry (GC/MS)**

Analyte Code	*Analyte*
5500	Acenaphthene
5505	Acenaphthylene
7005	Alachlor
5555	Anthracene

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
7065	Atrazine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
6062	bis(2-Ethylhexyl)adipate
7130	Bromacil
7160	Butachlor
5670	Butyl benzyl phthalate
7300	Chlorpyrifos
7310	Chlorthalonil (Daconil)
5855	Chrysene
8550	Dacthal (DCPA)
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
7410	Diazinon
5895	Dibenz(a,h) anthracene
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
7835	Metolachlor
7845	Metribuzin
7875	Molinate
5005	Naphthalene
6615	Phenanthrene
8035	Prometon
8040	Prometryn
8045	Propachlor (Ramrod)
6665	Pyrene
8125	Simazine
8220	Thiobencarb
8295	Trifluralin (Treflan)

EPA 531.1 3.1 **10091006** **Carbamates HPLC with post column derivatization**

Analyte Code	*Analyte*
7710	3-Hydroxycarbofuran
7010	Aldicarb (Temik)
7015	Aldicarb sulfone
7020	Aldicarb sulfoxide
7195	Carbaryl (Sevin)
7205	Carbofuran (Furaden)
7800	Methiocarb (Mesurol)
7805	Methomyl (Lannate)
7940	Oxamyl
8080	Propoxur (Baygon)
8220	Thiobencarb

EPA 531.2 1 **10091302** **Carbamate Pesticides by Post-column Derivitization HPLC/Fluorescence**

Analyte Code	*Analyte*
7710	3-Hydroxycarbofuran
7010	Aldicarb (Temik)
7015	Aldicarb sulfone
7020	Aldicarb sulfoxide
7195	Carbaryl (Sevin)
7205	Carbofuran (Furaden)

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Analyte Code	*Analyte*
7800	Methiocarb (Mesurol)
7805	Methomyl (Lannate)
7940	Oxamyl
8080	Propoxur (Baygon)

EPA 547 **10092009** **Glyphosate by Direct Aqueous Injection by Post-column Derivitization and HPLC/Fluorescence**

Analyte Code	*Analyte*
9411	Glyphosate

EPA 548.1 1 **10092805** **Endothall by Ion Exchange, Methylation and GC/MS**

Analyte Code	*Analyte*
7525	Endothall

EPA 549.2 1 **10093400** **Diquat/Paraquat by Liquid/Liquid Extraction and HPLC/UV-VIS**

Analyte Code	*Analyte*
9390	Diquat
9528	Paraquat

EPA 552.3 1 **10239608** **Haloacetic Acid/Dalapon, Microextraction, Derivitization and GC/ECD**

Analyte Code	*Analyte*
9312	Bromoacetic acid
9315	Bromochloroacetic acid
9336	Chloroacetic acid
9357	Dibromoacetic acid
9360	Dichloroacetic acid
9414	Total haloacetic acids
9642	Trichloroacetic acid

EPA 632 **10108608** **Carbamate and Urea Pesticides by Liquid/Liquid Extraction and HPLC/UV-VIS**

Analyte Code	*Analyte*
7505	Diuron

Georgia Institute of Technology, GA: Radium 226/228 1.2 **90016005** **Radium-226 and Radium-228 in Drinking Water by Gamma-ray Spectrometry using HPGE or Ge (Li) Detectors**

Analyte Code	*Analyte*
2965	Radium-226
2970	Radium-228

SM 2120 B-2001 online **20039309** **Color by Visual Comparison**

Analyte Code	*Analyte*
1605	Color

SM 2130 B-94 online **20042802** **Turbidity by Nephelometric Method**

Analyte Code	*Analyte*
2055	Turbidity

SM 2320 B-97 1997 **20045607** **Alkalinity by Titration Method**

Analyte Code	*Analyte*
1505	Alkalinity as CaCO3

ORELAP Fields of Accreditation

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SM 2330 B 20th Ed	**20003309**	**Calcium Carbonate Indices**

Analyte Code	*Analyte*
1615	Corrosivity

SM 2340 B-97 1997	**20046600**	**Hardness by calculation**

Analyte Code	*Analyte*
1750	Hardness

SM 2510 B-97 1997	**20048606**	**Conductivity by Probe**

Analyte Code	*Analyte*
1610	Conductivity

SM 2540 C-97 1997	**20050402**	**Total Dissolved Solids Dried at 180C**

Analyte Code	*Analyte*
1955	Residue-filterable (TDS)

SM 4500-Cl⁻ F 20th ED	**20087201**	**Chloride by Ion Chromatography**

Analyte Code	*Analyte*
1945	Residual free chlorine

SM 4500-CN E-1999	**20096417**	**Cyanide by Colorimetric Method**

Analyte Code	*Analyte*
1645	Total cyanide

SM 4500-F⁻ C-97 online	**20102403**	**Fluoride by Ion-Selective Electrode Method**

Analyte Code	*Analyte*
1730	Fluoride

SM 4500-H+ B-2000 online	**20105219**	**pH Value by Electrometric Method .**

Analyte Code	*Analyte*
1900	pH

SM 4500-NO3⁻ F-97 online	**20117606**	**Nitrate by Automated Cadmium Reduction Method**

Analyte Code	*Analyte*
1820	Nitrate-nitrite

SM 4500-P E-1999	**20124214**	**Phosphorous by Ascorbic Acid Method**

Analyte Code	*Analyte*
1870	Orthophosphate as P

SM 5310 C 21st ED	**20138607**	**TOC by Persulfate-Ultraviolet or Heated-Persulfate Oxidation Method**

Analyte Code	*Analyte*
1710	Dissolved organic carbon (DOC)

SM 5310 C-2000 online	**20138812**	**Total Organic Carbon by Persulfate-Ultraviolet Oxidation Method**

Analyte Code	*Analyte*
2040	Total organic carbon

ORELAP Fields of Accreditation

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SM 5540 C-93 online	**20145000**	**Surfactants by Anionic Surfactants as MBAS**

Analyte Code	*Analyte*
2025	Surfactants - MBAS

SM 5910 B-00 online	**20146401**	**UV--Absorbing Organic Constituents by Ultraviolet Absorption Method**

Analyte Code	*Analyte*
2060	UV 254

SM 7110 C (GPC) 21st ED	**20158809**	**Radioactivity by Coprecipitation Method for Gross Alpha Radioactivity in Drinking Water**

Analyte Code	*Analyte*
2830	Gross-alpha

SM 9215 B (PCA) 21st ED	**20181402**	**Heterotrophic Plate Count Pour Plate (plate count agar): Heterotrophic Bacteria**

Analyte Code	*Analyte*
2555	Heterotrophic plate count

SM 9221 B (LTB) + C MPN 21st ED	**20187002**	**Multiple Tube Fermentation Quantitative (LTB): Total Coliform**

Analyte Code	*Analyte*
2525	Escherichia coli
2500	Total coliforms

SM 9221 B (LTB) + E (EC) 21st ED	**20188005**	**Multiple Tube Fermentation Qualitative (LTB/EC): Total Coliform and Fecal Coliform**

Analyte Code	*Analyte*
2530	Fecal coliforms
2500	Total coliforms

SM 9221 B (LTB) + F (EC MUG) 21st ED	**20189804**	**Multiple Tube Fermentation Qualitative (LTB/EC MUG): Total Coliform and E. Coli**

Analyte Code	*Analyte*
2525	Escherichia coli
2500	Total coliforms

SM 9221 B (LTB) 21st ED	**20186009**	**Multiple Tube Fermentation Qualitative (LTB): Total Coliform**

Analyte Code	*Analyte*
2500	Total coliforms

SM 9223 B (Colilert®-18 Quanti-Tray®) 21st ED	**20213405**	**Chromogenic/Fluorogenic Quantitative (Colilert®-18): Total Coliform and E. coli**

Analyte Code	*Analyte*
2525	Escherichia coli
2500	Total coliforms

SM 9223 B (Colilert®-18) 21st ED	**20214408**	**Chromogenic/Fluorogenic Qualitative (Colilert®-18): Total Coliform and E. coli**

Analyte Code	*Analyte*
2525	Escherichia coli
2500	Total coliforms

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MATRIX : Non-Potable Water

Reference	Code	Description
ASTM D4374-06 Kelada-01	**30031250**	**Standard Test Methods for Cyanides in Water-Automated Methods for Total Cyanide, Weak Acid Dissociable Cyanide, and Thiocyanate**

Analyte Code	*Analyte*
1645	Total cyanide
2074	Weak Acid Dissociable Cyanide

EPA 1664A	**10127603**	**Silica Gen Treated N-Hexane Extractable Material (Oil and Grease)**

Analyte Code	*Analyte*
1860	Oil & Grease

EPA 1664A (HEM)	**10127807**	**N-Hexane Extractable Material (Oil and Grease) by Extraction and Gravimetry**

Analyte Code	*Analyte*
1803	n-Hexane Extractable Material (O&G)
1860	Oil & Grease
2050	Total Petroleum Hydrocarbons (TPH)

EPA 1664A (SGT-HEM)	**10261606**	**Silica Gen Treated N-Hexane Extractable Material (Oil and Grease)**

Analyte Code	*Analyte*
1803	n-Hexane Extractable Material (O&G)
1860	Oil & Grease
2050	Total Petroleum Hydrocarbons (TPH)

EPA 200.2	**10013000**	**Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements - Revision 2.8**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 200.7 5	**10014003**	**ICP - metals**

Analyte Code	*Analyte*
1000	Aluminum
1015	Barium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1760	Hardness (calc.)
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1990	Silica as SiO2
1150	Silver
1155	Sodium
1175	Tin
1185	Vanadium
1190	Zinc

ORELAP Fields of Accreditation

ORELAP ID: 4021
EPA CODE: CA00079
Certificate: 4021 - 005

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EPA 200.8 5.5 **10014809** **Metals by ICP-MS**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1090	Manganese
1095	Mercury
1100	Molybdenum
1105	Nickel
1140	Selenium
1150	Silver
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

EPA 218.6 3.3 **10028009** **Dissolved Hexavalent Chromium by Ion Chromatography**

Analyte Code	*Analyte*
1045	Chromium VI

EPA 218.7 1 **10268414** **Determination of Hexavalent Chromium in Drinking Water by Ion Chromatography with Post-column Derivatization and UV-VIS Spectroscopic Determination**

Analyte Code	*Analyte*
1045	Chromium VI

EPA 300.0 2.1 **10053200** **Methods for the Determination of Inorganic Substances in Environmental Samples**

Analyte Code	*Analyte*
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1820	Nitrate-nitrite
1840	Nitrite as N
1870	Orthophosphate as P
2000	Sulfate

EPA 300.1 **10053608** **Ion chromatography - anions.**

Analyte Code	*Analyte*
1540	Bromide

EPA 3010A **10133605** **Acid Digestion of Aqueous samples and Extracts for Total Metals**

Analyte Code	*Analyte*
8031	Extraction/Preparation

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EPA 314.0 **10277006** **Perchlorate in Drinking Water by Ion Chromatography**

Analyte Code	*Analyte*
1895	Perchlorate

EPA 350.1 2 **10063602** **Ammonia Nitrogen - Colorimetric, Auto Phenate**

Analyte Code	*Analyte*
1515	Ammonia as N

EPA 351.2 2 **10065404** **Total Kjeldahl Nitrogen - Block Digest, Phenate**

Analyte Code	*Analyte*
1790	Kjeldahl nitrogen

EPA 365.4 **10071008** **Phosphorous - Colorimetric, automated block.**

Analyte Code	*Analyte*
1910	Phosphorus, total

EPA 608 **10103603** **Organochlorine Pesticides & PCBs by GC/ECD**

Analyte Code	*Analyte*
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7685	Heptachlor
7690	Heptachlor epoxide
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

EPA 624 **10107207** **Volatile Organic Compounds by purge and trap GC/MS**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
5150	1,2,3-Trichlorobenzene
5155	1,2,4-Trichlorobenzene
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
4615	1,3-Dichlorobenzene
4675	1,3-Dichloropropene
4620	1,4-Dichlorobenzene
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4860	2-Hexanone (MBK)
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4325	Acrolein (Propenal)
4340	Acrylonitrile
4375	Benzene
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4580	Dibromochloropropane
4625	Dichlorodifluoromethane (Freon-12)
4765	Ethylbenzene
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
5100	Styrene
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5235	Vinyl chloride

EPA 625 **10300002** **Base/Neutrals and Acids by GC/MS**

Analyte Code	*Analyte*
5155	1,2,4-Trichlorobenzene
4610	1,2-Dichlorobenzene
6221	1,2-Diphenylhydrazine
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
6165	1,4-Dinitrobenzene
6380	1-Methylnaphthalene
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)

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Analyte Code	*Analyte*
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
6355	3-Methylcholanthrene
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5825	4-Chlorophenyl phenylether
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
9309	Benzo(j)fluoranthene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
9354	Dibenz(a, h) acridine
5900	Dibenz(a, j) acridine
5895	Dibenz(a,h) anthracene
9348	Dibenzo(a, h) pyrene
9351	Dibenzo(a, i) pyrene
5890	Dibenzo(a,e) pyrene
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6608	Perylene
6615	Phenanthrene
6625	Phenol
6665	Pyrene

EPA 632 **10108608** **Carbamate and Urea Pesticides by Liquid/Liquid Extraction and HPLC/UV-VIS**

Analyte Code	*Analyte*
7080	Barban
7195	Carbaryl (Sevin)

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Analyte Code	*Analyte*
7205	Carbofuran (Furaden)
7275	Chloropropham
7505	Diuron
7610	Fenuron
7630	Fluometuron
7765	Linuron (Lorox)
7805	Methomyl (Lannate)
7885	Monuron
7915	Neburon
7940	Oxamyl
8075	Propham
8080	Propoxur (Baygon)
8120	Siduron

EPA 9040B **10197203** **pH Electrometric Measurement**

Analyte Code	*Analyte*
1900	pH

EPA 9045C **10198400** **Soil and Waste pH**

Analyte Code	*Analyte*
1900	pH

NWTPH-Dx **90018409** **Oregon DEQ TPH Diesel Range**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
9488	Jet Fuel
9499	Motor Oil
2050	Total Petroleum Hydrocarbons (TPH)

NWTPH-GX (GC/MS) **90018658** **Oregon DEQ TPH Gasoline Range Organics by GC/MS Purge & Trap**

Analyte Code	*Analyte*
4375	Benzene
4765	Ethylbenzene
9408	Gasoline range organics (GRO)
5240	m+p-xylene
5000	Methyl tert-butyl ether (MTBE)
5245	m-Xylene
5250	o-Xylene
5255	p-Xylene
5140	Toluene
5260	Xylene (total)

