SOIL AND WATER MANAGEMENT PLAN

Modera Morrison

1120 SE Morrison Street

Portland, Oregon

Prepared for:

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1.0 INTRODUCTION

GeoDesign, Inc. (GeoDesign), who will serve as the on-site environmental professional, has prepared this Soil and Water Management Plan (SWMP) for the proposed Modera Morrison development located at 1120 SE Morrison Street in Portland, Oregon (the "Property") (Figure 1). The 0.86-acre Property occupies Tax Lot 5100 of Multnomah Tax Map 1S1E02BA and is currently occupied by a 19,593-square-foot commercial structure and an asphalt concrete-paved parking lot. Based on preliminary information provided by Mill Creek Residential Trust (MCRT), GeoDesign understands that the proposed development will include demolition of the existing structure and construction of a new commercial/retail/residential mixed-use, seven-story building consisting of ground floor retail spaces, building services, common areas, and apartment units. The upper floors (two through seven) will consist of apartment units. Subterranean parking consisting of one level of underground parking on the west side of the structure and two levels of underground parking on the east side of the structure will be constructed beneath the ground floor level. This SWMP provides protocols for the proper management of soil and water that is exported from or imported onto the Property. The management, recordkeeping, reporting, characterization, transportation, and disposal of soil and/or water must be completed in accordance with all applicable local, State, and Federal regulations that govern such activities, including, but not limited to, generator registration (if required); characterization of the subject soil/waste; and procedures for transporting soil, waste, or water from the Property.

A site-specific Health and Safety Plan (HSP) and directions to Providence Hospital are presented in Appendix A. The attached HSP was created solely for use by GeoDesign employees. However, Contractors may adopt the HSP with proper modifications, as needed, to address the type of work they will be completing at the Property.

1.1 PURPOSE OF SWMP

The purpose of the SWMP is to describe the procedures that Contractors must follow in the event that soil and/or water is removed, stockpiled, stored, and/or transported off site for disposal. In addition, this SWMP provides protocols for the importation of soil onto the Property for use as fill or topsoil. The SWMP has been developed to facilitate the redevelopment of the Property by outlining those specific procedures that will be used for identifying, testing, handling, and disposal of soil and water containing regulated constituents that may be encountered during redevelopment activities. Implementing the procedures in this SWMP will help to ensure that soil from the identified Soil Management Area (SMA) is managed in a manner that is protective of human health, the environment, and Owner‘s liabilility and compliant with applicable Federal, State, and local regulations.

A copy of this SWMP will be kept in the on-site construction management office for reference, and it is the responsibility of the General Contractor and applicable subcontractors to ensure it is followed.

1.2 BACKGROUND

The Property was vacant land until sometime prior to 1901. By 1901 a residence was constructed on the southeast portion of the Property. By 1909 additional residences and a telephone office were constructed. By 1924 a pie bakery was constructed on the southwestern portion of the Property. By 1969 the residences were demolished from the eastern portion of the Property and a parking lot was constructed. By 2005 the Property was occupied by AJP Northwest and A&S Marketing. The Property has remained relatively unchanged since that time. The Property currently consists of office space and a warehouse for the storage and sale of paper products, janitorial supplies, and tobacco products.

Two Leaking Underground Storage Tank (LUST) file numbers pertain to the Property, including: 26-16-1462 and 26-91-0267. The Oregon Department of Environmental Quality (DEQ) established LUST File No. 26-91-0267 in 1991 after

soil contamination was encountered during decommissioning of two 1,000-gallon gasoline underground storage tanks (USTs) located in the northwestern portion of the Property (shown on Figure 2). DEQ issued a No Further Action (NFA) determination for LUST File No. 26-91-0267 in 1996. DEQ established LUST File No. 26-16-1462 after soil contamination was encountered in 2016 when right-of-way (ROW) construction activities damaged a heating oil UST located beneath the sidewalk adjacent to the southwest corner of the Property (shown on Figure 2). DEQ closed File No. 26-16-1462 in June 2017.

The Property is also listed on the DEQ UST database. The DEQ UST database includes a listing of facilities with registered USTs. The Property is identified on the DEQ UST database as UST Facility I.D. 6680. UST Facility I.D. 6680 is listed as having three decommissioned USTs. Two gasoline USTs were decommissioned by removal in 1991 and one UST was decommissioned in place in 1988. Detailed documentation regarding the former contents and location of the decommissioned in-place UST and soil sampling records were not available through public files or provided by MCRT. A recent geophysical survey (further described in Section 2.6) identified two off-site USTs (beneath the north sidewalk of SE Belmont Street that adjoins the Property) and one on-site previously decommissioned in-place UST (east of the Property structure in the parking lot).

In addition, the Property is listed on the DEQ Recovered Government Archive Leaking Underground Storage Tank (RGA LUST) and the U.S. Environmental Protection Agency (EPA) Facilities Index System/Facility Registry System (FINDS) database. The DEQ RGA LUST database contains a list of leaking UST incidents derived from historical databases and includes many records that no longer appear in current government lists. The EPA FINDS database is an inventory or reference list and does not imply a release or recognized environmental condition at the Property.

1.3 PROPERTY SETTING AND GEOLOGY

The Property is located in the western portion of the Portland Basin physiographic province, which is bound by the Tualatin Mountains to the west and south and the Cascade Range to the east and north. The Portland Basin is described as a fault bounded pull-apart basin that was formed by two northwest-trending fault zones.[1] The Portland Hills fault zone trends along the west side of the basin and the Frontal fault zone trends along the east side of the basin near Lacamas Lake, east of Vancouver, Washington.

A review of published geologic literature, previous explorations in the area, and explorations conducted during our investigation indicates the Property is underlain by Quaternary flood deposits delineated as the fine-grained facies (Qff).[2,3,4] The unit consists of unconsolidated, clayey silt and was deposited by multiple catastrophic glacial floods associated with the late Pleistocene (15,500 to 13,000 years before present) Missoula Floods.

Underlying the flood deposits is the Pliocene to Pleistocene (5 million to 1.5 million years before present) Troutdale Formation (QTg), which consists of poorly to moderately consolidated, semi-cemented, subrounded to rounded sand and gravel.[2,3,4] The Troutdale Formation is underlain by the Miocene Age

[1] Pratt, T.L. et al., 2001, *Late Pleistocene and Holocene Tectonics of the Portland Basin, Oregon and Washington, from High-Resolution Seismic Profiling*, Bulletin of the Seismological Society of America, 91, pp. 637-650.

[2] Gannett, Marshall W., and Caldwell, Rodney R., 1998. *Geologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington*: U.S. Geological Survey Professional Paper 1424-A. 32p. 8 plates.

[3] Madin, Ian P., 1990. *Earthquake-Hazard Geology Maps of the Portland Metropolitan Area, Oregon: Text and Map Explanation.* Oregon Department of Geology and Mineral Industries. Open-File Report O-90-2. 21p. 8 plates.

[4] Ma, Lina, Madin, Ian P., Olson, Keith V., Watzig, Rudie J., compilers, 2009, *Oregon Geologic Data Compilation*, Version 5, Oregon Department of Geology and Mineral Industries, ODGC-5, GIS digital data.

(20 million to 10 million years before present) Columbia River Basalt Group (Tcr), which is a series of basalt flows that originated from southeastern Washington and northeastern Oregon. The Columbia River Basalt Group is several hundred feet thick and considered the geologic basement unit for this report.

Subsurface conditions beneath the Property include fill material from the ground surface to depths up to 7 feet below ground surface (BGS). The fill material is highly variable and consists of clay, sand, gravel, and/or pea gravel. Brick, concrete, and wood debris was also observed in the fill material beneath the eastern poriton of the Property. The fill is underlain by alluvial fine-grained soil, including silt, silty sand, and silty gravel, to depths of up to 30 feet BGS.

The Property is situated at an elevation of approximately 60 feet above mean sea level. The topography of the Property slopes slightly downward to the west. Based on a review of topographic maps for the area, shallow groundwater beneath the Property is expected to flow to the west toward the Willamette River.

Groundwater was not encounterd at the Property during our limited Phase II Environmental Site Assessments (ESAs). However, during our geotechnical investigation, groundwater was measured at a depth of approximately 45 feet BGS at the Property in February 2017. Therefore, significant quantities of groundwater are not anticipated to be generated during construction. Although significant quantities of groundwater are not anticipated, precipitation could accumulate in the excavation and/or create shallow zones of perched groundwater or seasonally high groundwater during Property construction activities that may require dewatering.

2.0 RESULTS OF PREVIOUS ASSESSMENTS

GeoDesign reviewed previous environmental documents regarding the Property. The findings and conclusions of the following documents are summarized in the following sections:

- *Letter Re: Tank Removal – AJP, Facility #6680,* prepared by O'Sullivan Construction, Inc. (O'Sullivan), dated July 29, 1991
- *Letter Re: AJP Tank Removal and Contamination,* prepared by O'Sullivan, dated April 30, 1992
- *Letter Re: Heating Oil Underground Storage Tank Decommissioning; 1120 SE Morrison Street, Portland, Oregon 97214; Trackit Number 1090867, NRC Job Number 108524,* prepared by NRC*,* dated December 20, 2016
- *Letter Re: UST Decommissioning and Risk-Based Cleanup for H/O UST; Property Located at 1120 SE Morrison Street, Portland, OR; DEQ File No. 26-16-1462,* prepared by K&S Environmental, Inc. (K&S*), dated April 17, 2017*
- *Phase I Environmental Site Assessment; Modera Morrison; 1120 SE Morrison Street; Portland, Oregon*, prepared by GeoDesign, Inc. dated May 16, 2019
- *Phase II Environmental Site Assessment; Modera Morrison; 1120 SE Morrison Street; Portland, Oregon*, prepared by GeoDesign, Inc. dated July 30, 2019
- *Updated Phase II Environmental Site Assessment; Modera Morrison; 1120 SE Morrison Street; Portland, Oregon*, prepared by GeoDesign, Inc. dated August 28, 2019

2.1 O'SULLIVAN (1991 and 1992)

In 1991 O'Sullivan decommissioned two 1,000-gallon gasoline USTs on the northwestern portion of the Property (see Figure 2). Approximately 100 cubic

yards of soil containing petroleum hydrocarbons were excavated and stored on site. Petroleum hydrocarbons were not detected above laboratory reporting limits in confirmation soil samples collected from the limits of the excavation. O'Sullivan indicated that the excavated soil would be treated on site before being taken off site for disposal. DEQ assigned LUST File No. 26-91-0267 to the incident in 1991.

In a 1992 letter, O'Sullivan indicated that the excavated soil from the release associated with the two 1,000-gallon gasoline USTs (LUST File No. 26-91-0267) was moved to behind the Property structure on SE 11th Avenue and SE Morrison Street, spread in a 6-inch layer, covered with Visqueen, and surrounded by hay bales. The soil was left undisturbed for three months and later sampled and tested for gasoline-range hydrocarbons. Gasoline-range hydrocarbons were not detected above laboratory reporting limits. The final off-site disposition of the treated soil was not documented. DEQ issued an NFA determination for LUST File No. 26-91-0267 in October 1996.

2.2 NRC (2016)

In November 2016 a 1,000-gallon heating oil UST was discovered beneath the sidewalk adjacent to the southwest corner of the Property during ROW construction activities (see Figure 2). The UST was damaged by excavation equipment and approximately 20 gallons of heating oil were released to the subsurface. The UST was subsequently decommissioned by removal. Field evidence of petroleum in soil was observed at the limits of the excavation. Approximately 27.28 tons of soil were excavated from the vicinity of the former heating oil UST and transported to Waste Management's Hillsboro landfill. Soil samples were collected from the limits of the excavation and analyzed for diesel- and oil-range petroleum hydrocarbons. Oil-range hydrocarbons were not detected above laboratory reporting limits in the soil samples submitted for chemical analysis. Diesel-range hydrocarbons were detected in the soil samples submitted for chemical analysis at a maximum concentration of 10,900 milligrams per kilogram (mg/kg). This concentration exceeds the DEQ *Soil Ingestion, Dermal*

Contact, and Inhalation risk-based concentrations (RBCs) for residential and urban residential receptors. Groundwater was not encountered in the excavation during decommissioning activities. NRC reported the release to DEQ, and LUST File No. 26-16-1462 was assigned to the incident. NRC suggested further action was necessary to address the petroleum hydrocarbons in soil within the area of the former heating oil UST. These soils were addressed by K&S in 2017.

2.3 K&S (2017)

In April 2017 K&S conducted soil sampling in the vicinity of the former heating oil UST located beneath the sidewalk adjacent to the southwest corner of the Property. Five borings were advanced to a depth of 15 feet BGS, and soil samples were collected from between 9 and 15 feet BGS. Diesel-range hydrocarbons were detected in 3 of the 11 soil samples submitted for chemical analysis at a maximum concentration of 1,980 mg/kg at 13 feet BGS. This concentration exceeds the DEQ *Soil Ingestion, Dermal Contact, and Inhalation* RBC for residential receptors. One soil sample was submitted for chemical analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs). BTEX and PAHs were not detected at concentrations greater than applicable RBCs. In addition, field evidence of contamination was observed in only one of the borings between 9 and 14 feet BGS. Based on the analytical results of the soil investigation, K&S concluded that the concentrations of the remaining diesel in soil were below applicable DEQ RBCs at the time of the investigation and that the release associated with LUST File No. 26-16-1462 appeared to qualify for regulatory closure. DEQ issued an NFA determination for LUST File No. 26-16-1462 in June 2016 following review of the report submitted by K&S.

2.4 GEODESIGN (MAY 2019)

A Phase I ESA was conducted at the Property by GeoDesign in 2019, which identified the following enviromental concerns at the Property:

- Residual petroleum hydrocarbons in soil associated with a former heating oil UST likely remains in place beneath the sidewalk adjacent to the southwestern portion of the Property (LUST File No. 26-16-1462).
- Two gasoline USTs were formerly located on the northwestern portion of the Property (LUST File No. 26-91-0267). However, it appeared that the USTs were decomissioned by removal and were adequately remediated (see Sections 2.1 and 2.2).
- A decomissoined in-place UST was identifed beneath the eastern parking area of the Proeprty (see Figure 2).
- Historical records identifed one heating oil UST and one heating oil aboveground storage tank (AST) located on the Property. The heating oil AST was not observed during the site reconnisance.
- Two USTs were identified located in the sidewalk along SE Belmont Street adjacent to the south of the Property.
- Contaminated groundwater beneath the Piacentini Property, located approximately 130 feet upgradient of the Property relative to the inferred groundwater flow direction, was identified as potentially impacting groundwater beneath the Property.
- A suspect circular feature was observed in the east-central portion of the Property parking lot. GeoDesign recommended that the suspect circular feature and possible presence of on-site drywells be further evaluated using geophysical survey methods.