SM 2120 B-2001 online **20039309** **Color by Visual Comparison**

Analyte Code	*Analyte*
1605	Color

SM 2130 B-94 online **20042802** **Turbidity by Nephelometric Method**

Analyte Code	*Analyte*
2055	Turbidity

SM 2320 B-97 1997 **20045607** **Alkalinity by Titration Method**

Analyte Code	*Analyte*
1505	Alkalinity as CaCO3

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SM 2340 B-97 1997	**20046600**	**Hardness by calculation**

Analyte Code	*Analyte*
1750	Hardness

SM 2510 B-97 1997	**20048606**	**Conductivity by Probe**

Analyte Code	*Analyte*
1610	Conductivity

SM 2540 B-97 1997	**20049405**	**Total Solids Dried at 103 - 105C**

Analyte Code	*Analyte*
1950	Residue-total

SM 2540 C-97 1997	**20050402**	**Total Dissolved Solids Dried at 180C**

Analyte Code	*Analyte*
1955	Residue-filterable (TDS)

SM 2540 D-97 1997	**20051201**	**Total Suspended Solids Dried at 103 - 105C**

Analyte Code	*Analyte*
1960	Residue-nonfilterable (TSS)

SM 2540 E-1997	**20051585**	**Fixed & Volatile Solids Ignited at 550 C**

Analyte Code	*Analyte*
1725	Total, fixed, and volatile residue

SM 2540 F-97 online	**20052204**	**Settleable Solids**

Analyte Code	*Analyte*
1965	Residue-settleable

SM 4500-Cl B-93 online	**20078404**	**Chlorine by Iodometric Method I**

Analyte Code	*Analyte*
1580	Chlorine

SM 4500-Cl⁻ F 20th ED	**20087201**	**Chloride by Ion Chromatography**

Analyte Code	*Analyte*
1945	Residual free chlorine

SM 4500-CN C-1999	**20095652**	**Cyanide (Total) after Distillation**

Analyte Code	*Analyte*
1635	Cyanide

SM 4500-CN E-1999	**20096417**	**Cyanide by Colorimetric Method**

Analyte Code	*Analyte*
1645	Total cyanide

SM 4500-F⁻ C-97 online	**20102403**	**Fluoride by Ion-Selective Electrode Method**

Analyte Code	*Analyte*
1730	Fluoride

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SM 4500-H+ B-2000 online **20105219** **pH Value by Electrometric Method .**

Analyte Code	*Analyte*
1900	pH

SM 4500-NH3 G-97 online **20111404** **Ammonia by Automated Phenate Method**

Analyte Code	*Analyte*
1515	Ammonia as N

SM 4500-$NO3^-$ F-97 online **20117606** **Nitrate by Automated Cadmium Reduction Method**

Analyte Code	*Analyte*
1820	Nitrate-nitrite

SM 4500-O C-93 online **20120803** **Oxygen by Azide Modification**

Analyte Code	*Analyte*
1880	Oxygen, dissolved

SM 4500-O G-2001 online **20121657** **Dissolved Oxygen by Membrane Electrode Method**

Analyte Code	*Analyte*
1880	Oxygen, dissolved

SM 4500-P B 5 20th ED **20123200** **Phosphorus by Persulfate Digestion Method**

Analyte Code	*Analyte*
1910	Phosphorus, total

SM 4500-P E-1999 **20124214** **Phosphorous by Ascorbic Acid Method**

Analyte Code	*Analyte*
1870	Orthophosphate as P

SM 5210 B-2001 online **20135255** **Biochemical Oxygen Demand (BOD), 5-Day**

Analyte Code	*Analyte*
1530	Biochemical oxygen demand
1555	Carbonaceous BOD, CBOD

SM 5220 D-97 online **20136805** **COD by Closed Reflux, Colorimetric Method**

Analyte Code	*Analyte*
1565	Chemical oxygen demand

SM 5310 C 21st ED **20138607** **TOC by Persulfate-Ultraviolet or Heated-Persulfate Oxidation Method**

Analyte Code	*Analyte*
1710	Dissolved organic carbon (DOC)

SM 5310 C-2000 online **20138812** **Total Organic Carbon by Persulfate-Ultraviolet Oxidation Method**

Analyte Code	*Analyte*
2040	Total organic carbon

SM 5520 B-97 online **20141600** **Oil and Grease by Partition-Gravimetric Method**

Analyte Code	*Analyte*
1803	n-Hexane Extractable Material (O&G)

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Analyte Code	*Analyte*
1860	Oil & Grease

SM 5520 F-05 online **20143208** **Oil and Grease by Hydrocarbons**

Analyte Code	*Analyte*
1803	n-Hexane Extractable Material (O&G)
1860	Oil & Grease

SM 5540 C-93 online **20145000** **Surfactants by Anionic Surfactants as MBAS**

Analyte Code	*Analyte*
2025	Surfactants - MBAS

SM 9215 B (PCA) 21st ED **20181402** **Heterotrophic Plate Count Pour Plate (plate count agar): Heterotrophic Bacteria**

Analyte Code	*Analyte*
2555	Heterotrophic plate count

SM 9221 B (LTB) + C MPN 21st ED **20187002** **Multiple Tube Fermentation Quantitative (LTB): Total Coliform**

Analyte Code	*Analyte*
2525	Escherichia coli
2500	Total coliforms

SM 9221 B (LTB) + E (EC) 21st ED **20188005** **Multiple Tube Fermentation Qualitative (LTB/EC): Total Coliform and Fecal Coliform**

Analyte Code	*Analyte*
2530	Fecal coliforms
2500	Total coliforms

SM 9221 B (LTB) + F (EC MUG) 21st ED **20189804** **Multiple Tube Fermentation Qualitative (LTB/EC MUG): Total Coliform and E. Coli**

Analyte Code	*Analyte*
2525	Escherichia coli
2500	Total coliforms

SM 9223 B (Colilert®-18 Quanti-Tray®) 21st ED **20213405** **Chromogenic/Fluorogenic Quantitative (Colilert®-18): Total Coliform and E. coli**

Analyte Code	*Analyte*
2525	Escherichia coli
2500	Total coliforms

SM 9223 B (Colilert®-18) 21st ED **20214408** **Chromogenic/Fluorogenic Qualitative (Colilert®-18): Total Coliform and E. coli**

Analyte Code	*Analyte*
2525	Escherichia coli
2500	Total coliforms

SM 9230 B (PSE) 21st ED **20217407** **Multiple Tube Fermentation Quantitative: Fecal Streptococci**

Analyte Code	*Analyte*
2540	Fecal streptococci

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MATRIX : Solids

Reference	Code	Description
EPA 1010	**10116606**	**Pensky-Martens Closed-Cup Method for Determining Ignitability**

Analyte Code	*Analyte*
1780	Ignitability

EPA 1311	**10118806**	**Toxicity Characteristic Leaching Procedure**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 300.0 2.1	**10053200**	**Methods for the Determination of Inorganic Substances in Environmental Samples**

Analyte Code	*Analyte*
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1820	Nitrate-nitrite
1840	Nitrite as N
1870	Orthophosphate as P
2000	Sulfate

EPA 3050B	**10135601**	**Acid Digestion of Sediments, Sludges, and soils**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3060A	**10136604**	**Alkaline Digestion for Hexavalent Chromium**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 350.1 2	**10063602**	**Ammonia Nitrogen - Colorimetric, Auto Phenate**

Analyte Code	*Analyte*
1515	Ammonia as N

EPA 3510C	**10138202**	**Separatory Funnel Liquid-liquid extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3520C	**10139001**	**Continuous Liquid-liquid extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3540C	**10140202**	**Soxhlet Extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3550B	**10141807**	**Ultrasonic Extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

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EPA 3620B **10145809** **Florisil Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3660B **10148400** **Sulfur cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 5030B **10153409** **Purge and trap for aqueous samples**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 5035 **10154004** **Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 6010B **10155609** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1015	Barium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1990	Silica as SiO2
1150	Silver
1155	Sodium
1175	Tin
1185	Vanadium
1190	Zinc

EPA 6020 **10156000** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1090	Manganese

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Analyte Code	*Analyte*
1100	Molybdenum
1105	Nickel
1140	Selenium
1150	Silver
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 6020A **10156408** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1095	Mercury

EPA 7199 **10163005** **Determination of Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography**

Analyte Code	*Analyte*
1045	Chromium VI

EPA 8015B **10173601** **Non-halogenated organics using GC/FID**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
9488	Jet Fuel
9409	Kerosene
9410	Mineral Spirits
9499	Motor Oil
2050	Total Petroleum Hydrocarbons (TPH)

EPA 8081A **10178606** **Organochlorine Pesticides by GC/ECD**

Analyte Code	*Analyte*
8580	2,4'-DDD
8585	2,4'-DDE
8590	2,4'-DDT
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7310	Chlorthalonil (Daconil)
7105	delta-BHC
7460	Dicofol
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
6275	Hexachlorobenzene
6285	Hexachlorocyclopentadiene
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

ORELAP Fields of Accreditation

ORELAP ID: 4021
EPA CODE: CA00079
Certificate: 4021 - 005

BSK Associates

1414 Stanislaus St.
Fresno CA 93706

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Analyte Code	*Analyte*
8295	Trifluralin (Treflan)

EPA 8082 **10179007** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	*Analyte*
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)

EPA 8260B **10184802** **Volatile Organic Compounds by purge and trap GC/MS**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4622	1,4-Difluorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4535	2-Chlorotoluene
4860	2-Hexanone (MBK)
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4320	Acetonitrile
4325	Acrolein (Propenal)
4340	Acrylonitrile
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
4525	Chloroprene (2-Chloro-1,3-butadiene)
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4580	Dibromochloropropane
4590	Dibromofluoromethane
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
9375	Di-isopropylether (DIPE)
4750	Ethanol
4810	Ethyl methacrylate
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4840	Hexachloroethane
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4900	Isopropylbenzene
4925	Methacrylonitrile
4930	Methanol
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
4990	Methyl methacrylate
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4435	n-Butylbenzene
5090	n-Propylbenzene
5040	Pentafluorobenzene
5080	Propionitrile (Ethyl cyanide)
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4420	tert-Butyl alcohol
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
4605	trans-1,4-Dichloro-2-butene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride
5260	Xylene (total)

EPA 8270C **10185805** **Semivolatile Organic compounds by GC/MS**

Analyte Code	*Analyte*
6715	1,2,4,5-Tetrachlorobenzene
5155	1,2,4-Trichlorobenzene
4610	1,2-Dichlorobenzene
6155	1,2-Dinitrobenzene
6221	1,2-Diphenylhydrazine
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)
4615	1,3-Dichlorobenzene
6160	1,3-Dinitrobenzene (1,3-DNB)
4620	1,4-Dichlorobenzene
6165	1,4-Dinitrobenzene
4735	1,4-Dioxane (1,4- Diethyleneoxide)
6420	1,4-Naphthoquinone
6630	1,4-Phenylenediamine

ORELAP Fields of Accreditation

ORELAP ID: 4021
EPA CODE: CA00079
Certificate: 4021 - 005

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Analyte Code	*Analyte*
6380	1-Methylnaphthalene
6425	1-Naphthylamine
6735	2,3,4,6-Tetrachlorophenol
6835	2,4,5-Trichlorophenol
9643	2,4,6-Tribromophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6005	2,6-Dichlorophenol
6190	2,6-Dinitrotoluene (2,6-DNT)
5515	2-Acetylaminofluorene
5795	2-Chloronaphthalene
5800	2-Chlorophenol
5867	2-Fluorobiphenyl
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
5145	2-Methylaniline (o-Toluidine)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6430	2-Naphthylamine
6460	2-Nitroaniline
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
6120	3,3'-Dimethylbenzidine
6355	3-Methylcholanthrene
6405	3-Methylphenol (m-Cresol)
6465	3-Nitroaniline
5540	4-Aminobiphenyl
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6105	4-Dimethyl aminoazobenzene
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
6570	5-Nitro-o-toluidine
6115	7,12-Dimethylbenz(a) anthracene
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
7030	Allethrin
5545	Aniline
5555	Anthracene
7065	Atrazine
7075	Azinphos-methyl (Guthion)
5562	Azobenzene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
9309	Benzo(j)fluoranthene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
7117	Bifenthrin
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
6062	bis(2-Ethylhexyl)adipate
7125	Bolstar (Sulprofos)
5670	Butyl benzyl phthalate
7260	Chlorobenzilate
7300	Chlorpyrifos
5855	Chrysene
7965	cis-Permethrin
7315	Coumaphos
7340	Cyanazine
7345	Cyfluthrin
7346	Cypermethrin
200	Deltamethrine
7395	Demeton-o
7385	Demeton-s
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
7405	Diallate
7410	Diazinon
9354	Dibenz(a, h) acridine
5900	Dibenz(a, j) acridine
5895	Dibenz(a,h) anthracene
9348	Dibenzo(a, h) pyrene
9351	Dibenzo(a, i) pyrene
5890	Dibenzo(a,e) pyrene
5905	Dibenzofuran
7435	Dichloran
8610	Dichlorovos (DDVP, Dichlorvos)
7460	Dicofol
6070	Diethyl phthalate
7475	Dimethoate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6205	Diphenylamine
8625	Disulfoton
7550	EPN
7565	Ethion
7570	Ethoprop
6260	Ethyl methanesulfonate
7580	Famphur
201	Fenpropathrin
7600	Fensulfothion
7605	Fenthion
7620	Fenvalerate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6295	Hexachloropropene
6315	Indeno(1,2,3-cd) pyrene
7725	Isodrin
6320	Isophorone
6325	Isosafrole
7740	Kepone
202	Lambda-Cyhalothrin
7770	Malathion
6345	Methapyrilene
6375	Methyl methanesulfonate
7825	Methyl parathion (Parathion, methyl)
7850	Mevinphos

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Analyte Code	*Analyte*
7880	Monocrotophos
7905	Naled
5005	Naphthalene
5015	Nitrobenzene
6525	n-Nitrosodiethylamine
6530	n-Nitrosodimethylamine
5025	n-Nitroso-di-n-butylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6550	n-Nitrosomethylethalamine
6560	n-Nitrosopiperidine
6565	n-Nitrosopyrrolidine
8290	o,o,o-Triethyl phosphorothioate
7955	Parathion, ethyl
7960	Pendimethalin\ (Penoxalin)
6590	Pentachlorobenzene
6600	Pentachloronitrobenzene
6605	Pentachlorophenol
6608	Perylene
6610	Phenacetin
6615	Phenanthrene
6625	Phenol
7985	Phorate
8000	Phosmet (Imidan)
9550	Piperonyl butoxide
203	Prallethrin
8040	Prometryn
6650	Pronamide (Kerb)
6665	Pyrene
5095	Pyridine
8110	Ronnel
6685	Safrole
8125	Simazine
8155	Sulfotepp
8160	Sumithrin (Phenothrin)
204	Tefluthrin
8200	Tetrachlorvinphos (Stirophos, Gardona) Z-isomer
8220	Thiobencarb
8235	Thionazin (Zinophos)
8245	Tokuthion (Prothiophos)
7970	trans Permethrin
8275	Trichloronate
8295	Trifluralin (Treflan)