Based on the results of the Phase I ESA, GeoDesign recommended conducting a Phase II ESA at the Property (including a geophysical survey) to evaluate potential releases from the former and existing on- and off-site USTs and the potential drywell. GeoDesign also recommended that the Phase II ESA should include a clean fill evaluation to evaluate the quantity of soil that may need to be disposed of as solid waste if exported during future redevelopment.

2.5 GEODESIGN (JULY AND AUGUST 2019)

GeoDesign conducted a Phase II ESA of the Property to evaluate the nature and extent of chemical constituents in media at the Property. The Phase II ESA was conducted in several phases, including (1) the initial Phase II ESA, (2) the south USTs/lead-containing fill investigation, and (3) the supplemental lead-containing fill investigation. The results of the Phase II ESA indicate the following:

- Fill material was identified beneath the eastern parking area of the Property to depths of up to 3.45 feet BGS. The fill material generally consists of clay or gravel and was visually distinguishable from the underlying native soil. The fill material also was commonly present overlying concrete and/or wood debris.
- Lead was detected in soil samples collected of the shallow fill material (less than 4 feet BGS) beneath the eastern parking area of the Property at concentrations ranging from 50.6 to 1,580 mg/kg, which exceed the DEQ Clean Fill Screening Level (CFSL). In addition, the detected concentrations of lead in soil samples DP-26(1-1.5) and DP-32(1-1.5) exceed the DEQ *Soil* Ingestion, Dermal Contact, and Inhalation RBCs for occupational, construction worker, and excavation worker receptors. Toxicity Characteristic Leaching Procedure (TCLP) lead results indicated that leachable lead was not detected at concentrations greater than the EPA non-hazardous landfill disposal limit of 5.0 milligrams per liter (mg/L). Therefore, the lead-containing fill can be managed as non-hazardous waste.
- Gasoline-range hydrocarbons, benzo(a)pyrene, and napthalene were detected in soil sample HA-8(1.3-1.5) at concentrations greater than DEQ CFSLs, but less than applicable DEQ RBCs. Benzo(a)pyrene was also detected in soil samples DP-4(0.5-1.5) and HA-10(0.3-0.7) at a concentration greater than the DEQ CFSL, but less than applicable DEQ RBCs. These exceedances were only detected in the fill material located on the eastern portion of the Property.

- A geophysical survey confirmed the presence of the footprints of strucutres formerly located on the eastern portion of the Property. The geophysical survey also estimated that fill material beneath the eastern parking area extends to a maximum depth of 3.45 feet BGS (see Figure 3).
- Native soil underlying the eastern fill material does not contain contaminants of potential concern (COPCs) at concentrations greater than DEQ RBCs or CFSLs. The shallow fill material is visibly distinguishable from the underlying native soil.
- Fill material consisting of backfill for former UST excavations or pea gravel was encountered outside of the eastern parking area at depths of up to 7 feet BGS. Chemical analytial results indicated that COPCs were not detected in fill material outside of the eastern parking area.
- Arsenic and cadmium were detected in select samples at concentrations above DEQ CFSLs, but based on the calculated 90% upper confidence limits (UCLs), the detected concentraitons appeared to be within naturally occurring concentrations for the area. DEQ issued a letter, dated August 22, 2019, that concluded the soil proposed for excavation at the Property (with the exception of lead- and benzo(a) pyrene-containing fill within the main parking lot) is essentially the same as clean fill and is exempt from solid waste permitting regulations pursuant to Oregon Administrative Rule (OAR) 340-0093-0080 (2).
- COPCs were not detected in the soil vapor samples collected from the Property at concentrations greater than applicable DEQ RBCs.
- The geophysical survey confirmed the presence of two off-site USTs (beneath the north sidewalk of SE Belmont Street that adjoins the Property) and one on-site previously decommissioned in-place UST (east of the Property structure in the main parking lot). Petroleum hydrocarbons and related constituents were not detected in the limited soil samples collected near the former USTs.
- The geophysical survey did not identify the presence of drywells at the Property in the areas surveyed.

The locations of the borings are shown on Figures 2 and 3. A summary of the chemical analytical results are presented in Tables 1 through 5.

3.0 KNOWN OR SUSPECTED ENVIRONMENTAL CONDITIONS

Based on the results of previous environmental investigatons conducted at the Property (discussed in Section 2.0) one SMA and three areas of interest (AOIs) have been identified on the Property.

3.1 SMA

The SMA encompasses the majority of the eastern parking area and is associated with fill material likely placed during the demolition of the structures formerly located on the Property. Up to approximately 3.45 feet of fill (consisting clay and gravel with brick) was encountered beneath the asphalt concrete and/or aggregate base in select borings advanced in the eastern parking lot. The fill was generally encountered above concrete and/or wood debris and was visually distinguishable from the underlying native soil. The thickest zones of fill (building debris) correlate with the locations of the structures formerly located in the eastern parking lot. The approximate limits of the remnant foundations and building debris are shown on Figure 3. Chemical analytical results indicate that gasoline-range hydrocarbons, lead, benzo(a)pyrene, and naphthalene are present in the fill material at concentrations greater than applicable DEQ RBCs and/or CFSLs (discussed in Section 2.6). Based on this, fill material excavated from the SMA should be disposed of at a Resource Conservation and Recovery Act (RCRA) Subtitle D landfill, as further discussed in Section 4.3. It appears that the underlying native soil qualifies as clean fill and should be managed in accordance with Section 4.4.

3.2 AREAS OF INTEREST

Three AOIs have been identified at the Property that are associated with current and historical USTs as shown on Figure 3. AOI #1 is located on the southwestern corner of the Property and is associated with a heating oil UST formerly located beneath the adjoining sidewalk. The heating oil UST was decommissioned by removal, and residual petroleum-containing soil was left in place. According to the decommissioning report, residual contamination was not observed in the boring

advanced between the former UST and the Property. However, it is likely that petroleum-containing soil will be encountered during redevelopment in the vicinity of AOI #1.

AOI #2 is associated with two USTs located beneath the sidewalk adjoining the southern portion of the Property and AOI #3 is associated with a UST that was decommissioned in-place in the eastern parking area of the Property. Although chemical analytical results collected from borings advanced in the vicinity of AOIs #2 and #3 indicated that petroleum-containing soil is not present, it is possible that petroleum-containing soil is present between the borings or below the USTs.

Soil generated from within the AOIs should be continuously field screened (see Section 4.2) and if contaminated soil is encountered, it should be managed in accordance with Section 4.3.

4.0 SOIL MANAGEMENT

This section describes the management protocols recommended for handling, moving, stockpiling, and disposing of soil from the Property, as well as requirements for soil to be imported to the Property. In general, soil at the Property includes fill material from the ground surface to depths of up to 7 BGS and consists of clay, gravel, and pea gravel. Lead-containing fill material was identified to depths of up to 3.45 feet BGS inside the SMA. The fill is underlain by a visually distinguisable alluvial fine-grained soil, consisting of silt, sand, and clay, to the maximum depths explored. Construction, utility, and landscape workers may disturb the subsurface through digging, grading, trenching, and/or excavating and, therefore, may be potentially exposed to petroleum and petroleum constituents, lead, and/or other hazardous constituents. Construction workers or other workers involved in activities that disrupt soil may encounter previously unknown structures or areas of affected soil. During construction activities, workers who may directly contact shallow soil within the SMA/AOIs will conduct the work in accordance with Occupational Safety and Health Administration (OSHA) training and worker protection rules and regulations and their company's Health and Safety procedures; at a minimum the company Health and Safety procedures must meet all the minimum requirements of all applicable OSHA requirements.

The information provided in this SWMP will be used to communicate the location of the SMA/AOIs and potential concentration of constituents of concern to workers. All soil that will be transported off site must be adequately characterized and disposed of at a facility that is permitted and approved by GeoDesign and MCRT to receive such material. Likewise, all soil that will be imported to the Property must be either from a virgin quarry or certified or determined by analysis to be "clean" in accordance with applicable State standards prior to arriving at the Property.

4.1 POTENTIAL SOIL DISTURBANCE ACTIVITIES

Activities that may cause soil disturbance at the Property include mass excavation, grading, grubbing, removal of soil, removing/installing underground utilities, planting trees/landscaping, excavating elevator shaft pits, installing soldier piles and/or tiebacks, and performing other construction activities. If these or other subsurface activities are performed, this SWMP must be followed.

4.2 SOIL SCREENING METHODS

During excavation activities, soil should be continuously observed by the Excavation Contractor for visual or olfactory indications of petroleum contamination. If suspect soil is encountered, GeoDesign should be notified immediately and the soil should be further characterized and managed in accordance with this SWMP.

The fill material present in the SMA (Figure 3) contains lead at concentrations greater than applicable DEQ RBCs and/or CFSLs. The fill material is visually distinguishable from the underlying native soil, which does not contain lead at concentrations greater than applicable DEQ RBCs and/or CFSLs. Lead-containing soil generally does not present visual indicators; therefore, confirmation soil samples (see Section 4.7) should be collected by GeoDesign once the fill material is removed to demonstrate that the lead-containing fill has been adequately removed from the Property.

4.3 CONTAMINATED SOIL DISPOSAL

Fill material containing lead at concentrations greater than applicable DEQ RBCs and/or CFSLs will be encountered during excavation of the SMA to depths of up to approximately 3.45 feet BGS. The SMA fill material did not contain leachable lead at concentrations exceeding the EPA limit for disposal as non-hazardous waste (5.0 mg/L). Therefore, fill material excavated from the SMA should managed in accordance with this SWMP and be disposed of at a RCRA Subtitle D landfill, such as the Waste Management's Hillsboro landfill.

Petroleum-containing soil may also be encountered during installation of soldier piles and tiebacks or excavation in the AOIs. GeoDesign should be notified immediately if petroleum-containing soil is encountered and work should either cease until the material is properly characterized or the soil should be stockpiled in accordance with this SWMP. GeoDesign should be on Property during excavation of known or unknown USTs and provide appropriate oversight and closure documentation according to UST closure requirements.

In the event that undocumented petroleum contamination or other potentially hazardous conditions are encountered, the Excavation Contractor shall cease work and notify GeoDesign. The Excavation Contractor will then barricade or otherwise isolate the area and avoid filling the area until authorized to do so. The Excavation Contractor shall not replace any known or suspected contaminated soil in any excavation area.

4.3.1 Disposal Locations

Soil not meeting DEQ CFSLs must be disposed of at facilities that are pre-authorized by GeoDesign and MCRT and permitted by the applicable regulatory authorities to receive such material. If chemical analytical results indicate that soil contains concentrations of contaminants that are suitable for disposal as non-hazardous waste at a RCRA Subtitle D landfill, the following disposal facility can be used:

Waste Management – Hillsboro Landfill
3205 SE Minter Bridge Road
Hillsboro, OR 97123

If chemical analytical results indicate that impacted soil contains concentrations of contaminants that will require disposal as hazardous waste at a RCRA Subtitle C landfill, the following disposal facility can be used:

Waste Management – Arlington Landfill
17629 Cedar Springs Lane
Arlington, OR 97812

Operating permits for the above-identified disposal facilities are presented in Appendix B.

Prior to use, the following information will be provided to MCRT and GeoDesign for its review of each proposed disposal facility for contaminated materials.

- Facility name and address
- Type of soil to be disposed of at the proposed facility (e.g., residential, >residential but <commercial criteria, >commercial but <hazardous waste criteria, hazardous waste, other)
- Facility regulatory permits and/or other soil management approvals
- Facility compliance information (e.g., audit packages, regulatory inspection reports, Notices of Violations, Consent Agreements, etc.)
- Acceptance and shipment quality control protocols
- Facility use (e.g., daily cover, landfill disposal/burial, beneficial re-use, recycling, treatment, trans-shipment, etc.)
- Trans-shipment facility name and address
- Facility service agreements with generator indemnity Terms & Conditions
- Facility insurance/certificate of insurance naming owner as an additional insurer

4.4 CLEAN FILL DISPOSAL

Based on the chemical analytical data collected from the Property, it appears that soil generated from outside of the SMA that does not exhibit field evidence of impact qualifies as clean fill. Further, DEQ reviewed GeoDesign's application for a Solid Waste Permit Exemption determination, dated July 30, 2019, and issued a letter, dated August 22, 2019, concluding that the soil proposed for excavation at

the Property (with the exception of SMA fill within the eastern parking lot) is essentially the same as clean fill and is exempt from solid waste permitting regulations pursuant to OAR 340-0093-0080 (2).

However, slightly elevated concentrations of arsenic and cadmium were detected in the clean fill; therefore, it should be disposed of at either (1) a commercial use site or (2) a residential use site if it is placed beneath at least 3 feet of clean fill or hardscapes.

Note: No soil or waste material will be transported for beneficial re-use or disposal at sites that are currently used as a residential, school, playground, agricultural or similar high public risk-use area without pre-authorization from MCRT.

4.5 SOIL GRADING AND EXCAVATION ACTIVITIES

During soil grading and excavation activities, the Excavation Contractor will use control measures for fugitive dust, odor, and uncontrolled migration of potentially impacted soil. Dust and odor control measures will be used such that visible dust migration or offensive odors are not observed. Typically, misting with water can be used to control dust emissions and odors or temporary suspension of work to allow odors to dissipate. OSHA worker safety requirements shall be followed as appropriate.

4.6 STOCKPILE MANAGEMENT

If soil stockpiles are created during Property construction activities, they must be managed in accordance with the project Stormwater Pollution Prevention Plan (SWPPP), DEQ National Pollutant Discharge Elimination System (NPDES) 1200-C Permit, and appropriate erosion and sediment control measures. Excavated material that is placed in temporary stockpiles must be well maintained at all times. All stockpiled contaminated material must be placed on impermeable plastic sheeting (minimum 6-mil thick) with a berm around the perimeter of the stockpile. The plastic sheeting and berm must be constructed to prevent the runoff of soil

and contaminants to surrounding areas. The berm can be constructed with hay bales, dimensional lumber, or other equivalent methods. The bottom plastic sheeting should be lapped over the berm materials and the soil stockpile covered with plastic sheeting to prevent erosion or leaching of contaminants to underlying soil and prevent exposure to precipitation and wind. Plastic sheeting that covers the soil stockpile should be secured using sandbags or equivalent.

Stockpiles must be clearly designated as to the nature of the stockpiled soil (e.g., contaminated soil versus clean fill), either with signage or stakes with different colored flagging. The locations and nature of each on-site stockpile should be discussed during daily work meetings. All stockpiles should be located on the Property. Following removal, the stockpile areas should be restored to a pre-stockpile condition. Residual plastic or debris should not be left unattended at the Property and must be properly disposed of following stockpile removal.

4.7 SOIL CHARACTERIZATION

Previous investigations identified that the majority of the Property soil does not contain contaminants at concentrations greater than DEQ CFSLs and, therefore, can be managed as clean fill. However, if excavated soil outside the SMA (including the AOIs) exhibits physical indicators of contamination (visual, olfactory, and instrument-based soil screening), this material must be appropriately sampled and characterized/profiled prior to re-use or being transported off site for disposal. The State of Oregon solid and hazardous waste management regulations, RCRA, and other applicable waste management regulations have requirements and procedures for handling of contaminated soil. The regulations regarding land disposal of soil are overseen in Oregon by DEQ. All soil will be adequately characterized to ensure proper management and disposal using standard State or EPA testing methods. Soil samples will be submitted to Apex Laboratories, LLC of Tigard, Oregon, which is an Oregon-certified analytical laboratory.

Profiling of contaminated soil for the off-site disposal facility is necessary to determine proper disposal methods in order to verify the soil meets all acceptance criteria of the proposed disposal facility and ensure compliance with all Federal, State, and local regulations. Characterization information will be documented on a waste profile form provided by the disposal facility. Only individuals designated by MCRT may sign waste profile and manifests documents on behalf of MCRT as the generator. For materials that may be hazardous, determination of the generator and application for a generator number, as appropriate, should be completed prior to starting excavation and all hazardous materials must be removed from the Property within 90 days of generating the materials. Prior to starting excavation of hazardous or potentially hazardous materials, individual(s) who will sign waste manifests must be identified by MCRT.

Stockpile or in situ soil sampling will be conducted in accordance with DEQ guidance and regulations and as required by the off-site receiving permitted disposal facility. The DEQ guidance is presented in Appendix C. All sampling activities will be coordinated and scheduled with MCRT.

4.7.1 Confirmation Soil Sampling

The results of previous investigations identified an SMA on the Property, which consists of lead-containing fill material in the upper 3.45 feet in the SMA (Figure 3). If deemed necessary, once the SMA fill material has been removed, confirmation soil samples may be collected from the limits of the excavation to evaluate whether the lead-containing soil was adequately removed. Confirmation soil samples will consist of 10-point composite soil samples collected from the base of the excavation and will be collected at a frequency of one 10-point composite soil sample per 3,000 square feet. Sidewall samples will be collected from the limits of the excavation at a frequency of one 10-point composite soil sample per 100 linear feet. The confirmation soil samples should be submitted to Apex Laboratories of Tigard, Oregon, for total lead by EPA Method 6020.

4.7.2 Stockpile Soil Sampling

Potentially contaminated stockpiled soil will be further sampled if required by the disposal facility using composite soil sampling methods and analyzed for disposal profiling. Composite soil sampling frequency will adhere to the following:

Stockpile Soil Sampling Frequency

Stockpile Volume (cubic yards)	Number of Composite Soil Samples to Collect
0 - 10	1
11 - 50	2
51 - 100	3
101 - 500	4

Each composite soil sample will be comprised of three soil sub-samples collected from a particular area of the soil stockpile. Soil stockpiles greater than 1,000 cubic yards will be sampled at a rate of five composite soil samples for the first 500 cubic yards, plus one composite soil sample for each additional 500 cubic yards.

Collection of soil samples will be accomplished with hand tools. Decontaminated hand tools should be used to remove the surface layer of soil and then the soil sample will be retrieved with a decontaminated stainless steel scoop or disposable gloves. Chrome-plated tools will not be used.

Soil samples will be collected using the procedure oulined below. Disposable gloves will be worn and changed between samples.

- Remove the top layer of soil to the desired sampling depth using a decontaminated hand tool.
- Conduct an initial visual/olfactory screen (based on discoloration, sheen, and odor) to help identify the most appropriate sampling location.

- Mix the composite soil sample in a decontaminated stainless steel bowl or disposable plastic bag until thoroughly homogenized.
- Transfer the composite soil sample to a labeled, laboratory-prepared sample jar using a decontaminated stainless steel or plastic laboratory spoon. Follow proper labeling procedures. Fill the jar(s) completely to minimize headspace.
- Quickly and adequately seal the sample containers. Clean the jar rim(s) before tightening the lids.
- Collect a sufficient volume of soil sample for the particular analysis. Place the labeled soil sample jar(s) in an iced cooler for temporary storage and transport the soil samples to the chemical analytical laboratory.
- Use a field notebook to record a description of the soil that was sampled, the location of soil sample, the sample I.D., and the time of the soil sample collection. Record the sample on the soil sampling field forms and chain of custody. The stockpile soil sample I.D. will include a prefix identifying the stockpile (SP) number followed by a sequential numeric designation. For example, the third composite soil sample collected from stockpile SP-3 will be identified as “SP3-3.“
- Decontaminate the equipment between collection of soil samples. Decontamination will include (1) rinse with tap water and scrub with a scrub brush until free of large particles, (2) wash with phosphate-free detergent solution, (3) rinse with tap water, and (4) rinse with distilled water.

All soil stockpile composite samples may be submitted to an analytical laboratory for analysis of one or more of the following, as appropriate:

- Gasoline-range hydrocarbons by Method NWTPH-Gx
- Diesel- and oil-range hydrocarbons by Method NWTPH-Dx
- Total metals by EPA Method 6020
- TCLP metals by EPA Methods 1311/6020
- PAHs by EPA Method 8270D-SIM

- Polychlorinated biphenyls (PCBs) by EPA Method 8082
- Volatile organic compounds (VOCs) by EPA Method 8260B

The chemical analytical results shall be used to evaluate the appropriate off-site disposal location. All soil designated for off-site disposal must be characterized and permitted in accordance with the receiving facility's requirements prior to transport and disposal.

4.8 TRANSPORTATION

All transport of soil will be performed by properly licensed and permitted haulers in accordance with appropriate local, State, and Federal regulations. Loaded transport vehicles leaving the Property will be appropriately lined, securely covered, cleaned, manifested, and placarded in accordance with appropriate local, State, and Federal requirements, including the Oregon Department of Transportation.

4.9 IMPORTED SOIL

Unless pre-approved by MCRT, proposed backfill material from an off-site source must come from a certified "virgin" mine, borrow pit, or other source or be certified as "clean" by an independent entity acceptable to MCRT. Such certification can be based on laboratory testing, certification from the State agency that oversees and manages such activities, or other methods approved by the State of Oregon. If such certifications are not available, MCRT will (1) arrange for GeoDesign to conduct a risk evaluation of the proposed "virgin" material source to verify acceptability, and (2) GeoDesign will collect representative soil samples for laboratory analyses at a frequency of one sample per 500 yards of soil imported to confirm that the proposed fill contains no regulated constituents at concentrations that exceed regulatory standards for residential fill or concentrations that exceed naturally occurring concentrations present at the project Property.

Analytical parameters to be analyzed will include at a minimum:

- Total metals by EPA Method 6020
- PAHs by EPA Method 8270D-SIM
- PCBs by EPA Method 8082
- VOCs by EPA Method 8260B

Additional parameters may be added depending on the history of the imported soil source property. Manufactured rock aggregate obtained from a permitted quarry does not require analytical data to demonstrate it meets DEQ CFSLs.

According to the February 2019 DEQ guidance document title *Clean Fill Determinations,* clean fill means material consisting of soil, rock, concrete, brick, building block, tile, or asphalt paving, which do not contain contaminants at concentrations greater than DEQ CFSLs. However, import of concrete, brick, tile, or asphalt paving will not be allowed during this project without written approval of MCRT.

4.10 SOIL RE-USE ON SITE

Based on the results of our assessment activities, soil generated outside the SMA during earthwork at the Property can be re-used on site without additional testing requirements, assuming (1) it is geotechnically suitable and (2) field screening evidence of contamination is not observed.

5.0 WATER MANAGEMENT

All waste water to be removed from the Property, including excavation dewatering, stormwater, and vehicle wash water, will be managed, transported, and disposed of in accordance with applicable local, State, and Federal regulations. Water containing regulated constituents will not be discharged to the land surface or subsurface of the Property or conveyed to an off-site treatment facility unless approved by GeoDesign and the receiving treatment facility or Authority.

Discharge of water generated during large-scale construction activities to surface waters (i.e., a local pond, stream, or river) will only be performed under a State-specific NPDES permit (DEQ 1200-C Permit). Prior to any large site redevelopment (i.e., greater than 1 acre), an SWPPP must be developed. The SWPPP must comply with the requirements of the applicable State environmental agency. All discharges of water to the City of Portland stormwater or sanitary sewer must be permitted through the City of Portland Bureau of Environmental Services (BES).

The estimated depth of regional groundwater beneath the Property is approximately 45 feet BGS. Based on GeoDesign's understanding of the planned redevelopment, it is not anticipated that a significant volume of groundwater will be encountered during excavation activities. Although unanticipated, precipitation could accumulate in the excavation and/or create shallow zones of perched groundwater at the Property. If only a limited volume of groundwater or surface water requires removal during excavation, vacuum trucks can be mobilized to remove and dispose of the accumulated water.

If water encountered cannot be managed on site and merits dewatering, the Contractor should make arrangements to have the water generated during construction activities pumped to storage tanks for management. Containerized water will require handling in accordance with City of Portland BES Industrial Source Control Division Batch Discharge procedures.

If groundwater containing chemical constituents is identified during construction, contingencies to address unacceptable contaminant levels in the effluent stream will be employed. A typical treatment system could include a series of 20,000-gallon storage tanks equipped with chitosan socks, carbon adsorption filters, sand filters, and/or bag filters to remove sediments and contaminants (if necessary). The Excavation Contractor is responsible for obtaining the necessary discharge permits; treatment system setup, maintenance, and modification; effluent testing; discharge metering; and agency reporting.

Prior to use, the following information will be provided to MCRT and GeoDesign for its review of each proposed disposal facility.

- Facility name and address
- Type of water to be disposed of at the proposed facility (e.g., groundwater, stormwater, process water, hazardous waste, etc.)
- Facility regulatory permits and/or other water management approvals
- Facility compliance information (e.g., audit packages, regulatory inspection reports, Notices of Violations, Consent Agreements, etc.)
- Acceptance and shipment quality control protocols
- Facility treatment/discharge process
- Trans-shipment facility name and address
- Facility service agreements with Terms & Conditions
- Facility insurance/certificate of insurance naming owner as an additional insured

6.0 CONTINGENCY PLAN

The following contingency procedures will be followed upon discovery of an unknown source of contamination that may require remediation (such as unknown USTs, stained soil, drums, etc.) and the procedures for suspending excavation work; transferring any materials; and notifying applicable local, State, and/or Federal agencies. The contingency procedures include the following:

- If USTs, containers, or other previously unidentified regulated constituent source is found during construction, grading, or excavation, activities will be suspended until an adequate plan is implemented to address the condition. Additionally, GeoDesign will be immediately notified.
- Sampling will be performed by GeoDesign on the material, soil, groundwater, surrounding soil, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed by an accreditied laboratory consistent with the concern identified and include analyses as appropriate (e.g., disposal parameters, Target Analyte List metals, Target Compounds List (TCL) volatiles and semi-volatiles, and TCL pesticides and PCBs).
- Identification of unknown or unexpected condition will be promptly communicated by telephone to the project manager(s), MCRT, and GeoDesign. Reportable quantities of petroleum product or hazardous substances may require notification to the applicable regulatory agencies, which will not be implemented until approved by MCRT.
- The Excavation Contractor shall not replace any known or suspected contaminated soil in any excavation area without prior approval by representatives of MCRT.

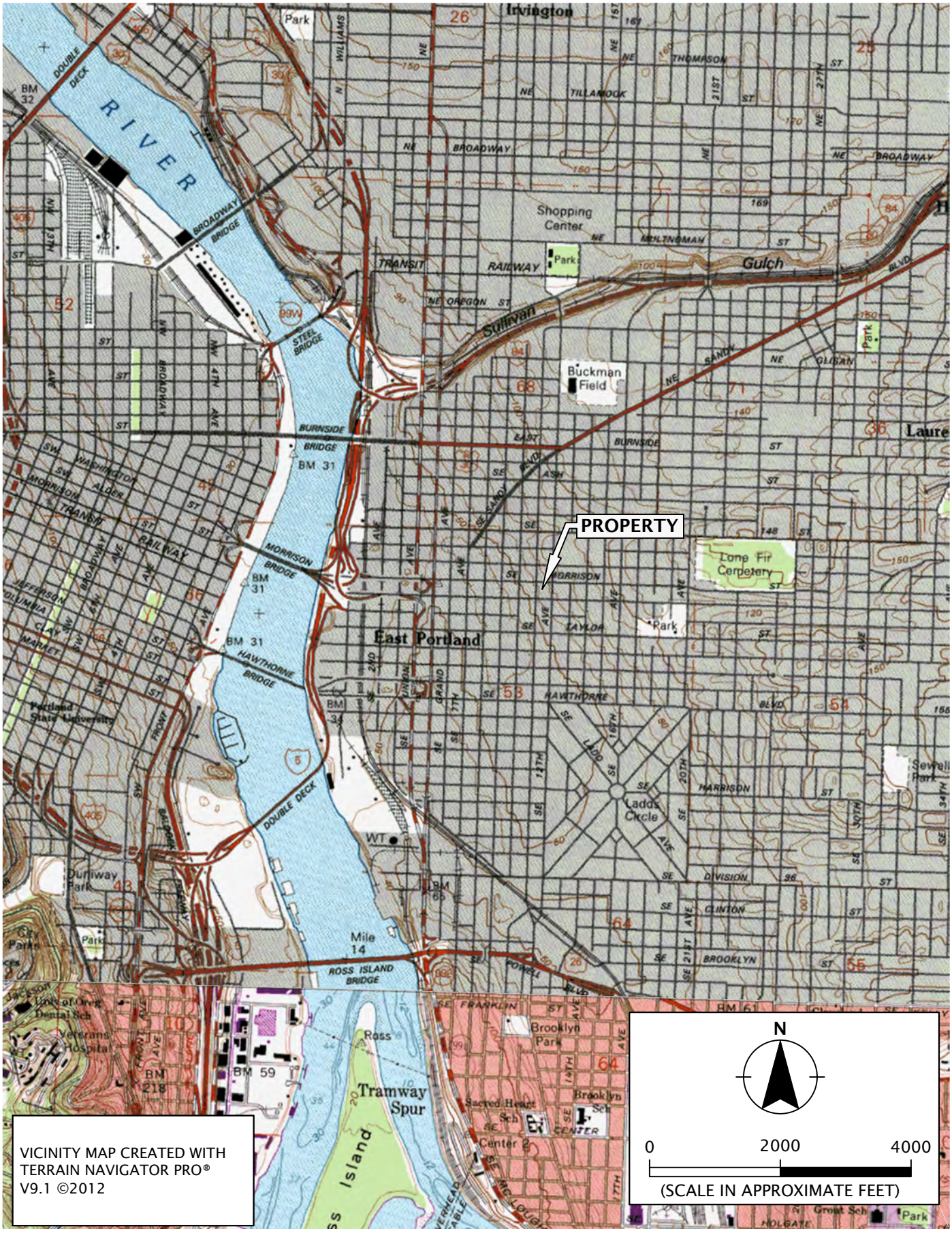
7.0 HEALTH AND SAFETY

All work shall be performed in accordance with all applicable OSHA standards as a minimum. Based on the known contaminant concentrations, the Property workers will wear the appropriate level of personal protective equipment (PPE) as described in their HSP and in accordance their company policies and procedures. Levels of PPE should be reconsidered and modified depending on the conditions encountered as the project progresses. The General Contractor is responsible for workers adhering to all applicable OSHA requirements at a minimum and all the Health and Safety policies and procedures.