EPA 8321A **10189001** **Solvent Extractable non-volatile compounds by HPLC/TS/MS**

Analyte Code	*Analyte*
8655	2,4,5-T
8545	2,4-D
8560	2,4-DB
7710	3-Hydroxycarbofuran
7010	Aldicarb (Temik)
7015	Aldicarb sulfone
7020	Aldicarb sulfoxide
7080	Barban
7130	Bromacil
7195	Carbaryl (Sevin)
7205	Carbofuran (Furaden)
7275	Chloropropham
8555	Dalapon
8595	Dicamba

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Analyte Code	*Analyte*
8605	Dichloroprop (Dichlorprop)
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
7505	Diuron
7610	Fenuron
7630	Fluometuron
7765	Linuron (Lorox)
7775	MCPA
7780	MCPP
7800	Methiocarb (Mesurol)
7805	Methomyl (Lannate)
7885	Monuron
7915	Neburon
7940	Oxamyl
8075	Propham
8080	Propoxur (Baygon)
8120	Siduron
8650	Silvex (2,4,5-TP)

EPA 9012A **10193405** **Total and Amenable Cyanide (automated colorimetric with off-line distillation)**

Analyte Code	*Analyte*
1645	Total cyanide

EPA 9040B **10197203** **pH Electrometric Measurement**

Analyte Code	*Analyte*
1900	pH

EPA 9045C **10198400** **Soil and Waste pH**

Analyte Code	*Analyte*
1900	pH

EPA 9214 **10206403** **Potentiometric Determination of Fluoride in Aqueous Samples with Ion-Selective Electrode**

Analyte Code	*Analyte*
1730	Fluoride

Kelada-01 1.2 **60005303** **Kelada Automated Test Methods for Total Cyanide, Acid Dissociable Cyanide, and Thiocyanate**

Analyte Code	*Analyte*
1645	Total cyanide

NWTPH-Dx **90018409** **Oregon DEQ TPH Diesel Range**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
9488	Jet Fuel
9499	Motor Oil
2050	Total Petroleum Hydrocarbons (TPH)

NWTPH-GX (GC/MS) **90018658** **Oregon DEQ TPH Gasoline Range Organics by GC/MS Purge & Trap**

Analyte Code	*Analyte*
4375	Benzene
4765	Ethylbenzene
9408	Gasoline range organics (GRO)
5240	m+p-xylene
5000	Methyl tert-butyl ether (MTBE)
5245	m-Xylene

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Analyte Code	*Analyte*
5250	o-Xylene
5255	p-Xylene
5140	Toluene
5260	Xylene (total)

SM 2320 B-97 1997 **20045607** **Alkalinity by Titration Method**

Analyte Code	*Analyte*
1505	Alkalinity as CaCO3

SM 2510 B-97 1997 **20048606** **Conductivity by Probe**

Analyte Code	*Analyte*
1610	Conductivity

SM 4500-NH3 G-97 online **20111404** **Ammonia by Automated Phenate Method**

Analyte Code	*Analyte*
1515	Ammonia as N

SM 5210 B-2001 online **20135255** **Biochemical Oxygen Demand (BOD), 5-Day**

Analyte Code	*Analyte*
1530	Biochemical oxygen demand

SM 5540 C-93 online **20145000** **Surfactants by Anionic Surfactants as MBAS**

Analyte Code	*Analyte*
2025	Surfactants - MBAS

OREGON

Environmental Laboratory Accreditation Program

BSK Associates –Vancouver

WA100008

2517 E. Evergreen Blvd.

Vancouver, WA 98661

NELAP Recognized

IS GRANTED APPROVAL BY ORELAP UNDER THE 2009 TNI STANDARDS, TO PERFORM ANALYSES ON ENVIRONMENTAL SAMPLES IN MATRICES AS LISTED BELOW :

Air	*Drinking Water*	*Non Potable Water*	*Solids and Chem. Waste*	*Tissue*
	Chemistry	Chemistry	Chemistry	
	Microbiology	Microbiology		

AND AS RECORDED IN THE LIST OF APPROVED ANALYTES, METHODS, ANALYTICAL TECHNIQUES, AND FIELDS OF TESTING ISSUED CONCURRENTLY WITH THIS CERTIFICATE AND REVISED AS NECESSARY.

ACCREDITED STATUS DEPENDS ON SUCCESSFUL ONGOING PARTICIPATION IN THE PROGRAM AND CONTINUED COMPLIANCE WITH THE STANDARDS.

CUSTOMERS ARE URGED TO VERIFY THE LABORATORY'S CURRENT ACCREDITATION STATUS IN OREGON.

Gary K. Ward, MS
Oregon State Public Health Laboratory
ORELAP Administrator
3150 NW. 229th Ave, Suite 100
Hillsboro, OR 97124

ISSUE DATE : 05/19/2016

EXPIRATION DATE : 05/18/2017

Certificate No : WA100008 - 008

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ORELAP Fields of Accreditation

ORELAP ID: WA100008

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EPA CODE: WA12806

2517 E. Evergreen Blvd.

Certificate: WA100008 - 009

Vancouver, WA 98661 Issue Date: 4/22/2016 Expiration Date: 5/18/2017

As of 4/22/2016 this list supercedes all previous lists for this certificate number.

MATRIX	Reference	Code	Analyte	Code	Description
Drinking Water					
	EPA 300.0 2.1			10053200	Methods for the Determination of Inorganic Substances in Environmental Samples
		1575	Chloride		
		1730	Fluoride		
		1810	Nitrate as N		
		1820	Nitrate-nitrite		
		1840	Nitrite as N		
		1870	Orthophosphate as P		
		2000	Sulfate		
	EPA 365.3			10070801	Phosphorous - Colorimetric, two reagent.
		1870	Orthophosphate as P		
	SM 2120 B-2001 online			20039309	Color by Visual Comparison
		1605	Color		
	SM 2130 B-94 online			20042802	Turbidity by Nephelometric Method
		2055	Turbidity		
	SM 2320 B-97 1997			20045607	Alkalinity by Titration Method
		1505	Alkalinity as CaCO3		
	SM 2340 C-97 online			20047603	Hardness by EDTA Titration Method
		1755	Total hardness as CaCO3		
	SM 2510 B-97 1997			20048606	Conductivity by Probe
		1610	Conductivity		
	SM 2540 C-97 1997			20050402	Total Dissolved Solids Dried at 180C
		1955	Residue-filterable (TDS)		
	SM 2540 F-97 online			20052204	Settleable Solids
		1965	Residue-settleable		
	SM 4500-Cl G-2000 online			20081612	Chlorine (Residual) by DPD Colorimetric Determination
		1945	Residual free chlorine		
		1940	Total residual chlorine		
	SM 4500-H+ B-2000 online			20105219	pH Value by Electrometric Method .
		1900	pH		
	SM 9215 B (PCA) 21st ED			20181402	Heterotrophic Plate Count Pour Plate (plate count agar): Heterotrophic Bacteria
		2555	Heterotrophic plate count		

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EPA CODE: WA12806

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Drinking Water	SM 9221 B (LTB) + E (EC) 21st ED			20188005	Multiple Tube Fermentation Qualitative (LTB/EC): Total Coliform and Fecal Coliform
		2530	Fecal coliforms		
		2500	Total coliforms		
	SM 9223 B (Colilert® Quanti-Tray®) 20th ED			20211205	Chromogenic/Fluorogenic Quantitative (Colilert®): Total Coliform and E. coli
		2525	Escherichia coli		
		2500	Total coliforms		
	SM 9223 B (Colilert®) 20th ED			20212208	Chromogenic/Fluorogenic Qualitative (Colilert®): Total Coliform and E. coli
		2525	Escherichia coli		
		2500	Total coliforms		
Non-Potable Water					
	Enterolert®			60030208	Chromogenic/Fluorogenic Quantitative (Enterolert®): Enterococci
		2520	Enterococci		
	EPA 300.0 2.1			10053200	Methods for the Determination of Inorganic Substances in Environmental Samples
		1575	Chloride		
		1730	Fluoride		
		1810	Nitrate as N		
		1820	Nitrate-nitrite		
		1840	Nitrite as N		
		1870	Orthophosphate as P		
		2000	Sulfate		
	EPA 365.3			10070801	Phosphorous - Colorimetric, two reagent.
		1870	Orthophosphate as P		
		1910	Phosphorus, total		
	SM 2120 B-2001 online			20039309	Color by Visual Comparison
		1605	Color		
	SM 2130 B-94 online			20042802	Turbidity by Nephelometric Method
		2055	Turbidity		
	SM 2320 B-97 1997			20045607	Alkalinity by Titration Method
		1505	Alkalinity as CaCO3		
	SM 2340 C-97 online			20047603	Hardness by EDTA Titration Method
		1755	Total hardness as CaCO3		
	SM 2510 B-97 1997			20048606	Conductivity by Probe
		1610	Conductivity		
	SM 2540 B-97 1997			20049405	Total Solids Dried at 103 - 105C
		1950	Residue-total		

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Non-Potable Water

SM 2540 C-97 1997			20050402	Total Dissolved Solids Dried at 180C
	1955	Residue-filterable (TDS)		
SM 2540 D-97 1997			20051201	Total Suspended Solids Dried at 103 - 105C
	1960	Residue-nonfilterable (TSS)		
SM 2540 E-1997			20051585	Fixed & Volatile Solids Ignited at 550 C
	1947	Residue - Fixed		
	1970	Residue-volatile		
SM 2540 F-97 online			20052204	Settleable Solids
	1965	Residue-settleable		
SM 4500-Cl G-2000 online			20081612	Chlorine (Residual) by DPD Colorimetric Determination
	1945	Residual free chlorine		
	1940	Total residual chlorine		
SM 4500-H+ B-2000 online			20105219	pH Value by Electrometric Method .
	1900	pH		
SM 5210 B-2001 online			20135255	Biochemical Oxygen Demand (BOD), 5-Day
	1530	Biochemical oxygen demand		
	1555	Carbonaceous BOD, CBOD		
SM 5220 D-97 online			20136805	COD by Closed Reflux, Colorimetric Method
	1565	Chemical oxygen demand		
SM 9215 B (PCA) 21st ED			20181402	Heterotrophic Plate Count Pour Plate (plate count agar): Heterotrophic Bacteria
	2555	Heterotrophic plate count		
SM 9221 B (LTB) + E (EC) 21st ED			20188005	Multiple Tube Fermentation Qualitative (LTB/EC): Total Coliform and Fecal Coliform
	2530	Fecal coliforms		
	2500	Total coliforms		
SM 9222 D (m-FC)-97 online			20210008	Membrane Filtration Quantitative (m-FC): Fecal Coliform
	2530	Fecal coliforms		
SM 9223 B (Colilert® Quanti-Tray®) 20th ED			20211205	Chromogenic/Fluorogenic Quantitative (Colilert®): Total Coliform and E. coli
	2525	Escherichia coli		
	2500	Total coliforms		
SM 9223 B (Colilert®) 20th ED			20212208	Chromogenic/Fluorogenic Qualitative (Colilert®): Total Coliform and E. coli
	2525	Escherichia coli		
	2500	Total coliforms		

Solids

NWTPH-Dx			90018409	Oregon DEQ TPH Diesel Range
	9369	Diesel range organics (DRO)		
	9488	Jet Fuel		
	9499	Motor Oil		
	8641	Percent Moisture		
	9506	Residual Range Organics (RRO)		
	2050	Total Petroleum Hydrocarbons (TPH)		

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Seattle

5755 8th Street East
Tacoma, WA 98424
(Tel.) 253-922-2310
(Fax) 253-922-5047
www.testamericainc.com

STATEMENT OF QUALIFICATIONS

February 2016

SECTION 1

COMPANY OVERVIEW

1.1 TestAmerica Overview

TestAmerica is the leading environmental testing firm in the United States, including over 80 laboratories and service centers. TestAmerica provides innovative technical expertise and comprehensive analytical testing services. Specialty analyses include source, ambient and indoor air, water quality and aquatic toxicity, compliance, desalination, shale gas, specialty organics, emergency response, industrial hygiene, dioxins, drinking water, sediments and tissues, PPCPs and emerging contaminants, explosives, Federal/DoD, and radiochemistry and mixed waste testing.

TestAmerica affiliate companies include EMLab P&K, the leader in analytical microscopy and indoor air quality; QED Environmental Systems, Inc., the leading supplier of groundwater sampling equipment and remediation pumping systems; and TestAmerica Air Emissions Corp. (METCO Environmental), specializing in air emissions testing. TestAmerica currently employs nearly 2,800 professionals dedicated to exceptional service and solutions for our clients' environmental testing needs.

Seattle – Customer Assistance

Kris Allen, Manager of Project Management	At the Lab – Tacoma, WA
Rob Greer, Project Manager	Telephone: 253-922-2310
Sarah Murphy, Project Manager	Fax: 253-922-5047
Christabel Escarez, Project Manager	
Wendy Jonas, Project Manager	
Kim Presley, Project Manager Assistant	
Cathy Gamble, Project Manager Assistant	
Kelsey DeVries, Project Manager Assistant	
Diane Vance, Sample Receipt Supervisor	
Steve Gonzales, Portland Service Center Manager	
Kathy Kreps, PNW Client Relations Manager	

1.2 SEATTLE LABORATORY

The Seattle Laboratory began operating as a small environmental testing laboratory in 1985 as Sound Analytical Services, a laboratory that originally specialized in the analysis of transformer oils for PCB content. The laboratory quickly developed a reputation for providing high-quality, cost-effective analytical services and demand for its services led to expansion into UST testing programs, wastewater and groundwater analyses, and hazardous waste characterization. In 1990, the laboratory moved into a new, 15,000 square foot facility and shortly after became one of the first laboratories to be accredited by the Washington State Department of Ecology.

In March of 2001, continued growth lead the company to move into a new 20,000 square foot, custom-designed laboratory facility in Tacoma. In October of 2001, Severn Trent Laboratories acquired Sound Analytical to expand its service offerings to the Pacific Northwest and Alaska. The laboratory became known as STL Seattle. After the merger of STL with TestAmerica in 2007, the laboratory name changed to TestAmerica Tacoma.