8.0 DOCUMENTATION

Following completion of the Property excavation and grading, all soil and water management efforts will be documented by GeoDesign. Documentation will include a narrative of activities completed; identification of areas excavated, including appropriate figures (as-builts) showing aerial extent and depth of excavation and fill areas; quantity of contaminated soil and/or water transported off site to each disposal facility; volume of soil imported onto the Property; characteristics of contaminated soil; volume of soil removed from the Property meeting the DEQ CFSL and/or water transported off site and/or imported onto the Property; disposal profiling documentation; laboratory reports; testing results; disposal manifests/bills of lading; disposal approval documentation and exported soil/water disposal facility name and address.

FIGURES



VICINITY MAP CREATED WITH TERRAIN NAVIGATOR PRO® V9.1 ©2012

GeoDesign Inc AN NV5 COMPANY	MILLCREEK-19-01-05	**VICINITY MAP**	
	FEBRUARY 2021	MODERA MORRISON PORTLAND, OR	**FIGURE 1**

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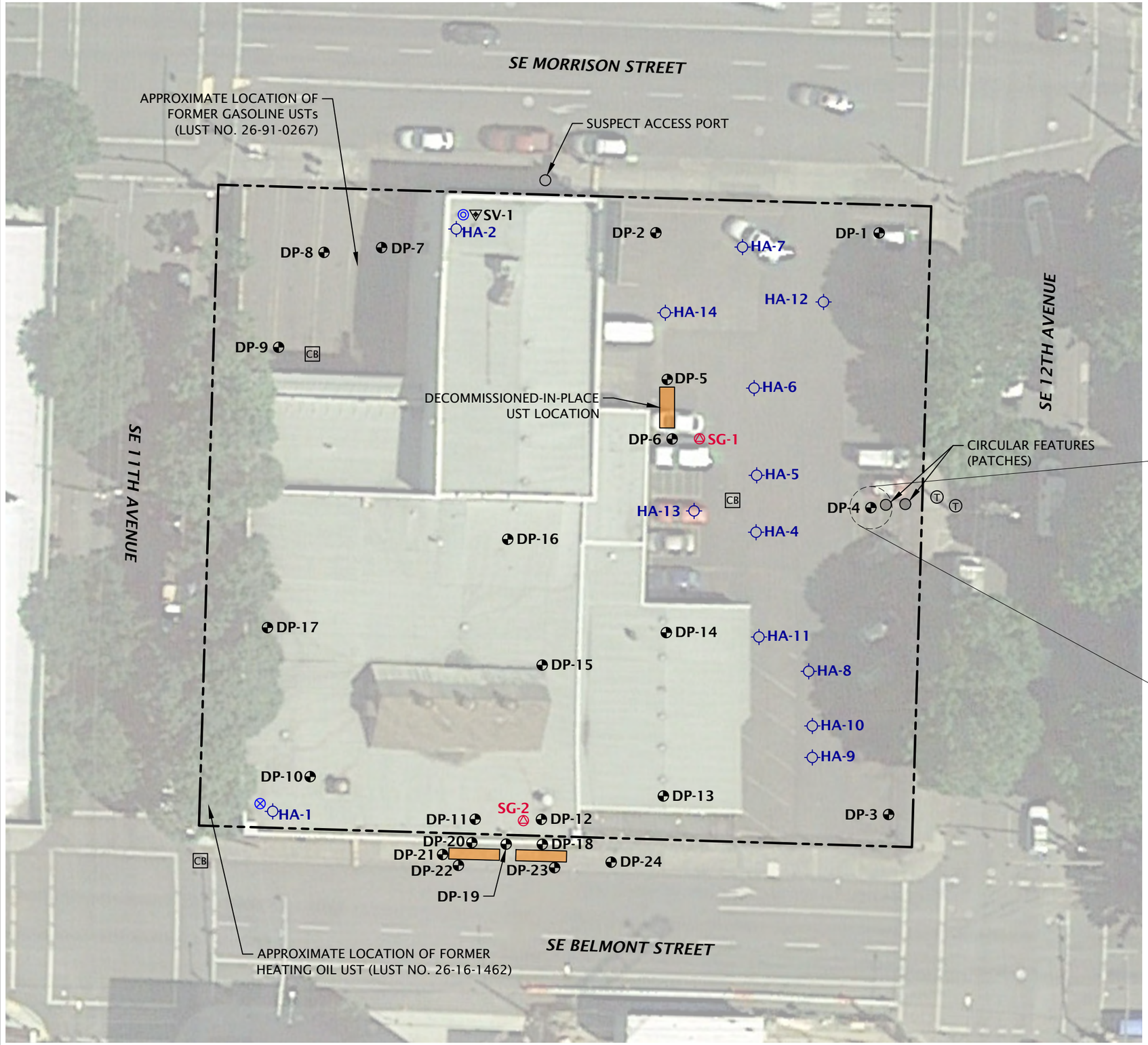
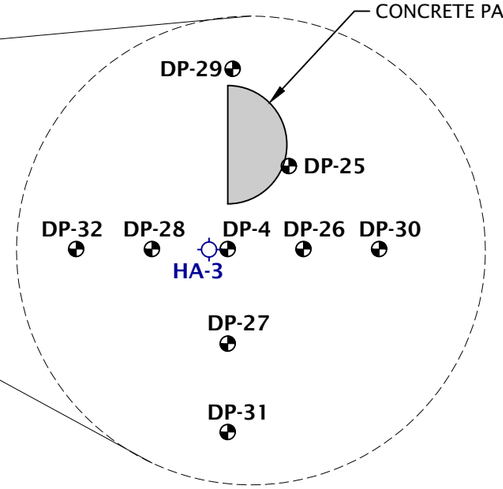
File Name: J:\M-R\MillCreek\MillCreek-19\MillCreek-19-01\MillCreek-19-01-05-SWMP\Figures\CAD\MillCreek-19-01-05-VM01.dwg | Layout: FIGURE 1



LEGEND:

- PROPERTY BOUNDARY
- DP-1 DIRECT-PUSH BORING (2019)
- HA-1 HAND AUGER BORING (2019)
- SG-1 SOIL GAS BORING (2019)
- SV-1 SUB-SLAB VAPOR POINT (2019)
- CB CATCH BASIN
- T POLE-MOUNTED TRANSFORMER
- FLOOR DRAIN IN OFFICE BASEMENT
- FLOOR DRAIN IN WAREHOUSE BATHROOM
- UST



SITE PLAN BASED ON AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO®, MARCH 22, 2019

SITE PLAN

MODERA MORRISON
PORTLAND, OR

FIGURE 2

MILLCREEK-19-01-05

FEBRUARY 2021

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AN NV5 COMPANY

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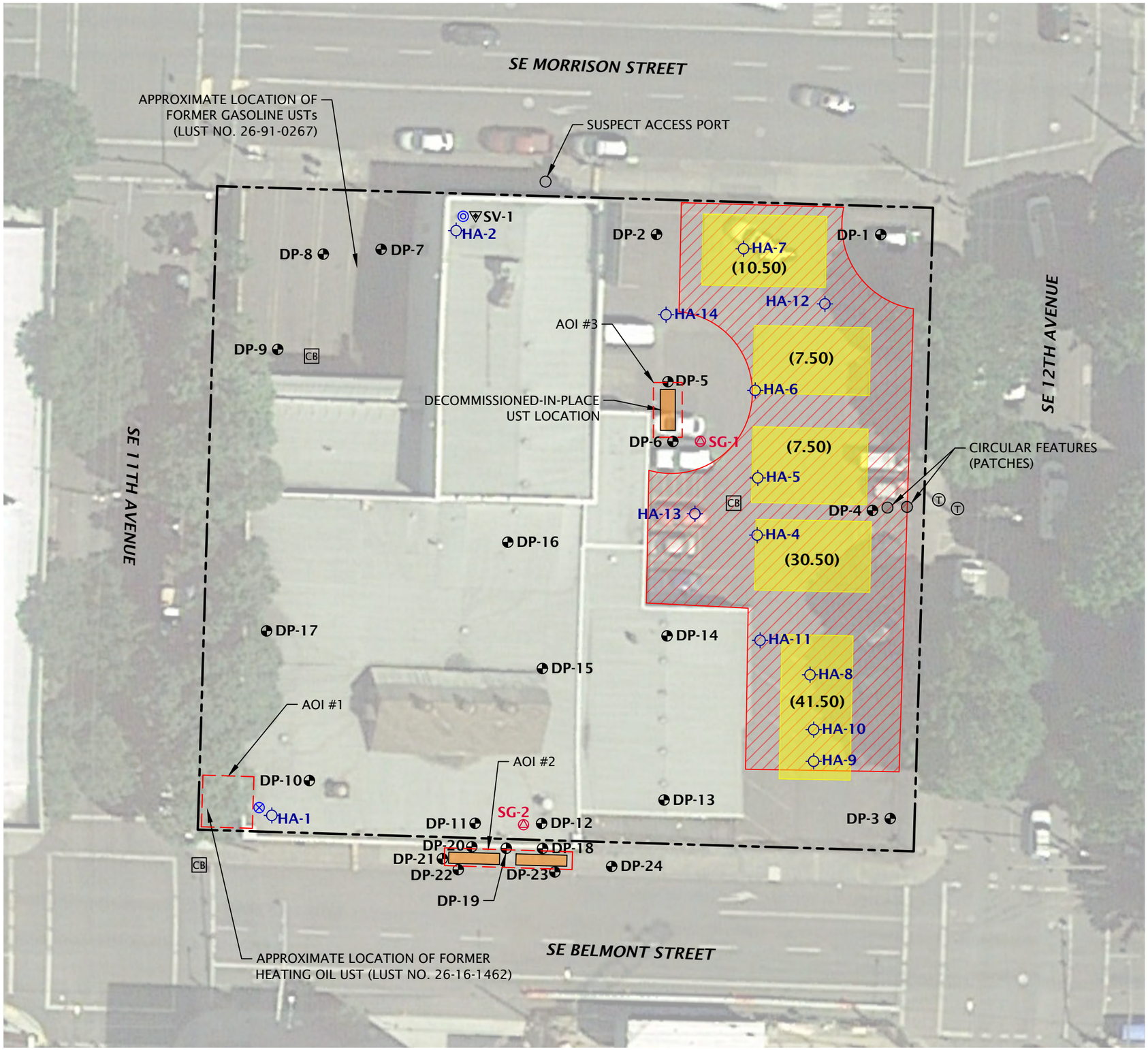
File Name: J:\M-R\MillCreek\MillCreek-19\MillCreek-19-01\MillCreek-19-01-05-SWMP\Figures\CAD\MillCreek-19-01-05-SP01.dwg | Layout: FIGURE 2



LEGEND:

- PROPERTY BOUNDARY
- DP-1 DIRECT-PUSH BORING (2019)
- HA-1 HAND AUGER BORING (2019)
- SG-1 SOIL GAS BORING (2019)
- SV-1 SUB-SLAB VAPOR POINT (2019)
- CB CATCH BASIN
- T POLE-MOUNTED TRANSFORMER
- FLOOR DRAIN IN OFFICE BASEMENT
- FLOOR DRAIN IN WAREHOUSE BATHROOM
- UST
- SMA - APPROXIMATELY 2 TO 41.5 INCHES THICK
- (7.50) APPROXIMATE EXTENT OF REMNANT STRUCTURE FOUNDATION SUSPECTED OF CONTAINING LEAD EXCEEDING CFSL - THICKNESS SHOWN IN INCHES
- AREA OF INTEREST

N

0 30 60

(SCALE IN FEET)

SITE PLAN BASED ON AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO®, MARCH 22, 2019

SITE PLAN - SMA AND AOIs

FIGURE 3

MODERA MORRISON
PORTLAND, OR

MILLCREEK-19-01-05

FEBRUARY 2021

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TABLES

TABLE 1
Summary of Soil Sample Chemical Analytical Results
Petroleum Hydrocarbons
Modera Morrison
1120 SE Morrison Street
Portland, Oregon

Sample I.D. (depth in feet BGS)	Sample Date	Hydrocarbon Identification by Method NWTPH-HCID (mg/kg)			Gasoline-Range Hydrocarbons by Method NWTPH-Gx (mg/kg)	Diesel- and Oil-Range Hydrocarbons by Method NWTPH-Dx (mg/kg)	
		Gasoline-Range	Diesel-Range	Oil-Range		Diesel-Range	Oil-Range
DP-5(8.5-9.5)	05/11/19	23.9 U	59.7 U	119 U	--	--	--
DP-5(13-14)	05/11/19	22.0 U	55.0 U	110 U	--	--	--
DP-6(8-9)	05/11/19	25.0 U	62.6 U	125 U	--	--	--
DP-6(12.5-13.5)	05/11/19	25.0 U	62.6 U	125 U	--	--	--
DP-7(6.5-7.5)	05/11/19	18.4 U	46.1 U	92.2 U	--	--	--
DP-7(11.5-12.5)	05/11/19	21.9 U	54.8 U	110 U	--	--	--
DP-11(10-11)	05/11/19	22.2 U	55.4 U	111 U	--	--	--
DP-11(18-19)	05/11/19	21.6 U	53.9 U	108 U	--	--	--
DP-12(12-13)	05/11/19	21.9 U	54.7 U	109 U	--	--	--
DP-12(16-17)	05/11/19	21.1 U	52.7 U	105 U	--	--	--
DP-18(10-11)	07/18/19	22.4 U	56.1 U	112 U	--	--	--
DP-19(11-12)	07/18/19	22.0 U	54.9 U	110 U	--	--	--
DP-20(10-11)	07/18/19	21.5 U	53.8 U	108 U	--	--	--
DP-21(10-11)	07/18/19	22.2 U	55.4 U	111 U	--	--	--
DP-21(13-14)	07/18/19	20.1 U	50.3 U	101 U	--	--	--
DP-22(10-11)	07/18/19	23.5 U	58.6 U	117 U	--	--	--
DP-22(12.5-13.5)	07/18/19	21.8 U	54.4 U	109 U	--	--	--
DP-23(10-11)	07/18/19	22.1 U	55.3 U	111 U	--	--	--
DP-23(11-12)	07/18/19	23.4 U	58.5 U	117 U	--	--	--
DP-24(12-13)	07/18/19	23.6 U	58.9 U	118 U	--	--	--
DP-24(16-17)	07/18/19	26.3 U	65.8 U	132 U	--	--	--
HA-1(15-15.5)	05/15/19	22.5 U	56.3 U	113 U	--	--	--
HA-8(1.3-1.5)	07/30/19	--	--	--	**57.7**	**26.5**	**157**
HA-10(0.3-0.7)	07/30/19	--	--	--	5.82 U	25.0 U	**94.3**
DEQ Generic RBCs[1]							
Soil Ingestion, Dermal Contact, and Inhalation							
Occupational		NE	NE	NE	20,000	14,000	NE
Construction Worker		NE	NE	NE	9,700	4,600	NE
Excavation Worker		NE	NE	NE	>Max	>Max	NE
Volatilization to Outdoor Air							
Occupational		NE	NE	NE	>Max	>Max	NE
Vapor Intrusion into Buildings							
Occupational		NE	NE	NE	>Max	>Max	NE
DEQ CFSLs[2]		NE	NE	NE	31	1,100	NE

Notes:

1. DEQ Generic RBCs dated May 2018
2. DEQ CFSLs dated February 21, 2019

>Max: The constituent RBC for this pathway is calculated as greater than 1,000,000 mg/kg or 1,000,000 mg/L. Therefore, this substance is deemed not to pose risks in this scenario.