It is our objective to be acknowledged as an organization that provides services and deliverables with the qualities of responsiveness, trust worthiness, resourcefulness, timeliness, economy, accuracy and professionalism. The laboratory is NELAP certified in the states of Oregon and California, holds state certifications in Washington, Alaska and Montana, is approved through several client audit programs and has been approved for work under the Federal DoD program, as confirmed by our DoD ELAP and ISO/IEC 17025:2005 Laboratory Accreditation.

TestAmerica Seattle	Fiscal Yr 2014 Revenues	Size (ft^2)	Full Time Employees	Major Equipment Summary			
				GC	GC/MS	AA/HG	ICP/ ICPMS
TestAmerica Laboratories, Inc. 5755 8th Street East Tacoma, WA 98424 Tel. 253-922-2310 Fax. 253-922-5047	$4.5M	20,000	35	14	17	2	3

1.3 CAPABILITIES

The Seattle laboratory utilizes the analytical QA/QC and reporting protocols of the U.S. EPA, SW-846, NELAP and the DoD QSM. Our primary services include full organic, inorganic and geotechnical analyses of water, soil, sediment, biota and hazardous waste. We analyze waste materials for profiling and disposal, including F-listed solvent analyses and have successfully provided analyses for ongoing waste profiling programs (one for over 18 years) and large scale drum removal projects. Many of our clients come to us because of our expertise in pesticide analysis, metals analysis, sediments, waste or simply because our project managers can discuss technical issues and accurately transmit that information to the laboratory staff. Over the last 20 years, the TestAmerica Seattle laboratory has supported government and commercial clients with environmental analyses that meet project requirements at a cost-effective price.

Expertise is a quality you need in your analytical laboratory service provider. Our services are designed to fulfill the requirements of major federal and state environmental programs in various areas of work:

- Washington State Model Toxics Control Act (MTCA)
- Washington State Sediment Management Standards (SMS) and Dredge Material Management Protocols (DMMP)
- Oregon/Washington Joint Source Control Strategy (JSCS) Guidelines
- Pacific Northwest Sediment Evaluation Framework (SEF)
- Clean Water Act (CWA)
- Resource Conservation and Recovery Act (RCRA)
- Toxic Substances Control Act (TSCA)
- Federal DoD Quality Systems Management (QSM)
- Underground Storage Tank (UST) Guidelines in Washington, Oregon, Alaska and Montana

1.4 CAPACITY

Forecasting is critical to our success. Environmental analysis always seems to include ups and downs in workflow into a laboratory. We understand that, even with the best intentions, it is not always feasible to schedule workloads with a laboratory. In cases where there is a large project over a small timeframe, we would appreciate as much heads-up as possible. However, we have a lot of measures in place to deal with excess capacity and still meet a client's needs.

The Seattle Laboratory has the capacity to analyze thousands of samples per month. TestAmerica Seattle constantly monitors commitments made by our laboratory using a sophisticated forecasting database. We can reserve capacity by shifting work to other TestAmerica laboratories or by shifting the work focus of cross-trained staff. By tapping into our national network, we can ensure that the personnel necessary to perform the scope of work will be available.

The following table provides estimated monthly capacity for a variety of analyses performed at the Seattle laboratory.

Routine Analyses

Functional Area	Test	Weekly Capacity	Monthly Capacity
Metals	ICP (6010B/200.7)	400	2000
	ICPMS (6020/200.8)	400	2000
	CVAA-Mercury (245.1/245.5/7470/7471)	300	1500
Wet Chemistry	Various Methods	1160	6050
Gas Chromatography VOC	TPH-GRO (8015B, NWTPH, AK)	300	1200
Gas Chromatography SVOC	TPH-DRO (8015B, NWTPH, AK - Extractable Hydrocarbons)	400	1600
	Pesticides/PCBs (8081A/8082/608)	300	1200
Mass Spectroscopy	VOCs (8260B/624)	500	2000
	SVOCs (8270C/625)	200	800
	Herbicides (8151A)	100	400
	Organotins (Krone)	100	400

SECTION 2

SERVICE

2.1 PROJECT MANAGEMENT

It is our standard practice to assign a single point of contact (i.e. Project Manager) to each of our clients. The Project Manager is supported by a team of experienced laboratory managers to plan, coordinate, integrate and monitor project activities. Efficient and effective project management is of prime importance to the successful execution of any contract and building lasting client relationships. Our Project Managers are involved from project start to finish: from the time of initial client contact; in dialogue with the client during the entire project; and available to answer questions or provide additional information after project completion.

The Project Manager is the principal client contact and has open access to all technical and management positions to obtain technical expertise and/or resolve resource management and scheduling issues on behalf of the client. The Project Manager will:

- Respond to the client in a timely manner to all requests
- Provide pricing and technical information
- Interface with project personnel to plan and schedule sample shipments to the laboratory
- Organize, schedule and attend project meetings with the client as necessary or helpful.
- Serve as consultant for field efforts to optimize batch sizes, arrange sample shipment/receipt, provide bottles and associated materials.
- Document the client's technical requirements to the laboratory staff.
- Monitor conformance of analytical protocols, quality assurance, and data reporting with contract and technical requirements.
- Monitor costs and schedule requirements
- Secure additional laboratory capacity from other TAL facilities as necessary.

When samples are received at TestAmerica Seattle, strict chain of Custody procedures are followed and documented. Any inconsistencies are immediately brought to the attention of the Project Manager for resolution with the client. The resolution is documented in a Sample Discrepancy Report (SDR).

TestAmerica Project Managers and laboratory Section Managers have a commitment to maintain project schedules with a goal of 100% on-time delivery of quality data packages. If at any time, a delay in the required project turnaround time is anticipated, the Project Manager will immediately contact the client and inform them of the nature of the problem, the corrective action taken and a revised delivery date for the analytical data report.

Normal office hours are 8:00 am to 5:00 pm, Monday through Friday. Sample receipt and laboratory working hours are flexible. Seattle accepts sample shipments Monday through Friday, and Saturdays during the Summer and Fall. After or before hours delivery should be pre-arranged with your Project Manager. TestAmerica realizes that field sampling constraints may dictate a project schedule and are adept at adjusting our

schedule to meet the client's needs. Advance notice for weekend receipt is requested to ensure that the appropriate laboratory personnel are available. Should a project require after-hours contact, telephone numbers for the appropriate TestAmerica personnel can be provided.

2.2 DATA MANAGEMENT

TestAmerica's facilities have extensive experience in producing data deliverables that are compliant with the respective federal, state, and project requirements. TestAmerica can provide various types of data reporting based upon a project's needs.

A Standard report typically includes a Case Narrative, Executive Summary, Method Number, Chain of Custody and Sample Summary, Analytical results by sample and a QC section with results for the Method Blank, LCS and any site specific Matrix Spike / Spike Duplicates if submitted. A Level IV or Expanded report includes the items listed for a standard report as well as the shipping documents, and raw data including instrument printouts and chromatograms.

Electronic Data Deliverables (EDDs) are provided to numerous government and commercial clients. EDDs can be provided in TestAmerica's standard format, or can be customized to meet client requirements. EDDs can be transferred on diskette, CD, via e-mail or across the web through our TotalAccess system. We currently provide EDDs in dozens of different formats that include Excel spreadsheets as well as various ASCII and DBF file formats.

While we offer a standard format, we have dozens of complex formats that are available in our LIMS system for clients to choose from. TestAmerica's EDD and Report Generation departments function to ensure that electronic data provided to the client is accurate and formatted to meet the clients' requirements. Our technical personnel are always available for consultation on producing the specific EDD for your program.

2.3 QUALITY ASSURANCE PROJECT PLAN ASSISTANCE

TestAmerica offers assistance to clients in preparing project specific Quality Assurance Plans. Our staff has written and/or assisted in writing numerous Project Specific Quality Assurance Plans for work the laboratory has performed under U.S. EPA oversight. We are knowledgeable regarding the fundamental requirements and have experience with the EPA approval process.

2.4 TotalAccess – VIEW YOUR DATA OVER THE INTERNET

Dedicated to leading the environment testing industry forward, TestAmerica is constantly striving to develop more efficient methods of information gathering and distribution. Investments in information technology have enabled TestAmerica to quickly and efficiently gather, process, and deliver sample results. This saves valuable time and money for our clients through our TotalAccess e-solutions offering.

TotalAccess allows you to track all aspects of your environment data program, rapidly – day or night, at work or on the road – through your own familiar web browser. TotalAccess can get your whole environment data program organized. It's an online resource that will make your job easier, your workflow faster, and your desktop cleaner.

TotalAccess features include:

- Real time access to your sample status and result data in our Laboratory Information Management System (LIMS).
- 24/7 availability to download your Electronic Data Deliverable (EDD) files.
- Convenient organization of all your program information in one place, categorized the way you want it.
- Instant archiving of all documents for secure storage and fast retrieval.
- Dynamic interactive capabilities, enabling you to query and trend data.
- Access to analytical capabilities and methodologies to help you select the best procedures for performing your work.
- Access to lists of Certification programs detailing which TestAmerica laboratories perform work under these programs.
- Online access to your invoices and quotes.
- Ability to compare data results to the regulatory limits.

SECTION 3

DEDICATION

3.1 KEY PERSONNEL

TestAmerica Seattle Laboratory prides itself on the quality of its personnel. The dedicated staff of experienced professional chemists and technicians is the key element in the laboratory's position as a leader in environmental analytical chemistry. The majority of staff have a Bachelors Degree or higher in Chemistry, Biology, Environmental Science or another related field. The section immediately below describes the qualifications and experience of our key management personnel. An Organization Chart is also provided below.

Laboratory Director, Dennis Bean

Mr. Bean has an M.S. in Chemistry from University of Wisconsin - Madison and over 25 years of experience in the environmental laboratory industry that includes extensive GCMS technical knowledge, IT and laboratory information management (LIMS) development, training and implementation experience. As Laboratory Director he holds a management/ leadership position with full profit and loss responsibility for the Seattle facility. Mr. Bean's first 14 years (with a TestAmerica predecessor company) were spent performing GCMS analysis, managing the VOC and SVOC departments, developing methods, evaluating technologies and training. He then became the Operations Manager for the Seattle laboratory. Mr. Bean was promoted into a corporate role which included leading the company-wide LIMS implementations and corporate initiatives. Mr. Bean's extensive depth of technical expertise enables him to support our clients more complex projects.

Quality Assurance Manager, Terri Torres

Ms. Torres has a BS in Biology from The Evergreen State College in Olympia, WA and 21 years experience in the analytical services field. This experience includes a wide variety of both organic and inorganic analysis as well as 3 years previously as Quality Assurance Manager for this lab. Her instrumentation experience includes GS/MS, GC, AA, ICAP, IR, and auto-analyzers. Ms. Torres' diversified experience has provided her with broad-based familiarity with regulatory protocols and methodologies including WA State DOE, State of CA DOH, NELAP, US Army Corps of Engineers, US Navy, and others. Previously as a project manager, Ms. Torres was the primary point-of-contact for her clients. She has particular expertise in computer systems and is involved in LIMS implementation.

Client Relations Manager, Kathy Kreps

Ms Kreps has a BA in Chemistry from Whitman College, Walla Walla, WA. She has 38 years of environmental laboratory experience and is the Client Relations Manager, a senior level operations position with responsibility for business development, technical sales, proposals, quotes, forecasting and market segment evaluations and strategies. In this position, Ms. Kreps also interacts with internal and external clients and is technical liaison for projects, planning and addressing issues. She possesses skills in proposal writing, project management, data validation, method development and evaluation, troubleshooting, consulting and SOP writing and editing. She is well versed in current hazardous waste regulations, including RCRA and TSCA, and their associated analytical requirements. Previously held positions include Laboratory Director and Laboratory Manager for over 18 years. She was initially employed as a chemist, performing GC,

HPLC, AA, ICPMS, wet chemistry techniques and process chemistry, and spent time in project management for a wide variety of projects involving full laboratory services for private and government contracts including AFCEE, NFESC, EPA and USACE.

Manager of Project Management, Kristine Allen

Ms. Allen holds a BS in Chemistry from San Jose State University and an MBA from Santa Clara University. She has over 16 years of experience as a chemist as well as project management experience in the pharmaceutical industry. She was a Project Manager at this lab for 2 years before being promoted to Manager of Project Management. Ms. Allen maintains her project management role for a number of clients as well as providing supervision for Project Managers in TestAmerica Seattle and the Pacific Northwest regional labs and service centers. Her clients appreciate her responsiveness, organization and seasoned problem-solving approach to all facets of project management.

Metals and Inorganics Department Manager, Stan Palmquist

Mr. Palmquist has a BS in Chemistry from the University of Puget Sound, Tacoma, WA and over 39 years of experience in the environmental laboratory industry that includes various responsibilities from analyst to supervisor to business owner. He has extensive experience in the analysis of petroleum products, hazardous materials, soils, and wastewater. He has over 20 years experience in the operation and maintenance of AA, ICP, and ICPMS instrumentation for the analysis of trace metals. In addition to his operational lab duties, Mr. Palmquist is also responsible for the laboratory's environmental health and safety program and for waste management. He previously held positions as Operations Manager/Owner of Sound Analytical Services before it was acquired as TestAmerica Seattle and as Laboratory Manager and Refinery Chemist.

Semi-Volatile Organics Department Manager, Joan Protasio

Ms. Protasio holds a BA in Molecular and Cell Biology from the University of California, Berkeley. She oversees the daily activities of the semivolatile and extractions departments. Her duties include ensuring on-time data delivery and method compliance as well as liaison with QA and project management departments, method development and new technology implementation. In addition to her supervisory responsibilities, she also keeps herself proficient in GC and GCMS Semivolatile analyses. She has over 11 years of experience as an analytical chemist in the biotech and environmental industries.

Volatile Organics Department Manager, Bisrat Tadesse

Mr. Tadesse holds an MBA in Technology Management from the University of Phoenix and a BS in Molecular Biology from the University of Washington, Seattle, Washington. He has over 15 years of analytical experience including organic and inorganic analyses, including GCMS semivolatiles, petroleum hydrocarbons, demand, organic carbon, metals, polychlorinated biphenyls and pesticides. Mr. Tadesse's current responsibilities include ensuring on-time data delivery, method and QA compliance, purchasing of all supplies, hiring of staff, ongoing training, employee reviews, collaborating with analysts, project managers and clients to ensure project cohesiveness, managing all samples from time of receipt until time of disposal. He also performs GCMS volatiles analysis, maintenance, peer review of data and troubleshooting instrument issues.