NE: not established

U: Not detected. Reporting or detection limit shown.

Bolding indicates analyte detection.

Shading indicates analyte detection at a concentration greater than DEQ CFSL.

--: not analyzed

TABLE 2
Summary of Soil Sample Chemical Analytical Results
VOCs
Modera Morrison
1120 SE Morrison Street
Portland, Oregon

Sample I.D. (depth in feet BGS)	Sample Date	VOCs[1] by EPA Methods 5035A/8260C (mg/kg)							
		1,2,4-TMB		1,3,5-TMB		m-p-Xylenes		o-Xylenes	
DP-1(0.5-1.5)	05/11/19	0.0692	U	0.0692	U	0.0692	U	0.0346	U
DP-1(11.5-12.5)	05/11/19	0.0593	U	0.0593	U	0.0593	U	0.0297	U
DP-2(1-2)	05/11/19	0.0652	U	0.0652	U	0.0652	U	0.0326	U
DP-2(12-13)	05/11/19	0.0683	U	0.0683	U	0.0683	U	0.0342	U
DP-3(1-2)	05/11/19	0.0619	U	0.0619	U	0.0619	U	0.0309	U
DP-3(12-13)	05/11/19	0.0854	U	0.0854	U	0.0854	U	0.0427	U
DP-4(0.5-1.5)	05/11/19	0.0572	U	0.0572	U	0.0572	U	0.0286	U
DP-4(8-9)	05/11/19	0.0732	U	0.0732	U	0.0732	U	0.0366	U
DP-4(11.5-12.5)	05/11/19	0.0743	U	0.0743	U	0.0743	U	0.0372	U
DP-5(1-2)	05/11/19	0.064	U	0.064	U	0.064	U	0.032	U
DP-5(8.5-9.5)	05/11/19	0.0701	U	0.0701	U	0.0701	U	0.035	U
DP-5(13-14)	05/11/19	0.0713	U	0.0713	U	0.0713	U	0.0356	U
DP-6(1-2)	05/11/19	0.0658	U	0.0658	U	0.0658	U	0.0329	U
DP-6(8-9)	05/11/19	0.0822	U	0.0822	U	0.0822	U	0.0411	U
DP-6(12.5-13.5)	05/11/19	0.0745	U	0.0745	U	0.0745	U	0.0373	U
DP-7(1-2)	05/11/19	0.0634	U	0.0634	U	0.0634	U	0.0317	U
DP-7(6.5-7.5)	05/11/19	0.0634	U	0.0634	U	0.0634	U	0.0317	U
DP-7(11.5-12.5)	05/11/19	0.0472	U	0.0472	U	0.0472	U	0.0236	U
DP-8(1.5-2.5)	05/11/19	0.0765	U	0.0765	U	0.0765	U	0.0382	U
DP-8(8-9)	05/11/19	0.067	U	0.067	U	0.067	U	0.0335	U
DP-8(11.5-12.5)	05/11/19	0.0628	U	0.0628	U	0.0628	U	0.0314	U
DP-9(1-2)	05/11/19	0.0773	U	0.0773	U	0.0773	U	0.0386	U
DP-9(8-9)	05/11/19	0.077	U	0.077	U	0.077	U	0.0385	U
DP-10(2-3)	05/11/19	0.0772	U	0.0772	U	0.0772	U	0.0386	U
DP-10(13-14)	05/11/19	0.0659	U	0.0659	U	0.0659	U	0.033	U
DP-11(3-4)	05/11/19	0.0578	U	0.0578	U	0.0578	U	0.0289	U
DP-11(10-11)	05/11/19	0.0771	U	0.0771	U	0.0771	U	0.0385	U
DP-11(18-19)	05/11/19	0.0723	U	0.0723	U	0.0723	U	0.0362	U
DP-12(1-2)	05/11/19	0.0843	U	0.0843	U	0.0843	U	0.0421	U
DP-12(12-13)	05/11/19	0.0661	U	0.0661	U	0.0661	U	0.033	U
DP-12(16-17)	05/11/19	0.0663	U	0.0663	U	0.0663	U	0.0332	U
DP-13(4-5)	05/11/19	0.074	U	0.074	U	0.074	U	0.037	U

TABLE 2
Summary of Soil Sample Chemical Analytical Results
VOCs
Modera Morrison
1120 SE Morrison Street
Portland, Oregon

Sample I.D. (depth in feet BGS)	Sample Date	VOCs[1] by EPA Methods 5035A/8260C (mg/kg)			
		1,2,4-TMB	1,3,5-TMB	m-p-Xylenes	o-Xylenes
DP-13(9-10)	05/11/19	0.074 U	0.074 U	0.074 U	0.037 U
DP-14(2-3)	05/11/19	0.0768 U	0.0768 U	0.0768 U	0.0384 U
DP-14(11-12)	05/11/19	0.0835 U	0.0835 U	0.0835 U	0.0417 U
DP-15(4-5)	05/11/19	0.0809 U	0.0809 U	0.0809 U	0.0404 U
DP-16(2-3)	05/11/19	0.0654 U	0.0654 U	0.0654 U	0.0327 U
DP-19(11-12)	07/18/19	0.0752 U	0.0752 U	0.113 U	
DP-23(11-12)	07/18/19	0.0724 U	0.0724 U	0.109 U	
HA-1(2-2.5)	05/15/19	0.0669 U	0.0669 U	0.0669 U	0.0334 U
HA-1(12-12.5)	05/15/19	0.0687 U	0.0687 U	0.0687 U	0.0343 U
HA-1(15-15.5)	05/15/19	0.0683 U	0.0683 U	0.0683 U	0.0341 U
HA-2(2-2.5)	05/15/19	0.0683 U	0.0683 U	0.0683 U	0.0342 U
HA-8(1.3-1.5)	07/30/19	**0.134**	**0.0752**	**0.119**	**0.0678**
HA-10(0.3-0.7)	07/30/19	0.0582 U	0.0582 U	0.0582 U	0.0291 U
DEQ Generic RBCs[2]					
Soil Ingestion, Dermal Contact, and Inhalation					
Occupational		6,900	6,900	25,000	25,000
Construction Worker		2,900	2,900	20,000	20,000
Excavation Worker		81,000	81,000	560,000	560,000
Volatilization to Outdoor Air					
Occupational		>Csat	>Csat	>Csat	>Csat
Vapor Intrusion into Buildings					
Occupational		>Csat	>Csat	>Csat	>Csat
DEQ CFSLs[3]		10	11	1.4	1.4

Notes:

1. Only VOCs detected are listed.
2. DEQ Generic RBCs dated May 2018
3. DEQ CFSLs dated February 21, 2019

>Csat: This soil RBC exceeds the limit of three-phase equilibrium partitioning. Refer to Appendix D of DEQ's *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* guidance document for the corresponding value of Csat. Soil concentrations in excess of Csat indicate that free product might be present.

TMB: trimethylbenzene

Bolding indicates analyte detection.

U: Not detected. Reporting or detection limit shown.

TABLE 3
Summary of Soil Sample Chemical Analytical Results
RCRA 8 Total Metals and Leachable Lead
Modera Morrison
1120 SE Morrison Street
Portland, Oregon

Sample I.D. (depth in feet BGS)	Sample Date	Fill/Native	RCRA 8 Total Metals by EPA Method 6020A (ICP-MS) (mg/kg)								Leachable Lead by EPA Methods 1311/6020A (ICP-MS) (mg/L)
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	
DP-1(0.5-1.5)	05/11/19	Native	5.38	179	0.358	19.1	10.8	0.105 U	1.32 U	0.264 U	--
DP-1(11.5-12.5)	05/11/19	Native	3.9	122	0.805	10.6	7.02	0.0964 U	1.20 U	0.241 U	--
DP-2(1-2)	05/11/19	Native	12.0	187	0.534	24.4	14.0	0.104 U	1.30 U	0.260 U	--
DP-2(12-13)	05/11/19	Native	5.8	151	0.931	17.6	8.53	0.110 U	1.38 U	0.276 U	--
DP-3(1-2)	05/11/19	Native	11.7	215	0.615	26.1	14.9	0.107 U	1.34 U	0.268 U	--
DP-3(12-13)	05/11/19	Native	5.35	150	0.698	16.4	8.83	0.111 U	1.38 U	0.277 U	--
DP-4(0.5-1.5)	05/11/19	Fill	7.75	183	0.431	15.0	194	0.101 U	1.26 U	0.252 U	0.0500 U
DP-4(8-9)	05/11/19	Native	8.87	186	1.05	21.0	11.9	0.114 U	1.43 U	0.286 U	--
DP-4(11.5-12.5)	05/11/19	Native	4.16	122	0.693	11.1	6.64	0.0991 U	1.24 U	0.248 U	--
DP-5(1-2)	05/11/19	Fill	9.54	190	0.545	21.3	28.3	0.109 U	1.36 U	0.273 U	--
DP-5(8.5-9.5)	05/11/19	Native	9.06	164	0.784	23.8	11.1	0.117 U	1.47 U	0.293 U	--
DP-5(13-14)	05/11/19	Native	5.67	157	0.800	20.1	7.32	0.105 U	1.32 U	0.263 U	--
DP-6(1-2)	05/11/19	Native	13.0	171	0.634	25.0	15.3	0.105 U	1.32 U	0.263 U	--
DP-6(8-9)	05/11/19	Native	8.43	178	0.842	26.3	10.5	0.108 U	1.35 U	0.270 U	--
DP-6(12.5-13.5)	05/11/19	Native	6.21	145	0.839	18.2	8.40	0.106 U	1.32 U	0.265 U	--
DP-7(1-2)	05/11/19	Fill	1.10 U	34.1	0.220 U	4.90	3.06	0.0879 U	1.10 U	0.220 U	--
DP-7(6.5-7.5)	05/11/19	Fill	3.32	86.8	0.504	10.9	14.8	0.0944 U	1.18 U	0.236 U	--
DP-7(11.5-12.5)	05/11/19	Native	4.56	118	0.689	11.5	19.5	0.100 U	1.25 U	0.250 U	--
DP-8(1.5-2.5)	05/11/19	Native	9.9	182	0.899 U	21.2	15.0	0.118 U	1.48 U	0.296 U	--
DP-8(8-9)	05/11/19	Native	4.36	132	0.79	11.5	7.56	0.0982 U	1.23 U	0.246 U	--
DP-8(11.5-12.5)	05/11/19	Native	3.89	114	0.552	11.6	5.08	0.0889 U	1.11 U	0.222 U	--
DP-9(1-2)	05/11/19	Native	11.2	201	0.92	22.8	15.9	0.124 U	1.55 U	0.311 U	--
DP-9(8-9)	05/11/19	Native	5.36	140	0.784	18.8	7.96	0.108 U	1.35 U	0.269 U	--
DP-10(2-3)	05/11/19	Native	7.37	132	0.326	19.6	13.8	0.102 U	1.27 U	0.254 U	--
DP-10(13-14)	05/11/19	Native	7.11	208	0.929	22.8	9.44	0.107 U	1.34 U	0.267 U	--
DP-11(3-4)	05/11/19	Native	9.11	199	0.624	25.1	13.6	0.110 U	1.38 U	0.276 U	--
DP-11(10-11)	05/11/19	Native	3.86	132	0.557	12.3	5.67	0.0980 U	1.22 U	0.245 U	--
DP-11(18-19)	05/11/19	Native	3.98	106	0.587	11.9	5.57	0.0985 U	1.23 U	0.246 U	--
DP-12(1-2)	05/11/19	Native	11.3	176	1.08	29.1	14.2	0.112 U	1.39 U	0.279 U	--

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			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	
DP-12(12-13)	05/11/19	Native	4.79	141	0.711	15.1	5.69	0.0981 U	1.23 U	0.245 U	--
DP-12(16-17)	05/11/19	Native	4.18	109	0.607	11.3	5.69	0.0947 U	1.18 U	0.237 U	--
DP-13(4-5)	05/11/19	Native	12.3	179	0.974	24.3	15.1	0.109 U	1.37 U	0.273 U	--
DP-13(9-10)	05/11/19	Native	4.89	127	0.801	14.4	7.16	0.108 U	1.35 U	0.269 U	--
DP-14(2-3)	05/11/19	Native	11.4	231	1.06	28.5	14.3	0.116 U	1.46 U	0.291 U	--
DP-14(11-12)	05/11/19	Native	4.78	129	0.853	14.9	7.48	0.113 U	1.42 U	0.284 U	--
DP-15(4-5)	05/11/19	Native	12.1	206	1.01	26.4	15.8	0.115 U	1.44 U	0.288 U	--
DP-16(2-3)	05/15/19	Native	11.9	176	0.837	28.3	15.2	0.110 U	1.38 U	0.275 U	--
DP-25(1-1.5)	07/18/19	Fill	--	--	--	--	50.6	--	--	--	--
DP-25(4-4.5)	07/18/19	Native	--	--	--	--	12.8	--	--	--	--
DP-26(1-1.5)	07/18/19	Fill	--	--	--	--	991	--	--	--	0.350
DP-26(2-2.5)	07/18/19	Native	--	--	--	--	17.6	--	--	--	--
DP-27(1-1.5)	07/18/19	Fill	--	--	--	--	146	--	--	--	--
DP-27(2-2.5)	07/18/19	Native	--	--	--	--	15.5	--	--	--	--
DP-28(1-1.5)	07/18/19	Fill	--	--	--	--	80	--	--	--	--
DP-28(2-2.5)	07/18/19	Native	--	--	--	--	15.4	--	--	--	--
DP-29(1-1.5)	07/18/19	Native	--	--	--	--	12.0	--	--	--	--
DP-29(2-2.5)	07/18/19	Native	--	--	--	--	13.8	--	--	--	--
DP-30(1-1.5)	07/18/19	Fill	--	--	--	--	59.8	--	--	--	--
DP-30(2-2.5)	07/18/19	Native	--	--	--	--	16.0	--	--	--	--
DP-31(1-1.5)	07/18/19	Fill	--	--	--	--	92.3	--	--	--	--
DP-31(2-2.5)	07/18/19	Native	--	--	--	--	17.6	--	--	--	--
DP-32(1-1.5)	07/18/19	Fill	--	--	--	--	1,580	--	--	--	0.173
DP-32(2-2.5)	07/18/19	Native	--	--	--	--	15.5	--	--	--	--
HA-1(2-2.5)	05/15/19	Native	10.3	121	0.318	22.5	21.7	0.100 U	1.25 U	0.251 U	--
HA-1(12-12.5)	05/15/19	Native	8.87	200	0.521	26.8	11.1	0.101 U	1.27 U	0.254 U	--
HA-1(15-15.5)	05/15/19	Native	6.21	153	0.612	17.3	9.54	0.105 U	1.31 U	0.263 U	--
HA-2(2-2.5)	05/15/19	Native	4.32	144	0.628	11.9	8.06	0.100 U	1.26 U	0.251 U	--
HA-3	07/30/19	NA	--	--	--	--	--	--	--	--	--