Semivolatile Extractions Department Supervisor, Jerod Romine

Mr. Romine holds a BS in Biology from Truman State University and has a year of experience at TestAmerica. He has developed a depth of knowledge of a range of organic extraction methods and is well respected for his troubleshooting ability and productivity. He is responsible for the daily operations of semi-volatile extractions

department, hiring of staff, ongoing training, employee reviews, collaborating with analysts, project managers and clients to ensure project cohesiveness, managing all samples from time of receipt until time of disposal.

Sample Control Supervisor, Diane Vance
Ms. Vance has an A.A.S. in Water & Environmental Technology and has over one year of experience with TestAmerica. She is responsible for the accurate receipt and computer log-in of samples received by the laboratory. She is also responsible for the daily operations of the Sample Control department, including purchasing of all sample containers and shipping supplies, hiring of staff, ongoing training, employee reviews, coordination of courier services, collaborating with analysts, project managers and clients to ensure project cohesiveness, managing all samples from time of receipt until time of disposal, managing subcontracting of analyses to outside laboratories, distributing samples to correct cold storage units, managing client bottle orders for completion and shipping, generating monthly report of sample totals for senior management and monitoring daily temperatures of the refrigerated storage units.

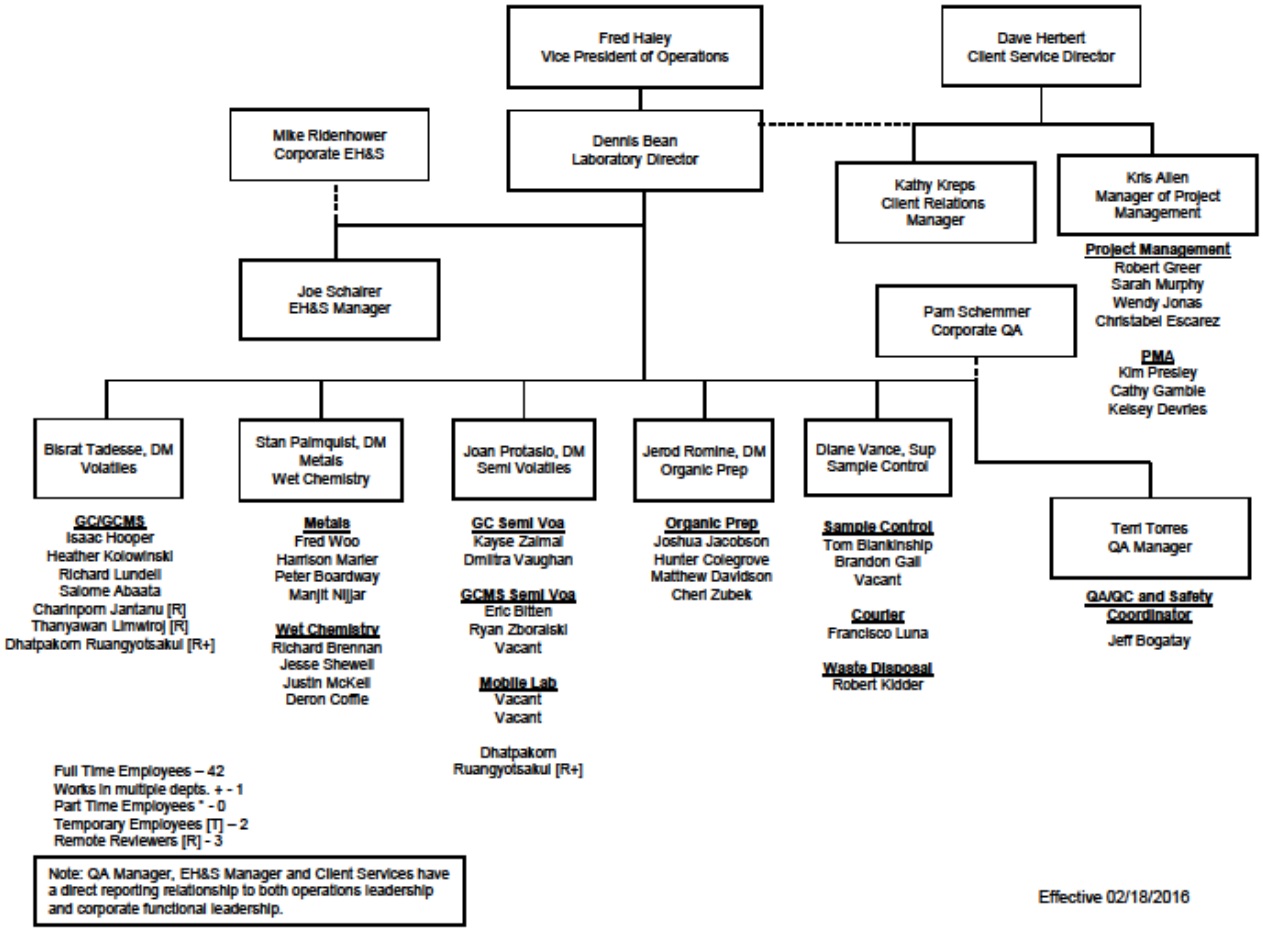
Project Manager, Robert Greer
Mr. Greer has a BA in Environmental Science from Purchase College, SUNY and over 16 years in the environmental laboratory industry. Mr. Greer has an extensive customer service background and is committed to being thorough and responsive. Pairing this with his analytical science background enables him to successfully work with clients to coordinate all facets of their projects.

Project Manager, Christabel Escarez
Ms. Escarez has over five years experience in the environmental industry and holds a BA in Biology from Lewis & Clark College, Oregon. Her environmental laboratory experience has been primarily as an ICPMS metals analyst. Additionally, she has over ten years of experience in roles dedicated to community and client engagement.

Project Manager, Wendy Jonas
Ms. Jonas has a B.A. in Environmental Health and Policy from Evergreen State College. She joined TestAmerica in April of 2015. Ms. Jonas has brought over 20 years of experience in the environmental industry with certifications in hazardous material coordination, Certified Erosion and Sediment Control Lead (CESCL), in addition to being a low impact development consultant paired with customer service relations. Ms. Jonas also has worked in a laboratory as a microbiologist and wet chemistry technician in addition to quality control which provides a basis for her communication with her clients regarding their analytical data. She has an embedded knowledge of the legislative system which has allowed her the ability to discuss policy and permit changes for municipalities and private industries.

Project Manager, Sarah Murphy
Ms. Murphy has a BS in Social Science and Interdisciplinary Studies from Sacramento State University. She has over five years experience with analytical laboratories and previous five years of experience with an engineering firm in the environmental industry. Ms. Murphy's project and client oriented background supports her customer service focus. Her clients praise her thorough and responsive project management.

Seattle Laboratory Organizational Chart



3.2 HEALTH AND SAFETY

TestAmerica's Management is committed to providing a work environment that is free of recognized environment safety and health hazards. It is TestAmerica's policy, and is fundamental to our management principles, that all work will be conducted in a manner that is safe to the employee, the community and the environment. By empowering each TestAmerica employee with the right, the responsibility, and the resources to make safe decisions, we ensure the success of our health and safety programs.

TestAmerica recognizes that health and safety is a team effort. Safety originates at the highest level of management. However, every employee, regardless of position is expected to assume responsibility for their actions and the actions of others around them. Adherence to Environment Health and Safety procedures is mandatory for every TestAmerica employee and is considered an integral part of each employee's performance.

The Corporate Safety Manual is the primary component of the Hazard Communication/Waste Management Plan for TestAmerica. For regulatory purposes this document serves as the Chemical Hygiene Plan for laboratory activities and the Hazard Communication Program for non-laboratory activities. This document incorporates responsibilities, procedures, protective equipment as well as facility requirements for our operations.

3.3 DISASTER RECOVERY PLAN SUMMARY

In case of a major natural catastrophe, client approved TestAmerica laboratory facilities would be available to provide project continuity and to meet sample holding time or critical project schedule requirements. In the event of instrument failure, portions of the sample load may be diverted to duplicate instrumentation within the facility. In some instances, an alternate approved technique such as manual colorimetric determination in lieu of an automated determination can be accommodated. At the client's direction or approval, samples can also be shipped to another properly certified and approved TestAmerica location for analysis. Detailed procedures for emergency circumstances and a description of emergency systems are located in the TestAmerica Corporate Safety Manual.

SECTION 4

QUALITY

4.1 QA/QC OVERVIEW

An integral part of TestAmerica's successful experience with its clients is the corporate and local commitment to provide quality services. This attitude towards Quality Assurance/Quality Control (QA/QC) is maintained through all of the divisions and departments at TestAmerica. The Seattle laboratory maintains a quality assurance program that is outlined in the laboratory's Quality Assurance Manual and managed by Terri Torres.

TestAmerica Seattle is approved through Oregon and California for the National Environmental Laboratory Accreditation Program (NELAP). TestAmerica's Corporate QA staff work to ensure consistency and uniformity of compliance to the NELAC standard for all our laboratories. TestAmerica Seattle has also been assessed by L-A-B and meet the requirements of the ELAP DoD.

The Quality Assurance Department at TestAmerica Seattle is comprised of professionals experienced in analytical laboratory techniques and quality assurance objectives. This department initiates and oversees audits, corrective action procedures, performs data review, maintains documentation of internal laboratory training, review Quality Assurance Plans for consistency with laboratory operations, tracks and monitors performance evaluation samples, document control, and Method Detection Limits (MDLs). In addition, the preparation of operating practices and quality assurance documentation for the laboratory is coordinated through the QA personnel.

4.2 STANDARD OPERATING PROCEDURES

TestAmerica Seattle maintains extensive documentation of Standard Operating Procedures (SOPs). We understand the need for SOP compliance and perform internal audits to assure that the laboratory staff adheres to the written SOPs, complies with accreditation/certification requirements and meets project objectives. The audit types and frequency are outlined in the Quality Assurance Manual and are scheduled by the QA/QC department.

4.3 CLIENT CONFIDENTIALITY & PROPRIETARY RIGHTS

Data and sample materials provided by the client or at the client's request, and the results obtained by TestAmerica, are held in confidence subject to any disclosure required by law or legal process. TestAmerica's reports and the data and information provided therein, are for the exclusive use and benefit of the client, and are not released to a third party without written consent from the client.

4.4 RECORD RETENTION & ARCHIVAL

TestAmerica Seattle has developed a formal record retention policy that is outlined in the Laboratory's Quality Assurance Manual and in the corporate Record Retention Policy. These documents outline the period of time various record types must be archived. Archives are indexed such that records are accessible on either a project or temporal basis. Archives are protected against fire, theft, loss, deterioration and vermin. Electronic records are protected from deterioration caused by magnetic fields and/or electronic deterioration. Access to archives is controlled and documented.

4.5 LABORATORY QAM

TestAmerica Seattle Quality Assurance Manual (QAM) is a document prepared to define the overall policies, organization objectives and functional responsibilities for achieving TestAmerica's data quality goals. Each TestAmerica laboratory maintains a local perspective in its scope of services and client relations and maintains a national perspective in terms of quality.

The QAM has been prepared to assure compliance with the 2003 National Environmental Laboratory Accreditation Conference (NELAC) standards and International ANS/ISO/IEC Standard 17025:2005. In addition, the policies and procedures outlined in this manual are compliant with TestAmerica's Corporate Quality Management Plan (CQMP) and the various accreditation and certification programs. The CQMP provides a summary of TestAmerica's quality and data integrity system. It contains requirements and general guidelines under which all TestAmerica facilities shall conduct their operations.

4.6 AUDIT AND PERFORMANCE PROGRAMS

TestAmerica Seattle participates in numerous federal, state, and industrial audit and performance sample programs for organic and inorganic analyses, including regular participation in the following performance studies:

- DMR-QA (supplied by client)
- Environmental Resource Associates (ERA) WS/WP/SW (2x yearly)
- U.S. Army Corps of Engineers (double blinds, as required for projects)
- Various Client Specific Programs

4.7 STATE CERTIFICATIONS AND AGENCY APPROVALS

TestAmerica Seattle's list of current state certifications, registrations and agency approvals is provided below.

The certificates and parameter lists (which may differ) for each organization may be found on TestAmerica's website www.testamericainc.com and on TotalAccess.

Organization	Lab ID Number
DoD ELAP	L2236
ISO 17025	L2236
Alaska	UST-022
California (ELAP)	2901
Montana	(UST – no number)
Oregon (NELAP)	WA100007
Washington	C553
USDA Soil Permit	P330-14-00126
USFWS Tissue Import Permit	LE058448-0

SECTION 5

EXPERIENCE

5.1 PROJECT EXPERIENCE

The Seattle laboratory has provided environmental chemical analyses for over 25 years. The management staff has worked together as a team for approximately 12 years, creating an organization with in-depth experience, extensive knowledge of the environmental field, and a high level of internal cooperation. Developing productive, on-going relationships with our clients is the cornerstone of our success. TestAmerica's client base is widely varied; some of the types of clients and projects we serve are listed below.

Government Project Experience

Client	Date	Project Highlights
USACE Alaska District JBER	2004 to Present	TestAmerica Seattle is contracted by the U.S. Army Corps of Engineers, Alaska District, to provide analytical testing services in support of remediation projects at military installations in the State of Alaska. Analyses performed under this contract included volatile and semivolatile organics, Alaska fuel testing methods, pesticides, PCB's, herbicides, TCLP parameters, and metals. All work was performed in accordance with the DOD QSM with full COE-level data packages, EDF 1.2 EDDs and sometimes SEDD EDDs.
USACE FAA Bristol Environmental Remediation Services LLC	2008 to Present	TestAmerica Seattle provides analytical support on various investigation and remediation projects for federal contracts with the USACE and FAA. Soil, water & groundwater samples are analyzed for volatiles, semivolatiles, Alaska TPH methods, metals, PCBs, pesticides, EDB, NWEPH, NWVPH and TCLP parameters. Many times these analyses are provided with quick turnaround of sample results. All USACE work was performed in accordance with the DOD QSM with full COE-level data packages and EDF 1.2 EDDs and SEDD EDDs. Full Level IV reporting is provided for FAA projects.
USEPA Ecology & Environment, Inc. START Emergency Response	2000 to Present	For over ten years, TestAmerica Seattle has provided ongoing analytical support for this client's contracts with USEPA and other federal and state agencies. We provide emergency response services through the START program. We have also performed on ARRA-funded projects. The full range of the laboratory's capabilities have been employed on sample matrices ranging from soil and water to vegetation, aquatic species, wipe samples, concrete cores, and hazardous waste. CLP-type data packages and SEDD electronic deliverables are provided.