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			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	
HA-4(0.5-1)	07/30/19	Fill	--	--	--	--	67.5	--	--	--	--
HA-5(0.3-0.7)	07/30/19	Fill	--	--	--	--	52.2	--	--	--	--
HA-5(0.7-1.2)	07/30/19	Native	--	--	--	--	14.6	--	--	--	--
HA-6(0.5-1)	07/30/19	Native	--	--	--	--	12.6	--	--	--	--
HA-6(1-1.5)	07/30/19	Native	--	--	--	--	16.8	--	--	--	--
HA-7(0.2-0.7)	07/30/19	Fill	--	--	--	--	131	--	--	--	0.0500 U
HA-7(1-1.5)	07/30/19	Native	--	--	--	--	16.9	--	--	--	--
HA-8(1-1.3)	07/30/19	Fill	--	--	--	--	54.6	--	--	--	--
HA-8(1.3-1.5)	07/30/19	Fill	--	--	--	--	94.6	--	--	--	--
HA-9(0.5-1)	07/30/19	Native	--	--	--	--	15.7	--	--	--	--
HA-10(0.3-0.7)	07/30/19	Fill	--	--	--	--	232	--	--	--	0.106
HA-11(0.5-1)	07/30/19	Fill	--	--	--	--	329	--	--	--	0.0560
HA-11(1-1.5)	07/30/19	Native	--	--	--	--	12.7	--	--	--	--
HA-12(1-1.5)	07/30/19	Native	--	--	--	--	16.5	--	--	--	--
HA-13(0.5-1)	07/30/19	Fill	--	--	--	--	108	--	--	--	--
HA-13(1-1.5)	07/30/19	Native	--	--	--	--	14.8	--	--	--	--
HA-14(0.5-1)	07/30/19	Native	--	--	--	--	12.0	--	--	--	--
HA-14(1-1.5)	07/30/19	Native	--	--	--	--	11.3	--	--	--	--
90% UCL [1]			***8.039*** [2]		***0.75*** [3]		***13.18*** [4]				
DEQ Generic RBCs [5]											
Soil Ingestion, Dermal Contact, and Inhalation											
Occupational			1.9	220,000	1,100	>Max	800	350	NE	5,800	NE
Construction Worker			15	69,000	350	530,000	800	110	NE	1,800	NE
Excavation Worker			420	>Max	9,700	>Max	800	2,900	NE	49,000	NE
Volatilization to Outdoor Air											
Occupational			NV	NV	NV	NV	NV	NV	NE	NV	NE
Vapor Intrusion into Buildings											
Occupational			NV	NV	NV	NV	NV	NV	NE	NV	NE
EPA Maximum Threshold Limits [6]			100	2,000	20	100	100	4	20	100	NA

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			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	
EPA TCLP Limits[7]			NA	NA	NA	NA	NA	NA	NA	NA	5.0
DEQ CFSLs[8]			8.8	790	0.63	76	28	0.23	0.71	2.6	NA

Notes:

1. Calculated 90% UCL based on data size, data distribution, and skewness, as recommended in DEQ's Internal Management Directive updated on February 21, 2019. The calculated 90% UCLs exclude data from DP-4(0.5-1.5), DP-25(1-1.5), DP-26(1-1.5), DP-27(1-1.5), DP-28(1-1.5), DP-30(1-1.5), DP-31(1-1.5), DP-32(1-1.5), HA-4(0.5-1), HA-5(0.0-0.7), HA-7(0.2-0.7), HA-8(1-1.3), HA-8(1.3-1.5), HA-10(0.3-0.7), HA-11(0.5-1), and HA-13(0.5-1).
2. ProUCL-recommended use of the Gamma KM Adjusted Gamma 90% UCL value for this analytes data set.
3. ProUCL-recommended use of the Normal KM Student's-t 90% UCL value for this analytes data set.
4. ProUCL-recommended use of the Normal Student's-t 90% UCL value for this analytes data set.
5. DEQ Generic RBCs dated May 2018
6. Section 1.2 of EPA Method 1311 (TCLP) allows for a total constituent analysis in lieu of the TCLP extraction. The maximum allowable limits equate to 20 times the maximum leachable limit.
7. Analytes exceeding the maximum leachable limits are defined as toxicity characteristic hazardous waste.
8. DEQ CFSLs dated February 21, 2019

>Max: The constituent RBC for this pathway is calculated as greater than 1,000,000 mg/kg or 1,000,000 mg/L. Therefore, this substance is deemed not to pose risks in this scenario.
NA: not applicable
NE: not established
NV: chemical is considered non-volatile
U: Not detected. Reporting or detection limit shown.
Bolding indicates analyte detection.
Gray shading indicates analyte detection at a concentration greater than DEQ CFSLs.
Orange shading indicates analyte detection at a concentration greater than DEQ RBCs and CFSLs.
--: not analyzed

TABLE 4
Summary of Soil Sample Chemical Analytical Results
PAHs
Modera Morrison
1120 SE Morrison Street
Portland, Oregon

Sample I.D. (depth in feet BGS)	Sample Date	PAHs by EPA Method 8270D SIM (mg/kg)																	
		Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Dibenzofuran	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	1-Methylnaphthalene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene
DP-1(0.5-1.5)	05/11/19	0.0103 U	0.0103 U	0.0103 U	**0.0217**	**0.0211**	**0.0315**	**0.0201**	0.0103 U	**0.0283**	0.0103 U	0.0103 U	**0.0407**	0.0103 U	**0.0181**	0.0103 U	0.0103 U	0.0103 U	**0.0256**	**0.0508**
DP-1(11.5-12.5)	05/11/19	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U	0.00973 U
DP-2(1-2)	05/11/19	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U
DP-2(12-13)	05/11/19	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U
DP-3(1-2)	05/11/19	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U
DP-3(12-13)	05/11/19	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U
DP-4(0.5-1.5)	05/11/19	**0.0127**	**0.197**	**0.0842**	**0.343**	**0.682**	**0.779**	**0.703**	**0.206**	**0.705**	**0.073**	0.0111 U	**1.67**	**0.0605**	**0.604**	**0.0859**	**0.0364**	**0.0267**	**1.26**	**2.15**
DP-4(8-9)	05/11/19	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
DP-4(11.5-12.5)	05/11/19	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U
DP-5(1-2)	05/11/19	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U	0.0122 U
DP-5(8.5-9.5)	05/11/19	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U
DP-5(13-14)	05/11/19	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U
DP-6(1-2)	05/11/19	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U
DP-6(8-9)	05/11/19	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U
DP-6(12.5-13.5)	05/11/19	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U
DP-7(1-2)	05/11/19	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U
DP-7(6.5-7.5)	05/11/19	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U
DP-7(11.5-12.5)	05/11/19	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U	0.00959 U
DP-8(1.5-2.5)	05/11/19	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U
DP-8(8-9)	05/11/19	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U	0.00971 U
DP-8(11.5-12.5)	05/11/19	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U
DP-9(1-2)	05/11/19	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U
DP-9(8-9)	05/11/19	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U
DP-10(2-3)	05/11/19	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U
DP-10(13-14)	05/11/19	0.00998 U	0.00998 U	0.00998 U	0.00998 U	0.00998 U	0.00998 U	**0.0135**	0.00998 U	0.00998 U	0.00998 U	0.00998 U	0.00998 U	0.00998 U	**0.014**	0.00998 U	0.00998 U	0.00998 U	0.00998 U	0.00998 U
DP-11(3-4)	05/11/19	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U	0.00983 U
DP-11(10-11)	05/11/19	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U	0.00943 U
DP-11(18-19)	05/11/19	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U
DP-12(1-2)	05/11/19	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U
DP-12(12-13)	05/11/19	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U
DP-12(16-17)	05/11/19	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U	0.00992 U
DP-13(4-5)	05/11/19	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U
DP-13(9-10)	05/11/19	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U
DP-14(2-3)	05/11/19	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U

TABLE 4
Summary of Soil Sample Chemical Analytical Results
PAHs
Modera Morrison
1120 SE Morrison Street
Portland, Oregon

Sample I.D. (depth in feet BGS)	Sample Date	PAHs by EPA Method 8270D SIM (mg/kg)																		
		Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Dibenzofuran	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	1-Methylnaphthalene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene
DP-14(11-12)	05/11/19	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U
DP-15(4-5)	05/11/19	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U
DP-16(2-3)	05/11/19	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U
DP-19(11-12)	07/18/19	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U
DP-23(11-12)	07/18/19	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U
HA-1(2-2.5)	05/15/19	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	**0.0109**	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	**0.012**
HA-1(12-12.5)	05/15/19	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U
HA-1(15-15.5)	05/15/19	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U	0.0103 U
HA-2(2-2.5)	05/15/19	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
HA-8(1.3-1.5)	07/30/19	0.0108 U	**0.0267**	**0.0185**	**0.0696**	**0.116**	**0.146**	**0.0432**	**0.111**	**0.136**	**0.0165**	0.0108 U	**0.183**	**0.0111**	**0.0912**	**0.0920**	**0.138**	**0.108**	**0.170**	**0.231**
HA-10(0.3-0.7)	07/30/19	0.00968 U	**0.0237**	**0.0121**	**0.0637**	**0.127**	**0.166**	**0.0481**	**0.125**	**0.134**	**0.0135**	0.00968 U	**0.228**	0.00968 U	**0.104**	0.00968 U	0.00968 U	**0.0285**	**0.157**	**0.275**
DEQ Generic RBCs[1]																				
Soil Ingestion, Dermal Contact, and Inhalation																				
Occupational		70,000	NE	350,000	21	2.1	21	210	NE	2,100	2.1	NE	30,000	47,000	21	NE	NE	23	NE	23,000
Construction Worker		21,000	NE	110,000	170	17	170	1,700	NE	17,000	17	NE	10,000	14,000	170	NE	NE	580	NE	7,500
Excavation Worker		590,000	NE	>Max	4,800	490	4,900	49,000	NE	490,000	490	NE	280,000	390,000	4,900	NE	NE	16,000	NE	210,000
Volatilization to Outdoor Air																				
Occupational		>Max	NE	>Max	>Csat	NV	NV	NV	NE	NV	NV	NE	NV	>Max	NV	NE	NE	83	NE	>Max
Vapor Intrusion into Buildings																				
Occupational		>Max	NE	>Max	>Csat	NV	NV	NV	NE	NV	NV	NE	NV	>Max	NV	NE	NE	83	NE	>Max
DEQ CFSLs[2]		0.25	120	6.8	0.73	0.11	1.1	11	25	3.1	0.11	0.002	10	3.7	1.1	0.36	11	0.077	5.5	10

Notes:
1. DEQ Generic RBCs dated May 2018
2. DEQ CFSLs dated February 21, 2019
>Csat: This soil RBC exceeds the limit of three-phase equilibrium partitioning. Refer to Appendix D of DEQ's *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* guidance document for the corresponding value of Csat. Soil concentrations in excess of Csat indicate that free product might be present.
>Max: The constituent RBC for this pathway is calculated as greater than 1,000,000 mg/kg or 1,000,000 mg/L. Therefore, this substance is deemed not to pose risks in this scenario.
NE: not established
NV: chemical is considered non-volatile
U: Not detected. Reporting or detection limit shown.
Bolding indicates analyte detection.
Shading indicates analyte detection at a concentration greater than DEQ CFSLs.

TABLE 5
Summary of Soil Sample Chemical Analytical Results
PCBs
Modera Morrison
1120 SE Morrison Street
Portland, Oregon

Sample I.D. (depth in feet BGS)	Sample Date	PCBs by EPA Method 8082A (mg/kg)													
		Aroclor 1016		Aroclor 1221		Aroclor 1232		Aroclor 1242		Aroclor 1248		Aroclor 1254		Aroclor 1260	
DP-1(0.5-1.5)	05/11/19	0.0117	U	0.0117	U	0.0117	U	0.0117	U	0.0117	U	0.0117	U	0.0117	U
DP-1(11.5-12.5)	05/11/19	0.0111	U	0.0111	U	0.0111	U	0.0111	U	0.0111	U	0.0111	U	0.0111	U
DP-2(1-2)	05/11/19	0.0118	U	0.0118	U	0.0118	U	0.0118	U	0.0118	U	0.0118	U	0.0118	U
DP-2(12-13)	05/11/19	0.0127	U	0.0127	U	0.0127	U	0.0127	U	0.0127	U	0.0127	U	0.0127	U
DP-3(1-2)	05/11/19	0.0119	U	0.0119	U	0.0119	U	0.0119	U	0.0119	U	0.0119	U	0.0119	U
DP-3(12-13)	05/11/19	0.0127	U	0.0127	U	0.0127	U	0.0127	U	0.0127	U	0.0127	U	0.0127	U
DP-4(0.5-1.5)	05/11/19	0.0115	U	0.0115	U	0.0115	U	0.0115	U	0.0115	U	0.0115	U	0.0115	U
DP-4(8-9)	05/11/19	0.0108	U	0.0108	U	0.0108	U	0.0108	U	0.0108	U	0.0108	U	0.0108	U
DP-4(11.5-12.5)	05/11/19	0.0125	U	0.0125	U	0.0125	U	0.0125	U	0.0125	U	0.0125	U	0.0125	U
DP-5(1-2)	05/11/19	0.0112	U	0.0112	U	0.0112	U	0.0112	U	0.0112	U	0.0112	U	0.0112	U
DP-5(8.5-9.5)	05/11/19	0.0117	U	0.0117	U	0.0117	U	0.0117	U	0.0117	U	0.0117	U	0.0117	U
DP-5(13-14)	05/11/19	0.0125	U	0.0125	U	0.0125	U	0.0125	U	0.0125	U	0.0125	U	0.0125	U
DP-6(1-2)	05/11/19	0.0112	U	0.0112	U	0.0112	U	0.0112	U	0.0112	U	0.0112	U	0.0112	U
DP-6(8-9)	05/11/19	0.0127	U	0.0127	U	0.0127	U	0.0127	U	0.0127	U	0.0127	U	0.0127	U
DP-6(12.5-13.5)	05/11/19	0.012	U	0.012	U	0.012	U	0.012	U	0.012	U	0.012	U	0.012	U
DP-7(1-2)	05/11/19	0.011	U	0.011	U	0.011	U	0.011	U	0.011	U	0.011	U	0.011	U
DP-7(6.5-7.5)	05/11/19	0.0101	U	0.0101	U	0.0101	U	0.0101	U	0.0101	U	0.0101	U	0.0101	U
DP-7(11.5-12.5)	05/11/19	0.00955	U	0.00955	U	0.00955	U	0.00955	U	0.00955	U	0.00955	U	0.00955	U
DP-8(1.5-2.5)	05/11/19	0.0118	U	0.0118	U	0.0118	U	0.0118	U	0.0118	U	0.0118	U	0.0118	U
DP-8(8-9)	05/11/19	0.0107	U	0.0107	U	0.0107	U	0.0107	U	0.0107	U	0.0107	U	0.0107	U
DP-8(11.5-12.5)	05/11/19	0.0113	U	0.0113	U	0.0113	U	0.0113	U	0.0113	U	0.0113	U	0.0113	U

TABLE 5
Summary of Soil Sample Chemical Analytical Results
PCBs
Modera Morrison
1120 SE Morrison Street
Portland, Oregon

Sample I.D. (depth in feet BGS)	Sample Date	PCBs by EPA Method 8082A (mg/kg)						
		Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
DP-9(1-2)	05/11/19	0.0136 U	0.0136 U	0.0136 U	0.0136 U	0.0136 U	0.0136 U	0.0136 U
DP-9(8-9)	05/11/19	0.0121 U	0.0121 U	0.0121 U	0.0121 U	0.0121 U	0.0121 U	0.0121 U
DP-10(2-3)	05/11/19	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U
DP-10(13-14)	05/11/19	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U
DP-11(3-4)	05/11/19	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
DP-11(10-11)	05/11/19	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U
DP-11(18-19)	05/11/19	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U
DP-12(1-2)	05/11/19	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U
DP-12(12-13)	05/11/19	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
DP-12(16-17)	05/11/19	0.0108 U	0.0108 U	0.0108 U	0.0108 U	0.0108 U	0.0108 U	0.0108 U
DP-13(4-5)	05/11/19	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U
DP-13(9-10)	05/11/19	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U
DP-14(2-3)	05/11/19	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U
DP-14(11-12)	05/11/19	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U
DP-15(4-5)	05/11/19	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U
DP-16(2-3)	05/11/19	0.0127 U	0.0127 U	0.0127 U	0.0127 U	0.0127 U	0.0127 U	0.0127 U
HA-1(2-2.5)	05/15/19	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U	0.0117 U
HA-1(12-12.5)	05/15/19	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U
HA-1(15-15.5)	05/15/19	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U
HA-2(2-2.5)	05/15/19	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U

TABLE 5
Summary of Soil Sample Chemical Analytical Results
PCBs
Modera Morrison
1120 SE Morrison Street
Portland, Oregon

Sample I.D. (depth in feet BGS)	Sample Date	PCBs by EPA Method 8082A (mg/kg)						
		Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
HA-8(1.3-1.5)	07/30/19	0.0102 U	0.0102 U	0.0102 U	0.0102 U	0.0102 U	0.0102 U	0.0102 U
HA-10(0.3-0.7)	07/30/19	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U	0.0101 U
DEQ Generic RBCs[1]								
Soil Ingestion, Dermal Contact, and Inhalation								
Occupational		0.59						
Construction Worker		4.9						
Excavation Worker		140						
Volatilization to Outdoor Air								
Occupational		>Csat						
Vapor Intrusion into Buildings								
Occupational		>Csat						
DEQ CFSLs[2]		1.1	0.0048	0.0048	0.041	0.0073	0.041	0.24

Notes:

1. DEQ Generic RBCs dated May 2018
2. DEQ CFSLs dated February 21, 2019

>Csat: This soil RBC exceeds the limit of three-phase equilibrium partitioning. Refer to Appendix D of DEQ's *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* guidance document for the corresponding value of Csat. Soil concentrations in excess of Csat indicate that free product might be present.

U: Not detected. Reporting or detection limit shown.

APPENDIX A

APPENDIX A
SITE-SPECIFIC HEALTH AND SAFETY PLAN

INTRODUCTION

This HSP is intended solely for the use of GeoDesign employees while providing on-site observation, monitoring, and sampling; is provided in this document for reference only; and is not a replacement for each Contractor's specific HSP. Each Contractor conducting work at the Property is individually responsible for the health and safety of their employees. This includes the implementation of any training requirements, HSPs, monitoring, and any other specific requirements for the type of work being completed by the Contractor. This HSP should be available to employees who will be working at the Property and can be used to assist the Contractor in preparation of their employee hazard communication and health and safety program for the Property. Contractors may adopt this HSP with the proper modifications to address the type of work they will be completing at the Property.

This HSP establishes the policies and procedure that will help minimize risk to on-site workers, visitors, and the public. The procedures and guidelines contained herein are based on the current available information at the time of this HSP's preparation. Specific requirements will be revised when new information is received or conditions change.

PROPERTY BACKGROUND

A summary the environmental history and background of the Property is presented in Section 1.0 of the SWMP.

PROPERTY LOCATION

Property Location: 1120 SE Morrison Street; Portland, Oregon

Description: The Property includes Tax Lot 5100 of Multnomah County Tax Map 1S1E02BA and is currently occupied by a commercial structure and associated paved areas.

Contracting Company or Agency: Morrison 12 Ave Apartments LLC

SCOPE OF WORK (GEODESIGN)

Objectives: Observe soil conditions, excavation activities, and/or construction; provide field screening of soil if excavated from excavation; collect samples as necessary, document Property activities

Duration of Work: To be determined

ON-SITE ORGANIZATION AND COORDINATION

The following personnel are designated to carry out the stated job functions on the Property. (Note: One person may carry out more than one job function.)

Project Manager:	Kyle Sattler
Property Safety Officer (SSO):	Kyle Sattler
Property Supervisor:	To be determined
Field Personnel:	To be determined
Subcontractor(s):	Not applicable (NA)
Owner's Representatives:	Sam Rodriguez

The Project Manager has overall responsibility for all activities on the Property, including implementation of the site safety plan. The Project Manager may delegate this function to the SSO.

The SSO is responsible for helping to ensure that work crews comply with all Property safety and health requirements.

All other Property personnel are responsible for understanding and complying with all Property safety and health requirements.

PROPERTY CONTROL

If encountered, areas of contamination should be delineated by stakes, ground paint, or flagging. Excavations deeper than 4 feet BGS should be properly shored and fenced to prevent excavation collapse and falls into the excavation.

EMPLOYEE TRAINING

All site personnel working in impacted portions of the Property and that might come in contact with impacted media or vapors will have received 24 or 40 hours of OSHA training on safe work practices for hazardous waste sites. In addition, personnel are required to receive eight hours of OSHA refresher training annually. Managers and supervisors are required to receive eight hours of OSHA training for safe management of hazardous waste site operations. All training will comply with 29 Code of Federal Regulations 1910.120. Site-specific training will be held at the beginning of the project. Daily site safety meetings will be held on the Property and a record kept.

MEDICAL SURVEILLANCE

Pre-employment and periodic medical examinations are required for personnel working at hazardous waste sites. The medical examination must be completed within the prior 12-month period. A statement deeming the worker fit-for-duty is required from a licensed physician. Medical records are accessible by workers.

HAZARD/RISK ASSESSMENT

This section discusses chemical, physical, and environmental hazards to workers on the Property. The table below lists major hazards associated with these tasks and methods to mitigate the hazards. The table below discusses physical hazards identified with this Property, including those associated with fire, use of heavy equipment, slip/trip/fall, lifting, tool and equipment, and heat stress.

Daily tailgate safety meetings will be held at the start of each workday to discuss potential chemical, physical, and environmental hazards and preventative safety measures. Attendance will be mandatory for all employees. Task hazard analyses have been developed for each major field activity/work phase and are presented in the table below. The following sections describe the specific hazards anticipated in more detail and the control measures to be implemented to minimize or eliminate each hazard. This information will be used to augment daily safety meetings intended to heighten safety and hazard awareness on the job.

HAZARDS ASSOCIATED WITH TASKS

The main hazards associated with site construction are struck-by and inhalation, contact, and/or ingestion of contaminants. Other potential hazards associated with the Property activity are analyzed as detailed in the table below.

Hazard Sources and Mitigation during Field Activities and Hazard Project Tasks Mitigation Methods

Hazard	Project Tasks	Mitigation Methods
Slip/trip/fall	All tasks	Maintain good housekeeping. Limit work area with boundary marking tape and signs. Slip/trip/fall hazards will be addressed through an ongoing proactive housekeeping program that eliminates elements in the work area that have potential for causing loss of footing.
Struck-by	All tasks	Maintain a safe distance from any heavy equipment. Workers should not stand within the swing radius or reach of heavy equipment.
Explosion/fire	All tasks	Smoking is not permitted in the work zones. Any free-phase petroleum or gasoline will be stored in appropriate containers. Signs indicating flammable liquids should be posted where appropriate. Appropriate fire extinguishers will be available to site personnel during field activities. Open-flame ignition sources will be restricted from the work area (smoking, etc.)

Hazard Sources and Mitigation during Field Activities and Hazard Project Tasks Mitigation Methods (continued)

Hazard	Project Tasks	Mitigation Methods
Inhalation, contact and, ingestion of organic vapors	Excavation, sampling, and monitoring	Level D PPE is typically adequate. If PID readings in the breathing zone indicate conditions require upgrading to air-purifying respirators (Modified Level C PPE) in accordance with the guidance presented below, an addendum to this HSP will be submitted for review and approval. • <5 parts per million (ppm) in the breathing zone = no action is required • 5 to 25 ppm in the breathing zone for 5 minutes or more = upgrade to Modified Level C (i.e., put on respirator) • >25 ppm in the breathing zone for 5 minutes or more = stop work and leave work area, then evaluate options In general, remain upwind of contaminated material whenever possible. Wear disposable gloves and safety glasses with side shields when handling soil and sampling water. Avoid smoking at all times during the mass excavation activities. Chewing tobacco and eating should also be avoided during excavation work to prevent ingestion of site contaminants.

Hazard Sources and Mitigation during Field Activities and Hazard Project Tasks Mitigation Methods (continued)

Hazard	Project Tasks	Mitigation Methods
Contact with contaminated soil and groundwater	Excavation, sampling, and monitoring	Level D PPE is typically adequate. Wear appropriate coveralls, gloves, and protective eyewear. No eating, smoking, or drinking on site.
Weather extremes	All tasks	Use dress consistent with weather conditions. Implement worker rotation and rest period schedules. Adjust workday to avoid exposure.

HAZARD ANALYSIS

Chemical(s)	Petroleum Hydrocarbons and metals
Heavy Equipment	Yes
Confined Space	Not anticipated
Flammability	NA
Reactivity	NA
Heat	Occasional warm periods
Cold	Occasional cold periods
Flammability	NA
Reactivity	NA
Drums	NA
Terrain	Potential excavation with steep sidewalls
Oxygen Deficient	NA
Electrical	NA
Corrosivity	NA
Noise	Construction equipment noise will be present during the entire work period
Altitude	NA

Radiation	NA
Wildlife	NA
Ergonomic	NA
Drilling	NA
Excavation	Mass excavation for Property redevelopment
Biological Agent	NA
Explosives	NA
Vehicles	Freight trucks, cars, construction vehicles

PERSONAL PROTECTIVE EQUIPMENT

Based on the evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work areas or tasks:

Location	Job Function	Levels of Protection
Exclusion Zone	**All Tasks**	**D**
		A B C D Other
		A B C D Other
		A B C D Other
Contamination Reduction Zone	**All Tasks**	**D**
		A B C D Other
		A B C D Other

Specific protective equipment for each level of protection is as follows:

Level A	Level C

Level B _____

_____

_____

_____

Level D Hard hat, safety vest, work boots; eye protection and ear protection if construction equipment is operating.

Other _____

DOWNGRADING CHANGES TO THE SPECIFIED LEVELS OF PROTECTION SHALL NOT BE MADE WITHOUT THE APPROVAL OF THE SITE SAFETY OFFICER.

DECONTAMINATION PROCEDURE

Personnel and equipment leaving the Exclusion Zone shall be thoroughly decontaminated. The standard level **NA** decontamination protocol shall be used with the following decontamination stations:

(1)_____ (2)_____

(3)_____ (4)_____

(5)_____ (6)_____

(7)_____ (8)_____

(9)_____ (10)_____

The decontamination station will be located immediately adjacent to the Exclusion Zone. The decontamination solution will be **NA**.

Emergency decontamination will include the following stations: **Soap and Water – Rinse Water – Eye-Wash Station**

Equipment decontamination will be as follows: **Trisodium Phosphate and Water**

EMERGENCIES

Closest Hospital	**Providence Hospital**		
Address	**4805 NE Glisan Street**	Phone	**503-215-1111**
Distance	**2.9 miles – see attached map**		
Ambulance		Phone	**911**
Police		Phone	**911**
Fire		Phone	**911**
GeoDesign, Inc.	Office Phone: **503-968-8787**		

Emergency Equipment is available on-site at the following locations:

First Aid Kit	**In Vehicle**
Eye Wash	**In Vehicle**
Fire Extinguisher	**On-Site**
Other	

The following standard emergency procedures will be used by on-site personnel. The SSO shall be notified of any on-site emergencies and will be responsible for helping ensure that the appropriate procedures are followed.

Personnel Injury in the Exclusion Zone: Upon notification of an injury in the Exclusion Zone, the designated emergency signal of three horn blasts shall be sounded. All Property personnel will assemble at the decontamination line. The rescue team will enter the Exclusion Zone (if required) to remove the injured person to the hotline. The SSO will evaluate the nature of the injury, and the impacted person should be decontaminated to the extent possible prior to movement to the Support Zone. Appropriate first aid and arrangement for an ambulance will be made with the designated medical facility (if required). No persons will re-enter the Exclusion Zone until the cause of the injury or symptoms is determined.

Personnel Injury in the Support Zone: Upon notification of an injury in the Support Zone, the SSO will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of Property personnel, operations may continue with the appropriate first aid and necessary follow-up as stated above. If the injury increases the risk to others, the designated emergency signal of three horn blasts will be sounded and all Property personnel shall move to the decontamination line for further instructions. Activities on site will stop until the added risk is removed or minimized.