Industrial Project Experience

Client	Date	Project Highlights
BP Innovex Environmental Management, Inc.	2014 to Present	TestAmerica Seattle provides analytical support for water and soil matrices for a confidential oil client. Samples are typically analyzed for volatiles, TPH, including EPH/VPH, metals, PAHs, TOC and Geochemistry. Special cleanups and TPH anlayte lists are involved. Involves special sample preparation including sample sieving, metals digestion and metals analysis. Results are provided in Level II reports.
Chevron Conoco-Phillips Arcadis US, Inc	2006 to Present	Quarterly groundwater monitoring for Metals, Volatile Organics, PAH, and TPH. Other Soil and Groundwater projects also included Pesticides, PCB, and general chemistry analyses, Project requirements include modified procedures to meet the low reporting limit requirements of the Portland Harbor Joint Source Control Strategy (JSCS).
Stericycle Environmental Solutions TSD Facilities	2005 to present	TestAmerica Seattle provides analytical services for the TSD plant discharges and RCRA analysis of hazardous waste samples for profiling. Quick turnaround of sample results (same day for plant discharge samples and 3 day TAT for others). Rapid delivery of results from TestAmerica Seattle helps the client meet their discharge requirements and maintain 24-hour operation.
Pierce County Recycling, Compost and Disposal	2005 to present	TestAmerica Seattle provides analytical support on wastewater discharges. Samples are analyzed for 625, total and amenable cyanides, BOD, Hexavalent chromium, O&G, TSS, ammonia, mercury and metals by 6020. We provide Level II reports.
Intel Corporation	2003 to Present	Analysis of wastewater for Volatile, PAH, Pesticides, Fuels, Metals, and Anions. Modified sample preparation and analysis procedures allow lower than normal reporting limits.

OREGON

Environmental Laboratory Accreditation Program

NELAP Recognized

TestAmerica Seattle

WA100007

5755 8th Street East

Tacoma,WA 98424

IS GRANTED APPROVAL BY ORELAP UNDER THE 2009 TNI STANDARDS, TO PERFORM ANALYSES ON ENVIRONMENTAL SAMPLES IN MATRICES AS LISTED BELOW :

Air	*Drinking Water*	*Non Potable Water*	*Solids and Chem. Waste*	*Tissue*
	Chemistry	Chemistry	Chemistry	

AND AS RECORDED IN THE LIST OF APPROVED ANALYTES, METHODS, ANALYTICAL TECHNIQUES, AND FIELDS OF TESTING ISSUED CONCURRENTLY WITH THIS CERTIFICATE AND REVISED AS NECESSARY.

ACCREDITED STATUS DEPENDS ON SUCCESSFUL ONGOING PARTICIPATION IN THE PROGRAM AND CONTINUED COMPLIANCE WITH THE STANDARDS.

CUSTOMERS ARE URGED TO VERIFY THE LABORATORY'S CURRENT ACCREDITATION STATUS IN OREGON.

Gary K. Ward

Gary K. Ward, MS

Oregon State Public Health Laboratory

ORELAP Administrator

3150 NW. 229th Ave, Suite 100

Hillsboro, OR 97124

ISSUE DATE: 11/07/2015

EXPIRATION DATE: 11/06/2016

Certificate No: WA100007 - 011

Oregon

Environmental Laboratory Accreditation Program

Department of Agriculture, Laboratory Division
Department of Environmental Quality, Laboratory Division
Oregon Health Authority, Public Health Division

NELAP Recognized

ORELAP Fields of Accreditation

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TestAmerica Seattle

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MATRIX : Drinking Water

Reference	Code	Description
EPA 504.1	**10082607**	**EDB/DBCP/TCP micro-extraction, GC/ECD**

Analyte Code	*Analyte*
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)

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MATRIX : Non-Potable Water

Reference	Code	Description
EPA 1020A	**10117007**	**Ignitability Setaflash Closed-cup Method**

Analyte Code	*Analyte*
1780	Ignitability

Reference	Code	Description
EPA 120.1	**10006209**	**Conductance - Specific @ 25 C**

Analyte Code	*Analyte*
1610	Conductivity

Reference	Code	Description
EPA 130.2	**10007202**	**Hardness - Titrimetric, EDTA**

Analyte Code	*Analyte*
1750	Hardness

Reference	Code	Description
EPA 1311	**10118806**	**Toxicity Characteristic Leaching Procedure**

Analyte Code	*Analyte*
8031	Extraction/Preparation

Reference	Code	Description
EPA 1312	**10119003**	**Synthetic Precipitation Leaching Procedure**

Analyte Code	*Analyte*
8031	Extraction/Preparation

Reference	Code	Description
EPA 150.1	**10008409**	**pH - Electrometric Measurement**

Analyte Code	*Analyte*
1900	pH

Reference	Code	Description
EPA 160.1	**10009208**	**Total Dissolved Solids, dried @ 180 C.**

Analyte Code	*Analyte*
1955	Residue-filterable (TDS)

Reference	Code	Description
EPA 160.2	**10009606**	**Total Suspended Solids, 0.2um dried @105C**

Analyte Code	*Analyte*
1960	Residue-nonfilterable (TSS)

Reference	Code	Description
EPA 160.3	**10010001**	**Total Solids, dried @ 103-105 C.**

Analyte Code	*Analyte*
1950	Residue-total

Reference	Code	Description
EPA 160.5	**10010603**	**Settleable solids**

Analyte Code	*Analyte*
1965	Residue-settleable

Reference	Code	Description
EPA 1664A (HEM)	**10127807**	**N-Hexane Extractable Material (Oil and Grease) by Extraction and Gravimetry**

Analyte Code	*Analyte*
1803	n-Hexane Extractable Material (O&G)
2050	Total Petroleum Hydrocarbons (TPH)

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EPA 180.1 2 **10011800** **Turbidity - Nephelometric**

Analyte Code	*Analyte*
2055	Turbidity

EPA 200.7 5 **10014003** **ICP - metals**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1760	Hardness (calc.)
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1990	Silica as SiO2
1145	Silicon
1150	Silver
1155	Sodium
1160	Strontium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

EPA 200.8 5.5 **10014809** **Metals by ICP-MS**

Analyte Code	*Analyte*
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1040	Chromium
1050	Cobalt
1055	Copper
1075	Lead
1090	Manganese
1100	Molybdenum
1105	Nickel
1140	Selenium
1150	Silver
1160	Strontium
1165	Thallium
1180	Titanium
3035	Uranium
1185	Vanadium

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Analyte Code	*Analyte*
1190	Zinc

EPA 245.1 3 **10036609** **Mercury by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 300.0 2.1 **10053200** **Methods for the Determination of Inorganic Substances in Environmental Samples**

Analyte Code	*Analyte*
1540	Bromide
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1820	Nitrate-nitrite
1840	Nitrite as N
2000	Sulfate

EPA 3005A **10133207** **Acid Digestion of waters for Total Recoverable or Dissolved Metals**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3010A **10133605** **Acid Digestion of Aqueous samples and Extracts for Total Metals**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 310.1 **10054805** **Alkalinity as CaCO3**

Analyte Code	*Analyte*
1505	Alkalinity as CaCO3

EPA 335.4 1.0 **10061402** **Methods for the Determination of Inorganic Substances in Environmental Samples**

Analyte Code	*Analyte*
1635	Cyanide

EPA 350.1 2 **10063602** **Ammonia Nitrogen - Colorimetric, Auto Phenate**

Analyte Code	*Analyte*
1515	Ammonia as N

EPA 3510C **10138202** **Separatory Funnel Liquid-liquid extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3520C **10139001** **Continuous Liquid-liquid extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 353.2 **10067206** **Nitrate/Nitrite Nitrogen - Automated, Cadmium**

Analyte Code	*Analyte*
1810	Nitrate as N
1820	Nitrate-nitrite
1840	Nitrite as N

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EPA 3610B **10144602** **Alumina Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3620B **10145809** **Florisil Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3630C **10146802** **Silica gel cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 365.1 **10069600** **Phosphorous - Colorimetric, Automated persulfate**

Analyte Code	*Analyte*
1870	Orthophosphate as P

EPA 365.1 2 **10070005** **Phosphorous - Colorimetric, Automated persulfate**

Analyte Code	*Analyte*
1910	Phosphorus, total

EPA 3660B **10148400** **Sulfur cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3665A **10148808** **Sulfuric Acid / permanganate Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 405.1 **10075602** **Biochemical Oxygen Demand (5 days @ 20 C).**

Analyte Code	*Analyte*
1530	Biochemical oxygen demand

EPA 410.2 **10076401** **Chemical Oxygen Demand - Titrimetric (low-level).**

Analyte Code	*Analyte*
1565	Chemical oxygen demand

EPA 415.1 **10078407** **Organic carbon - Combustion or Oxidation**

Analyte Code	*Analyte*
2040	Total organic carbon

EPA 5030B **10153409** **Purge and trap for aqueous samples**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 6010B **10155609** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony

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Analyte Code	*Analyte*
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1760	Hardness (calc.)
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1990	Silica as SiO2
1145	Silicon
1150	Silver
1155	Sodium
1160	Strontium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

EPA 6010C **10155803** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1760	Hardness (calc.)
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1990	Silica as SiO2
1145	Silicon
1150	Silver
1155	Sodium
1160	Strontium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium

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Analyte Code	*Analyte*
1190	Zinc

EPA 6020 **10156000** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1040	Chromium
1050	Cobalt
1055	Copper
1075	Lead
1090	Manganese
1095	Mercury
1100	Molybdenum
1105	Nickel
1140	Selenium
1150	Silver
1160	Strontium
1165	Thallium
1180	Titanium
3035	Uranium
1185	Vanadium
1190	Zinc

EPA 6020A **10156408** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1040	Chromium
1050	Cobalt
1055	Copper
1075	Lead
1090	Manganese
1095	Mercury
1100	Molybdenum
1105	Nickel
1140	Selenium
1150	Silver
1160	Strontium
1165	Thallium
1180	Titanium
3035	Uranium
1185	Vanadium
1190	Zinc

EPA 608 **10103603** **Organochlorine Pesticides & PCBs by GC/ECD**

Analyte Code	*Analyte*
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)

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Analyte Code	*Analyte*
7240	alpha-Chlordane
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
8912	Aroclor-1262 (PCB-1262)
8913	Aroclor-1268 (PCB-1268)
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

EPA 624 **10107207** **Volatile Organic Compounds by purge and trap GC/MS**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4675	1,3-Dichloropropene
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4535	2-Chlorotoluene
4860	2-Hexanone
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone

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Analyte Code	*Analyte*
4320	Acetonitrile
4325	Acrolein (Propenal)
4340	Acrylonitrile
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4600	cis-1,4-Dichloro-2-butene
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
9375	Di-isopropylether (DIPE)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4840	Hexachloroethane
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4900	Isopropylbenzene
5240	m+p-xylene
4925	Methacrylonitrile
4940	Methyl acetate
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4965	Methylcyclohexane
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4425	n-Butyl alcohol (1-Butanol, n-Butanol)
4435	n-Butylbenzene
5090	n-Propylbenzene
5250	o-Xylene
4440	sec-Butylbenzene
5100	Styrene
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5120	Tetrahydrofuran (THF)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
4605	trans-1,4-Dichloro-2-butene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride
5260	Xylene (total)

EPA 625 **10300002** **Base/Neutrals and Acids by GC/MS**

Analyte Code	*Analyte*
5155	1,2,4-Trichlorobenzene
4610	1,2-Dichlorobenzene
4615	1,3-Dichlorobenzene

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Analyte Code	*Analyte*
4620	1,4-Dichlorobenzene
6380	1-Methylnaphthalene
4659	2,2'-Oxybis(1-chloropropane)
6735	2,3,4,6-Tetrachlorophenol
6738	2,3,4-Trichlorophenol
6740	2,3,5,6-Tetrachlorophenol
6742	2,3,5-Trichlorophenol
6830	2,3,6-Trichlorophenol (4C)
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
6412	3 & 4 Methylphenol
5945	3,3'-Dichlorobenzidine
6818	3,4,5-Trichlorophenol
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
5545	Aniline
5555	Anthracene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5670	Butyl benzyl phthalate
5680	Carbazole
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene

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Analyte Code	*Analyte*
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
6665	Pyrene
5095	Pyridine

EPA 7196A **10162400** **Chromium Hexavalent colorimetric**

Analyte Code	*Analyte*
1045	Chromium VI

EPA 7470A **10165807** **Mercury in Liquid Waste by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 7471A **10166208** **Mercury in Solid Waste by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 8000B **10172200** **Determinative Chromatographic Separations**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 8011 **10173009** **1,2-Dibromoethane and 1,2-Dibromo-3-chloropropane by Microextraction and GC/ECD**

Analyte Code	*Analyte*
5180	1,2,3-Trichloropropane
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4580	Dibromochloropropane

EPA 8015B **10173601** **Non-halogenated organics using GC/FID**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
9408	Gasoline range organics (GRO)
9499	Motor Oil

EPA 8081A **10178606** **Organochlorine Pesticides by GC/ECD**

Analyte Code	*Analyte*
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)

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Analyte Code	*Analyte*
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

EPA 8081B **10178800** **Organochlorine Pesticides by GC/ECD**

Analyte Code	*Analyte*
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

EPA 8082 **10179007** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	*Analyte*
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
8912	Aroclor-1262 (PCB-1262)
8913	Aroclor-1268 (PCB-1268)

ORELAP Fields of Accreditation

ORELAP ID: WA100007
EPA CODE: WA00050
Certificate: WA100007 - 011

TestAmerica Seattle

5755 8th Street East
Tacoma WA 98424

Issue Date: 11/07/2015 ***Expiration Date:*** 11/06/2016

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EPA 8082A **10179201** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	*Analyte*
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
8912	Aroclor-1262 (PCB-1262)
8913	Aroclor-1268 (PCB-1268)

EPA 8151A **10183207** **Chlorinated Herbicides by GC/ECD**

Analyte Code	*Analyte*
8655	2,4,5-T
8545	2,4-D
8560	2,4-DB
6500	4-Nitrophenol
8555	Dalapon
8595	Dicamba
8605	Dichloroprop (Dichlorprop)
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
7775	MCPA
7780	MCPP
6605	Pentachlorophenol
8650	Silvex (2,4,5-TP)

EPA 8260B **10184802** **Volatile Organic Compounds by purge and trap GC/MS**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5182	1,2,3-Trimethylbenzene
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4535	2-Chlorotoluene
4860	2-Hexanone
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4320	Acetonitrile
4325	Acrolein (Propenal)
4340	Acrylonitrile
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4600	cis-1,4-Dichloro-2-butene
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
9375	Di-isopropylether (DIPE)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
9408	Gasoline range organics (GRO)
4835	Hexachlorobutadiene
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4900	Isopropylbenzene
5240	m+p-xylene
4925	Methacrylonitrile
4940	Methyl acetate
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4965	Methylcyclohexane
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4425	n-Butyl alcohol (1-Butanol, n-Butanol)
4435	n-Butylbenzene
5090	n-Propylbenzene
5250	o-Xylene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5120	Tetrahydrofuran (THF)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
4605	trans-1,4-Dichloro-2-butene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride

EPA 8260C **10307003** **Volatile Organics: GC/MS (capillary column)**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5182	1,2,3-Trimethylbenzene
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4535	2-Chlorotoluene
4860	2-Hexanone (MBK)
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4320	Acetonitrile
4325	Acrolein (Propenal)
4340	Acrylonitrile
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4600	cis-1,4-Dichloro-2-butene
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
9375	Di-isopropylether (DIPE)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4900	Isopropylbenzene
5240	m+p-xylene
4925	Methacrylonitrile
4940	Methyl acetate
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)

ORELAP Fields of Accreditation

ORELAP ID: WA100007
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Analyte Code	*Analyte*
5000	Methyl tert-butyl ether (MTBE)
4965	Methylcyclohexane
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4425	n-Butyl alcohol (1-Butanol, n-Butanol)
4435	n-Butylbenzene
5090	n-Propylbenzene
5250	o-Xylene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5120	Tetrahydrofuran (THF)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
4605	trans-1,4-Dichloro-2-butene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride

EPA 8270C **10185805** **Semivolatile Organic compounds by GC/MS**

Analyte Code	*Analyte*
6715	1,2,4,5-Tetrachlorobenzene
4610	1,2-Dichlorobenzene
6221	1,2-Diphenylhydrazine
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
6380	1-Methylnaphthalene
4659	2,2'-Oxybis(1-chloropropane)
6735	2,3,4,6-Tetrachlorophenol
6738	2,3,4-Trichlorophenol
6740	2,3,5,6-Tetrachlorophenol
6742	2,3,5-Trichlorophenol
6830	2,3,6-Trichlorophenol (4C)
9363	2,3-Dichloroaniline
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
6412	3 & 4 Methylphenol
5945	3,3'-Dichlorobenzidine
6818	3,4,5-Trichlorophenol
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
5545	Aniline
5555	Anthracene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5587	Benzofluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5670	Butyl benzyl phthalate
5680	Carbazole
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
6665	Pyrene
5095	Pyridine

EPA 8270C SIM **10242407** **Semivolatile Organic compounds by GC/MS Selective Ion Monitoring**

Analyte Code	*Analyte*
6380	1-Methylnaphthalene
6385	2-Methylnaphthalene
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5855	Chrysene

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Analyte Code	*Analyte*
5895	Dibenz(a,h) anthracene
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
5005	Naphthalene
6605	Pentachlorophenol
6615	Phenanthrene
6665	Pyrene

EPA 8270D **10186002** **Semivolatile Organic compounds by GC/MS**

Analyte Code	*Analyte*
6715	1,2,4,5-Tetrachlorobenzene
4610	1,2-Dichlorobenzene
6221	1,2-Diphenylhydrazine
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
6380	1-Methylnaphthalene
4659	2,2'-Oxybis(1-chloropropane)
6735	2,3,4,6-Tetrachlorophenol
6740	2,3,5,6-Tetrachlorophenol
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
6412	3 & 4 Methylphenol
5945	3,3'-Dichlorobenzidine
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
5545	Aniline
5555	Anthracene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5670	Butyl benzyl phthalate
5680	Carbazole

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Analyte Code	*Analyte*
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
6665	Pyrene
5095	Pyridine

EPA 8270D SIM **10242509** **Semivolatile Organic compounds by GC/MS Selective Ion Monitoring**

Analyte Code	*Analyte*
6380	1-Methylnaphthalene
6385	2-Methylnaphthalene
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5855	Chrysene
5895	Dibenz(a,h) anthracene
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
5005	Naphthalene
6605	Pentachlorophenol
6615	Phenanthrene
6665	Pyrene

EPA 9012A **10193405** **Total and Amenable Cyanide (automated colorimetric with off-line distillation)**

Analyte Code	*Analyte*
1510	Amenable cyanide
1645	Total cyanide

EPA 9012B **10243206** **Total and Amenable Cyanide (automated colorimetric with off-line distillation)**

Analyte Code	*Analyte*
1510	Amenable cyanide

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
1645	Total cyanide

EPA 9013 **10193609** **Cyanide Extraction Procedure for Solids and Oils**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 9040B **10197203** **pH Electrometric Measurement**

Analyte Code	*Analyte*
1900	pH

EPA 9056A **10199607** **Determination of Inorganic Anions by Ion Chromatography**

Analyte Code	*Analyte*
1540	Bromide
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1820	Nitrate-nitrite
1840	Nitrite as N
2000	Sulfate

EPA 9060 **10200201** **Total Organic Carbon**

Analyte Code	*Analyte*
2040	Total organic carbon

NWTPH-Dx **90018409** **Oregon DEQ TPH Diesel Range**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
9499	Motor Oil

NWTPH-Gx **90018603** **Oregon DEQ TPH Gasoline Range Organics by GC/FID-PID Purge & Trap**

Analyte Code	*Analyte*
9408	Gasoline range organics (GRO)

NWTPH-GX (GC/MS) **90018658** **Oregon DEQ TPH Gasoline Range Organics by GC/MS Purge & Trap**

Analyte Code	*Analyte*
9408	Gasoline range organics (GRO)

NWTPH-HCID **90013200** **Oregon DEQ Total Petroleum Hydrocarbon ID**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
9408	Gasoline range organics (GRO)
9499	Motor Oil

Puget Sound Estuary Program (PSEP): Conventional Sediment Variables **60006408** **PSEP: Organotins, TOC, and Sulfide**

Analyte Code	*Analyte*
5913	Dibutyltin
1206	Monobutyltin
1209	Tetrabutyltin
2040	Total organic carbon
1213	Tributyltin

ORELAP Fields of Accreditation

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SM 2130 B 20th ED	**20042404**	**Turbidity by Nephelometric Determination**

Analyte Code	*Analyte*
2055	Turbidity

SM 2130 B 21st ED	**20042608**	**Turbidity by Nephelometric Method**

Analyte Code	*Analyte*
2055	Turbidity

SM 2320 B 20th ED	**20045209**	**Alkalinity by Titration**

Analyte Code	*Analyte*
1505	Alkalinity as CaCO3

SM 2320 B 21st ED	**20045403**	**Alkalinity by Titration Method**

Analyte Code	*Analyte*
1505	Alkalinity as CaCO3

SM 2320 B-97 online	**20045607**	**Alkalinity by Titration Method**

Analyte Code	*Analyte*
1505	Alkalinity as CaCO3

SM 2340 B 20th ED	**20046202**	**Hardness by calculation**

Analyte Code	*Analyte*
1750	Hardness

SM 2340 B 21st ED	**20046406**	**Hardness by calculation**

Analyte Code	*Analyte*
1750	Hardness

SM 2340 B-97 online	**20046600**	**Hardness by calculation**

Analyte Code	*Analyte*
1750	Hardness

SM 2340 C 20th ED	**20047205**	**Hardness by EDTA Titration**

Analyte Code	*Analyte*
1750	Hardness

SM 2340 C 21st ED	**20047409**	**Hardness by EDTA Titration Method**

Analyte Code	*Analyte*
1750	Hardness

SM 2340 C-97 online	**20047603**	**Hardness by EDTA Titration Method**

Analyte Code	*Analyte*
1750	Hardness

SM 2510 B 20th ED	**20048208**	**Conductivity by Probe**

Analyte Code	*Analyte*
1610	Conductivity

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SM 2510 B 21st ED	**20048402**	**Conductivity by Probe**

Analyte Code	*Analyte*
1610	Conductivity

SM 2510 B-97 online	**20048606**	**Conductivity by Probe**

Analyte Code	*Analyte*
1610	Conductivity

SM 2520 B 20th ED	**20040055**	**Salinity by Electrical Conductivity**

Analyte Code	*Analyte*
1975	Salinity

SM 2540 B 20th ED	**20049007**	**Total Solids**

Analyte Code	*Analyte*
1950	Residue-total

SM 2540 B 21st ED	**20049201**	**Total Solids Dried at 103 - 105C**

Analyte Code	*Analyte*
1950	Residue-total

SM 2540 B-97 online	**20049405**	**Total Solids Dried at 103 - 105C**

Analyte Code	*Analyte*
1950	Residue-total

SM 2540 C 20th ED	**20050004**	**Total Dissolved Solids**

Analyte Code	*Analyte*
1955	Residue-filterable (TDS)

SM 2540 C 21st ED	**20050208**	**Total Dissolved Solids Dried at 180C**

Analyte Code	*Analyte*
1955	Residue-filterable (TDS)

SM 2540 C-97 online	**20050402**	**Total Dissolved Solids Dried at 180C**

Analyte Code	*Analyte*
1955	Residue-filterable (TDS)

SM 2540 D 20th ED	**20050800**	**Total Suspended Solids**

Analyte Code	*Analyte*
1960	Residue-nonfilterable (TSS)

SM 2540 D 21st ED	**20051007**	**Total Suspended Solids Dried at 103 - 105C**

Analyte Code	*Analyte*
1960	Residue-nonfilterable (TSS)

SM 2540 D-97 online	**20051201**	**Total Suspended Solids Dried at 103 - 105C**

Analyte Code	*Analyte*
1960	Residue-nonfilterable (TSS)

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SM 2540 F 18th ED	**20005009**	**Settleable Solids**

Analyte Code	*Analyte*
1965	Residue-settleable

SM 2540 F 20th ED	**20051803**	**Settleable Solids**

Analyte Code	*Analyte*
1965	Residue-settleable

SM 2540 F 21st ED	**20052000**	**Settleable Solids**

Analyte Code	*Analyte*
1965	Residue-settleable

SM 2540 F-97 online	**20052204**	**Settleable Solids**

Analyte Code	*Analyte*
1965	Residue-settleable

SM 3500-Cr B 20th ED	**20065809**	**Chromium by Colorimetric Method**

Analyte Code	*Analyte*
1045	Chromium VI

SM 3500-Cr D 19th ED	**20067009**	**Chromium by Colorimetric Method**

Analyte Code	*Analyte*
1045	Chromium VI

SM 4500-CN E 20th ED	**20092404**	**Cyanide by Colorimetric Determination**

Analyte Code	*Analyte*
1645	Total cyanide

SM 4500-CN G 20th ED	**20093203**	**Cyanide Amenable to Chlorination after Distillation**

Analyte Code	*Analyte*
1510	Amenable cyanide

SM 4500-CN I 20th ED	**20093601**	**Weak Acid Dissociable Cyanide**

Analyte Code	*Analyte*
1635	Cyanide

SM 4500-CN⁻ E 21st ED	**20096202**	**Cyanide by Colorimetric Method**

Analyte Code	*Analyte*
1635	Cyanide

SM 4500-CN⁻ G 21st ED	**20097001**	**Cyanide by Cyanides Amenable to Chlorination after Distillation**

Analyte Code	*Analyte*
1510	Amenable cyanide

SM 4500-CN⁻ I 21st ED	**20097807**	**Cyanide by Weak Acid Dissociable Cyanide**

Analyte Code	*Analyte*
1635	Cyanide

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SM 4500-H+ B 20th ED	**20104807**	**pH by Probe**

Analyte Code	*Analyte*
1900	pH

SM 4500-H+ B 21st ED	**20105004**	**pH Value by Electrometric Method .**

Analyte Code	*Analyte*
1900	pH

SM 4500-NH3 G 20th ED	**20111006**	**Ammonia by Automated Phenate**

Analyte Code	*Analyte*
1515	Ammonia as N

SM 4500-P E 20th ED	**20123802**	**Phosphorus by Ascorbic Acid Reduction**

Analyte Code	*Analyte*
1870	Orthophosphate as P
1910	Phosphorus, total

SM 4500-P E 21st ED	**20124009**	**Phosphorus by Ascorbic Acid Method**

Analyte Code	*Analyte*
1870	Orthophosphate as P
1910	Phosphorus, total

SM 5210 B 20th ED	**20134809**	**Biochemical Oxygen Demand, 5-Day (BOD5)**

Analyte Code	*Analyte*
1530	Biochemical oxygen demand

SM 5210 B 21st ED	**20135006**	**Biochemical Oxygen Demand, 5-Day (BOD5)**

Analyte Code	*Analyte*
1530	Biochemical oxygen demand

SM 5220 C 20th ED	**20135608**	**Chemical Oxygen Demand by Closed Reflux and Titration**

Analyte Code	*Analyte*
1565	Chemical oxygen demand

SM 5220 C 21st ED	**20135802**	**COD by Closed Reflux, Titrimetric Method**

Analyte Code	*Analyte*
1565	Chemical oxygen demand

SM 5220 C-97 online	**20136009**	**COD by Closed Reflux, Titrimetric Method**

Analyte Code	*Analyte*
1565	Chemical oxygen demand

SM 5220 D 20th ED	**20136407**	**Chemical Oxygen Demand by Closed Reflux and Colorimetric Determination**

Analyte Code	*Analyte*
1565	Chemical oxygen demand

SM 5220 D 21st ED	**20136601**	**COD by Closed Reflux, Colorimetric Method**

Analyte Code	*Analyte*

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Analyte Code	Analyte
1565	Chemical oxygen demand

SM 5220 D-97 online **20136805** **COD by Closed Reflux, Colorimetric Method**

Analyte Code	Analyte
1565	Chemical oxygen demand

SM 5310 B 20th ED **20137400** **Total Organic Carbon by Combustion Infra-red Method**

Analyte Code	Analyte
2040	Total organic carbon

SM 5310 B 21st ED **20137604** **TOC by High-Temperature Combustion Method**

Analyte Code	Analyte
2040	Total organic carbon

WA EPH **60015001** **Extractable Petroleum Hydrocarbons**

Analyte Code	Analyte
9369	Diesel range organics (DRO)
6211	EPH Aliphatic >C10-C12
6212	EPH Aliphatic >C12-C16
6214	EPH Aliphatic >C16-C21
6216	EPH Aliphatic >C21-C34
6220	EPH Aliphatic C8-C10
6224	EPH Aromatic >C10-C12
6226	EPH Aromatic >C12-C16
6228	EPH Aromatic >C16-C21
6231	EPH Aromatic >C21-C34
6236	EPH Aromatic C8-C10

WA VPH **60015056** **Volatile Petroleum Hydrocarbons (VPH) by GC/PID Purge & Trap**

Analyte Code	Analyte
4375	Benzene
4765	Ethylbenzene
9408	Gasoline range organics (GRO)
5240	m+p-xylene
5000	Methyl tert-butyl ether (MTBE)
4855	n-Hexane
5250	o-Xylene
5140	Toluene
5300	VPH Aliphatic >C10-C12
5301	VPH Aliphatic >C6-C8
5302	VPH Aliphatic >C8-C10
5303	VPH Aliphatic C5-C6
5308	VPH Aromatic >C10-C12
5309	VPH Aromatic >C12-C13
5310	VPH Aromatic >C8-C10
5260	Xylene (total)

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MATRIX : Solids

Reference	Code	Description
ASTM D2217-85	**30025151**	**Grain sizing**

Analyte Code	*Analyte*
6118	Distribution of particle sizes

ASTM D421-85	**30030832**	**Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants**

Analyte Code	*Analyte*
3915	Particulates

ASTM D422-63	**30030854**	**Partical Size Distribution (Grain sizing)**

Analyte Code	*Analyte*
6118	Distribution of particle sizes

EPA 1020A	**10117007**	**Ignitability Setaflash Closed-cup Method**

Analyte Code	*Analyte*
1780	Ignitability

EPA 1311	**10118806**	**Toxicity Characteristic Leaching Procedure**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 1312	**10119003**	**Synthetic Precipitation Leaching Procedure**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 300.0 2.1	**10053200**	**Methods for the Determination of Inorganic Substances in Environmental Samples**

Analyte Code	*Analyte*
1540	Bromide
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1820	Nitrate-nitrite
1840	Nitrite as N
2000	Sulfate

EPA 3050B	**10135601**	**Acid Digestion of Sediments, Sludges, and soils**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3546	**10141205**	**Microwave Extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3550B	**10141807**	**Ultrasonic Extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

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EPA 3580A **10143007** **Waste Dilution**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3585 **10143201** **Waste Dilution for Volatile Organics**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3610B **10144602** **Alumina Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3620B **10145809** **Florisil Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3630C **10146802** **Silica gel cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3660B **10148400** **Sulfur cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3665A **10148808** **Sulfuric Acid / permanganate Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 5030B **10153409** **Purge and trap for aqueous samples**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 5035A **10284807** **Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 6010B **10155609** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1760	Hardness (calc.)
1070	Iron

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Analyte Code	*Analyte*
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1990	Silica as SiO2
1145	Silicon
1150	Silver
1155	Sodium
1160	Strontium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

EPA 6010C **10155803** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1760	Hardness (calc.)
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1990	Silica as SiO2
1145	Silicon
1150	Silver
1155	Sodium
1160	Strontium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

EPA 6020 **10156000** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1040	Chromium

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Analyte Code	*Analyte*
1050	Cobalt
1055	Copper
1075	Lead
1090	Manganese
1095	Mercury
1100	Molybdenum
1105	Nickel
1140	Selenium
1150	Silver
1160	Strontium
1165	Thallium
1180	Titanium
3035	Uranium
1185	Vanadium
1190	Zinc

EPA 6020A **10156408** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1040	Chromium
1050	Cobalt
1055	Copper
1075	Lead
1090	Manganese
1095	Mercury
1100	Molybdenum
1105	Nickel
1140	Selenium
1150	Silver
1160	Strontium
1165	Thallium
1180	Titanium
3035	Uranium
1185	Vanadium
1190	Zinc

EPA 7470A **10165807** **Mercury in Liquid Waste by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 7471A **10166208** **Mercury in Solid Waste by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 8000B **10172200** **Determinative Chromatographic Separations**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 8015B **10173601** **Non-halogenated organics using GC/FID**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)

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Analyte Code	*Analyte*
9408	Gasoline range organics (GRO)
9499	Motor Oil

EPA 8081A **10178606** **Organochlorine Pesticides by GC/ECD**

Analyte Code	*Analyte*
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

EPA 8081B **10178800** **Organochlorine Pesticides by GC/ECD**

Analyte Code	*Analyte*
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

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EPA 8082 **10179007** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	*Analyte*
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
8912	Aroclor-1262 (PCB-1262)
8913	Aroclor-1268 (PCB-1268)

EPA 8082A **10179201** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	*Analyte*
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
8912	Aroclor-1262 (PCB-1262)
8913	Aroclor-1268 (PCB-1268)

EPA 8151A **10183207** **Chlorinated Herbicides by GC/ECD**

Analyte Code	*Analyte*
8655	2,4,5-T
8545	2,4-D
8560	2,4-DB
6500	4-Nitrophenol
8555	Dalapon
8595	Dicamba
8605	Dichloroprop (Dichlorprop)
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
7775	MCPA
7780	MCPP
6605	Pentachlorophenol
8650	Silvex (2,4,5-TP)

EPA 8260B **10184802** **Volatile Organic Compounds by purge and trap GC/MS**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5182	1,2,3-Trimethylbenzene
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene

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Analyte Code	*Analyte*
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4535	2-Chlorotoluene
4860	2-Hexanone
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4320	Acetonitrile
4325	Acrolein (Propenal)
4340	Acrylonitrile
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4600	cis-1,4-Dichloro-2-butene
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
9375	Di-isopropylether (DIPE)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
9408	Gasoline range organics (GRO)
4835	Hexachlorobutadiene
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4900	Isopropylbenzene
5240	m+p-xylene
4925	Methacrylonitrile
4940	Methyl acetate
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4965	Methylcyclohexane
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4425	n-Butyl alcohol (1-Butanol, n-Butanol)
4435	n-Butylbenzene
5090	n-Propylbenzene
5250	o-Xylene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5120	Tetrahydrofuran (THF)

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Analyte Code	*Analyte*
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
4605	trans-1,4-Dichloro-2-butene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride

EPA 8260C **10307003** **Volatile Organics: GC/MS (capillary column)**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5182	1,2,3-Trimethylbenzene
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4535	2-Chlorotoluene
4860	2-Hexanone (MBK)
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4320	Acetonitrile
4325	Acrolein (Propenal)
4340	Acrylonitrile
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4600	cis-1,4-Dichloro-2-butene
4595	Dibromomethane (Methylene bromide)

ORELAP Fields of Accreditation

ORELAP ID: WA100007
EPA CODE: WA00050
Certificate: WA100007 - 011

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5755 8th Street East
Tacoma WA 98424

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Analyte Code	*Analyte*
4625	Dichlorodifluoromethane (Freon-12)
9375	Di-isopropylether (DIPE)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4900	Isopropylbenzene
5240	m+p-xylene
4925	Methacrylonitrile
4940	Methyl acetate
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4965	Methylcyclohexane
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4425	n-Butyl alcohol (1-Butanol, n-Butanol)
4435	n-Butylbenzene
5090	n-Propylbenzene
5250	o-Xylene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5120	Tetrahydrofuran (THF)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
4605	trans-1,4-Dichloro-2-butene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride

EPA 8270C **10185805** **Semivolatile Organic compounds by GC/MS**

Analyte Code	*Analyte*
6715	1,2,4,5-Tetrachlorobenzene
4610	1,2-Dichlorobenzene
6221	1,2-Diphenylhydrazine
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
6380	1-Methylnaphthalene
4659	2,2'-Oxybis(1-chloropropane)
6735	2,3,4,6-Tetrachlorophenol
6738	2,3,4-Trichlorophenol
6740	2,3,5,6-Tetrachlorophenol
6742	2,3,5-Trichlorophenol
6830	2,3,6-Trichlorophenol (4C)
9363	2,3-Dichloroaniline
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol

ORELAP Fields of Accreditation

ORELAP ID: WA100007
EPA CODE: WA00050
Certificate: WA100007 - 011

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Analyte Code	*Analyte*
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
6412	3 & 4 Methylphenol
5945	3,3'-Dichlorobenzidine
6818	3,4,5-Trichlorophenol
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
5545	Aniline
5555	Anthracene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5587	Benzofluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5670	Butyl benzyl phthalate
5680	Carbazole
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
6665	Pyrene
5095	Pyridine

ORELAP Fields of Accreditation

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EPA 8270C SIM **10242407** **Semivolatile Organic compounds by GC/MS Selective Ion Monitoring**

Analyte Code	*Analyte*
6380	1-Methylnaphthalene
6385	2-Methylnaphthalene
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5855	Chrysene
5895	Dibenz(a,h) anthracene
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
5005	Naphthalene
6605	Pentachlorophenol
6615	Phenanthrene
6665	Pyrene

EPA 8270D **10186002** **Semivolatile Organic compounds by GC/MS**

Analyte Code	*Analyte*
6715	1,2,4,5-Tetrachlorobenzene
4610	1,2-Dichlorobenzene
6221	1,2-Diphenylhydrazine
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
6380	1-Methylnaphthalene
4659	2,2'-Oxybis(1-chloropropane)
6735	2,3,4,6-Tetrachlorophenol
6740	2,3,5,6-Tetrachlorophenol
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
6412	3 & 4 Methylphenol
5945	3,3'-Dichlorobenzidine
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone

ORELAP Fields of Accreditation

ORELAP ID: WA100007
EPA CODE: WA00050
Certificate: WA100007 - 011

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Analyte Code	*Analyte*
5545	Aniline
5555	Anthracene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5670	Butyl benzyl phthalate
5680	Carbazole
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
6665	Pyrene
5095	Pyridine

EPA 8270D SIM **10242509** **Semivolatile Organic compounds by GC/MS Selective Ion Monitoring**

Analyte Code	*Analyte*
6380	1-Methylnaphthalene
6385	2-Methylnaphthalene
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5855	Chrysene
5895	Dibenz(a,h) anthracene
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
5005	Naphthalene
6605	Pentachlorophenol

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
6615	Phenanthrene
6665	Pyrene

EPA 9012A **10193405** **Total and Amenable Cyanide (automated colorimetric with off-line distillation)**

Analyte Code	*Analyte*
1510	Amenable cyanide
1645	Total cyanide

EPA 9012B **10243206** **Total and Amenable Cyanide (automated colorimetric with off-line distillation)**

Analyte Code	*Analyte*
1510	Amenable cyanide
1645	Total cyanide

EPA 9013 **10193609** **Cyanide Extraction Procedure for Solids and Oils**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 9045C **10198400** **Soil and Waste pH**

Analyte Code	*Analyte*
1900	pH

EPA 9056A **10199607** **Determination of Inorganic Anions by Ion Chromatography**

Analyte Code	*Analyte*
1540	Bromide
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1820	Nitrate-nitrite
1840	Nitrite as N
2000	Sulfate

EPA 9060 **10200201** **Total Organic Carbon**

Analyte Code	*Analyte*
2040	Total organic carbon

NWTPH-Dx **90018409** **Oregon DEQ TPH Diesel Range**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
9499	Motor Oil

NWTPH-Gx **90018603** **Oregon DEQ TPH Gasoline Range Organics by GC/FID-PID Purge & Trap**

Analyte Code	*Analyte*
9408	Gasoline range organics (GRO)

NWTPH-GX (GC/MS) **90018658** **Oregon DEQ TPH Gasoline Range Organics by GC/MS Purge & Trap**

Analyte Code	*Analyte*
9408	Gasoline range organics (GRO)

NWTPH-HCID **90013200** **Oregon DEQ Total Petroleum Hydrocarbon ID**

Analyte Code	*Analyte*

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
9408	Gasoline range organics (GRO)
9499	Motor Oil

PLUMB 1981 **60006259** **Extraction/Preparation**

Analyte Code	*Analyte*
6118	Distribution of particle sizes

Puget Sound Estuary Program (PSEP): Conventional Sediment Variables **60006408** **PSEP: Organotins, TOC, and Sulfide**

Analyte Code	*Analyte*
5913	Dibutyltin
1206	Monobutyltin
1209	Tetrabutyltin
2040	Total organic carbon
1213	Tributyltin

WA EPH **60015001** **Extractable Petroleum Hydrocarbons**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
6211	EPH Aliphatic >C10-C12
6212	EPH Aliphatic >C12-C16
6214	EPH Aliphatic >C16-C21
6216	EPH Aliphatic >C21-C34
6220	EPH Aliphatic C8-C10
6224	EPH Aromatic >C10-C12
6226	EPH Aromatic >C12-C16
6228	EPH Aromatic >C16-C21
6231	EPH Aromatic >C21-C34
6236	EPH Aromatic C8-C10

WA VPH **60015056** **Volatile Petroleum Hydrocarbons (VPH) by GC/PID Purge & Trap**

Analyte Code	*Analyte*
4375	Benzene
4765	Ethylbenzene
9408	Gasoline range organics (GRO)
5240	m+p-xylene
5000	Methyl tert-butyl ether (MTBE)
4855	n-Hexane
5250	o-Xylene
5140	Toluene
5300	VPH Aliphatic >C10-C12
5301	VPH Aliphatic >C6-C8
5302	VPH Aliphatic >C8-C10
5303	VPH Aliphatic C5-C6
5308	VPH Aromatic >C10-C12
5309	VPH Aromatic >C12-C13
5310	VPH Aromatic >C8-C10
5260	Xylene (total)

OREGON

Environmental Laboratory Accreditation Program

NELAP Recognized

Umpqua Research Company

OR100031

626 NE Division St

Myrtle Creek,OR 97457

IS GRANTED APPROVAL BY ORELAP UNDER THE 2009 TNI STANDARDS, TO PERFORM ANALYSES ON ENVIRONMENTAL SAMPLES IN MATRICES AS LISTED BELOW :

Air	*Drinking Water*	*Non Potable Water*	*Solids and Chem. Waste*	*Tissue*
	Chemistry			
	Microbiology			

AND AS RECORDED IN THE LIST OF APPROVED ANALYTES, METHODS, ANALYTICAL TECHNIQUES, AND FIELDS OF TESTING ISSUED CONCURRENTLY WITH THIS CERTIFICATE AND REVISED AS NECESSARY.

ACCREDITED STATUS DEPENDS ON SUCCESSFUL ONGOING PARTICIPATION IN THE PROGRAM AND CONTINUED COMPLIANCE WITH THE STANDARDS.

CUSTOMERS ARE URGED TO VERIFY THE LABORATORY'S CURRENT ACCREDITATION STATUS IN OREGON.

Gary K. Ward, MS

Oregon State Public Health Laboratory

ORELAP Administrator

3150 NW. 229th Ave, Suite 100

Hillsboro, OR 97124

ISSUE DATE: 01/24/2016

EXPIRATION DATE: 01/23/2017

Certificate No: OR100031 - 015