Fire/Explosion: Upon notification of a fire or explosion on the Property, the designated emergency signal of three horn blasts will be sounded and all Property personnel will assemble at the decontamination line. The fire department will be alerted and all personnel will move to a safe distance from the involved area.

PPE Failure: If any site worker experiences a failure or alteration of PPE that affects the protection factor, that person and his buddy will immediately leave the Exclusion Zone. Re-entry will not be permitted until the equipment has been repaired or replaced.

Other Equipment Failure: If any other equipment on the Property fails to operate properly, the Site Supervisor will be notified and then determine the effect of the failure on continuing operations on the Property. If the failure affects the safety of personnel or prevents completion of project objectives, all personnel will leave the Exclusion Zone until the situation is evaluated and appropriate actions taken.

Emergency Escape Routes: The following routes are designated for use in situations where egress from the Exclusion Zone cannot occur through the decontamination line: (describe alternate routes to leave the area in emergencies)

To be determined upon arrival on-site

In all situations, when an on-site emergency results in evacuation of the Exclusion Zone, personnel will not re-enter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been re-assessed.
3. The Site Safety Plan has been reviewed.
4. Site personnel have been briefed on any changes to the Site Safety Plan.

ATTACHMENT 1

HAZARD ANALYSIS

HAZARD	PREVENTION	TREATMENT
Traffic to and from site	**Defensive driving**	**Call 911 and insurance company**
Hot weather	**Wear sunscreen, drink water**	**Re-hydrate**
Slips, trips, falls, cuts	**Caution**	**Antibiotic ointment**
Construction equipment	**Eye contact with operator, personal protection equipment, caution**	**Call 911**
Soil sampling	**Use protective PPE**	**Call 911 or on-site assistance**

If additional physical hazards are identified during site work, document the conditions and contact the Project Manager.

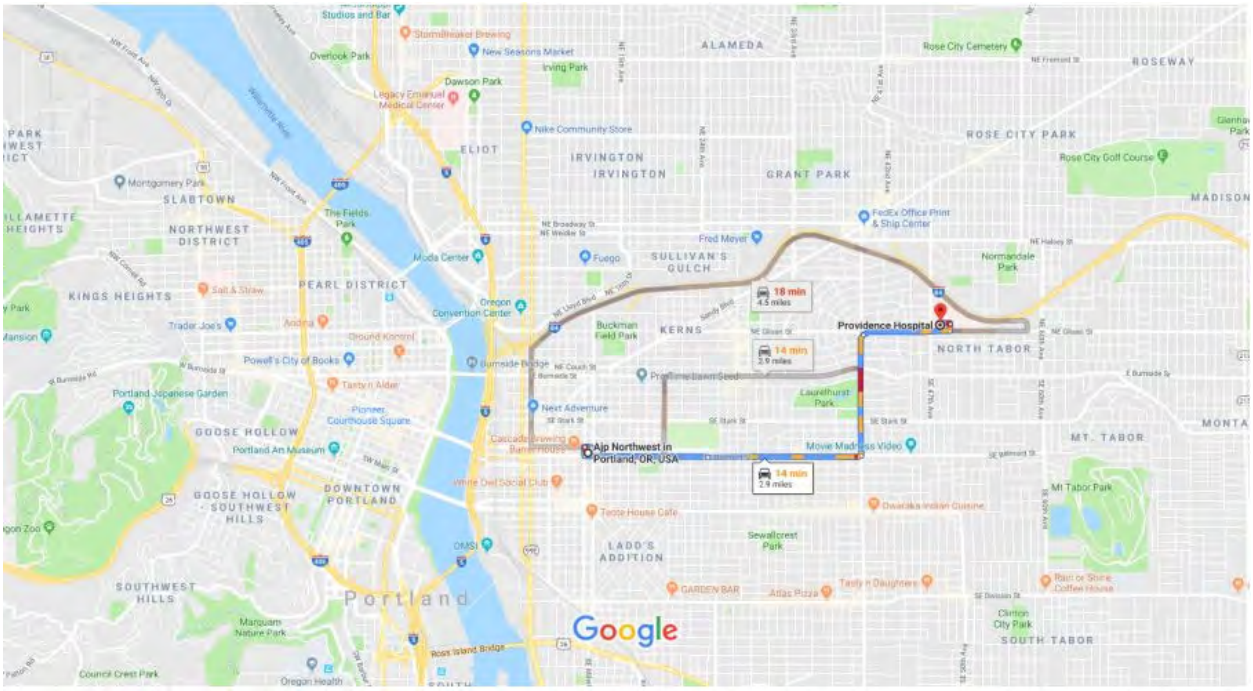
ATTACHMENT 2

SITE SAFETY PLAN ACKNOWLEDGMENT

All site personnel have read the above plan and are familiar with its provisions.

Name	Company	Date
Site Safety Officer		
Project Manager		
Site Personnel		

Map to Hospital
Providence Hospital
4805 NE Glisan Street
Portland, OR 97227



APPENDIX B

State of Oregon
Department of
Environmental
Quality

SOLID WASTE DISPOSAL SITE PERMIT
Special Purpose Landfill

Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201
Telephone: 503-229-5353

Issued in accordance with the provisions of ORS Chapter 459 and subject to the land use compatibility statement referenced below.

ISSUED TO:

Hillsboro Landfill, Inc.
3205 SE Minter Bridge Road
Hillsboro, OR 97123
503-640-9427

FACILITY NAME AND LOCATION:

Hillsboro Landfill
3205 SE Minter Bridge Road
Hillsboro, OR 97123
503-640-9427
T1N, R2W W.M.; Parts of Sections 7, 8 & 18
Latitude 45.4952, Longitude -122.9692
(entrance to facility)
Washington County

OWNER:

Hillsboro Landfill, Inc.
3205 SE Minter Bridge Road
Hillsboro, OR 97123
503-640-9427

OPERATOR:

Hillsboro Landfill, Inc.
3205 SE Minter Bridge Road
Hillsboro, OR 97123
503-640-9427
Contact: Paul Burns
pburns@wm.com

ISSUED IN RESPONSE TO:

- A solid waste permit application dated March 30, 2005, updated March 1, 2012
- A Land Use Compatibility Statement from Washington County dated July 29, 2004 and
- A Notice of Decision & Staff Report from Washington County dated June 3, 2011

The determination to issue this permit is based on findings and technical information included in the permit record.

ISSUED BY THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

Audrey M O'Brien — October 24, 2012

Audrey O'Brien, Manager
Environmental Partnerships
Northwest Region

Date

Permitted Activities

Until this permit expires or is modified or revoked, the permittee is authorized to operate and maintain a solid waste land disposal site in conformance with the requirements, limitations, and conditions set forth in this document, including all attachments.

TABLE OF CONTENTS

Introduction This document is a solid waste permit issued by the Oregon Department of Environmental Quality (DEQ) in accordance with Oregon Revised Statutes (ORS) 459 and Oregon Administrative Rules (OAR), Chapter 340.

PERMIT ADMINISTRATION

1.0 PERMIT ISSUANCE

1.1	**Permittee**	This permit is issued to Hillsboro Landfill, Inc.
1.2	**Permit number**	This permit will be referred to as Solid Waste Permit Number 112.
1.3	**Permit term**	The permit is issued on the date it is signed. The permit's expiration date is October 1, 2022.
1.4	**Facility type**	The facility is permitted as a special purpose landfill.
1.5	**Facility owner/ operator**	The owner of this facility is: Hillsboro Landfill, Inc. 3205 SE Minter Bridge Road Hillsboro, OR 97123 503-640-9427 The operator of this facility is: Hillsboro Landfill, Inc. 3205 SE Minter Bridge Road Hillsboro, OR 97123 503-640-9427 Contact: Paul Burns pburns@wm.com
1.6	**Basis for permit issuance**	This permit is issued based upon the following documents submitted by the permittee: • Solid waste permit application dated March 30, 2005, updated March 1, 2012; • A Land Use Compatibility Statement from Washington County dated July 29, 2004; and • A Notice of Decision & Staff Report from Washington County dated June 3, 2011.
1.7	**Definitions**	Unless otherwise specified, all terms are as defined in OAR 340-093-0030.
1.8	**Legal control of property**	The permittee shall at all times maintain legal control of the disposal site property; including maintaining a current permit, contract or agreement that allows the operation of the facility if the site is not owned by the permittee.
1.9	**Submittals & notification address**	Unless otherwise specified, all submittals and notifications to DEQ under this permit must be sent to: **Oregon Department of Environmental Quality** **Manager, Solid Waste Program** **2020 SW 4th Avenue, Suite 400** **Portland, OR 97201** **Telephone: 503-229-5353** All submittals must include at a minimum of one (1) paper copy and one (1) electronic copy in a format that is approved by the DEQ project manager. Note that some submittals may require more paper copies. Therefore, the permittee must confirm with the project manager how many copies prior to submittal of a document. Note: Whenever possible, the permittee must submit two-sided paper copies of all reports. DEQ may accept electronic submittals for portions of some reports, as approved in the Environmental Monitoring Plan or by DEQ.

1.10	**Description of site**	The facility is located on some of the same tax lots as the Tualatin Valley Waste Recovery (TVWR) facility, Solid Waste Permit #1280. Some of the site developments are shared by both facilities and some are specific to one permit or the other. This section designates which developments are shared and which are separate: TVWR: • Material recovery facility building and operations • Public recycling depot • Electronic waste recycling • Source separated recycling drop off area (wood, concrete, asphalt, metal & yard debris), including processing of these wastes for reuse or recycling • Stormwater storage tank HLI • Landfill areas • Active face • Undeveloped areas • Leachate collection and recovery system • Environmental monitoring (including groundwater, landfill gas and air) Shared • Scale house and scales • Roads • Stormwater collection and wetlands • Office • Truck wash area • Equipment maintenance area • Leachate disposal to sanitary sewer

2.0 DISCLAIMERS

2.1	**Property rights**	The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights.
2.2	**DEQ liability**	DEQ, its officers, agents, or employees do not sustain any liability on account of the issuance of this permit or on account of the construction, maintenance, or operation of facilities pursuant to this permit.

3.0 AUTHORITY

3.1	**Permit duration**	This permit is issued for up to ten (10) years as authorized by Oregon Revised Statutes 459.245 (2).
3.2	**Documents superseded**	This document is the primary solid waste permit for the facility, superseding all other solid waste permits issued for the Hillsboro Landfill by DEQ.

3.3	**Permittee responsibility and liability**	Conditions of this permit are binding upon the permittee. The permittee must conduct all facility activities in compliance with the provisions of the permit. The permittee is liable for all acts and omissions of the permittee's contractors and agents in carrying out the operations and other responsibilities pursuant to this permit.
3.4	**Other compliance**	This permit's issuance does not relieve the permittee from the responsibility to comply with all other applicable federal, state, or local laws or regulations, including the following solid waste requirements, and any future updates or additions to these requirements: • Solid waste permit application dated March 30, 2005 • Oregon Revised Statutes, Chapters 459 and 459A • Oregon Administrative Rules Chapter 340 • Any documents submitted by the permittee and approved by DEQ
3.5	**DEQ access to disposal site**	The permittee must allow representatives of DEQ access to the disposal facility at all reasonable times for the purpose of making inspections, surveys, collecting samples, obtaining data and carrying out other necessary functions related to this permit. Reference: OAR 340-093-0050(6).
3.6	**Penalties**	Violation of permit conditions will subject the permittee to civil penalties of up to $25,000 for each day of each violation. Reference: ORS 459.995(1)(a)

4.0 PERMIT MODIFICATION

4.1	**Permit review**	During the life of the permit, the DEQ may review the permit and amend it if necessary. DEQ will consider the following factors in making this determination: • Compliance history of the facility; • Changes in volume, waste composition, or operations at the facility; • Changes in state or federal rules which should be incorporated into the permit; • A significant release of leachate or landfill gas to the environment from the facility; • Significant changes to a DEQ-approved site development plan, and/or conceptual design; and • Other significant information or events.
4.2	**Permit modification**	DEQ or the permittee may, at any time during the permit's term, propose to change the permit. Once approved by DEQ, any permit-required plans become part of the permit by reference. DEQ may provide notice and opportunity for review of permit-required plans.
4.3	**Modification and revocation by DEQ**	The Director of DEQ may, at any time before the expiration date, modify, suspend, or revoke this permit in whole or in part, in accordance with Oregon Revised Statutes 459.255, for reasons including but not limited to the following: • Violation of any terms or conditions of this permit or any applicable statute, rule, standard, or order of the Environmental Quality Commission; • Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or • A significant change in the quantity or character of solid waste received or in the operation of the disposal site.
4.4	**Modification by permittee**	The permittee must apply for a modification to this permit if there is a significant change in facility operations or a deviation from permitted activities.

4.5	**Public participation**	DEQ will issue a public notice to inform the public of any significant changes to the permit.
4.6	**Changes in ownership or address**	The permittee must report to DEQ any change in the facility's ownership, the permittee's or operator's name and/or address within ten (10) days of the change. Reference: OAR 340-093-0070(6)(a)(A)

ALLOWABLE ACTIVITIES

5.0 AUTHORIZATIONS

5.1 Authorization of activities

The permittee must conduct all facility activities in accordance with the provisions of this permit. All plans required by this permit become part of the permit by reference once approved by DEQ. Any conditions of the approval are also incorporated into this permit unless contested by the permittee within 30 days of the receipt of a conditional approval.

5.2 Wastes authorized for receipt

The permittee is authorized to accept for disposal solid wastes as defined in OAR 340-093-0030, **except those prohibited under Section 6 of this permit**. Authorized solid wastes include:

1. Asbestos Containing Waste (friable and non-friable)
2. Auto shredder waste
3. DEQ approved Cleanup Materials contaminated with hazardous substances
4. Construction and Demolition Wastes
5. Contaminated soil
6. Domestic Solid Waste
7. Drummed waste with solids
8. Empty, rigid pesticide containers if they are:
   a. Disposed of or recovered in accordance with the approved facility operations plan; and
   b. Properly decontaminated by jet or multiple rinsing or other methods in accordance with OAR 340-109-0020; and
   c. Subjected to alteration. Alteration means to puncture or remove both ends and crush the container. Except that:
      - 30-gallon or larger containers must be punctured or their ends removed. Crushing is unnecessary
      - Alteration is not required for containers intended for beneficial use or reuse if alteration would interfere with such use or reuse
      - Gas cylinders must be altered by removing the closure valve or valve stem for pressure relief.
9. Industrial Waste
10. Infectious-waste sharps if confined in leak-proof, rigid, puncture-resistant red containers
11. Residual waste from a dry waste material recovery facility
12. Sludge
13. Wood waste

Note: The acceptance of solid and special wastes must be in accordance with the procedures in the DEQ approved operations and special waste management plans as described in Section 9 of this permit.

5.3	**Authorization of other wastes**	DEQ may authorize the permittee to accept other wastes if: • The permittee develops a Special Waste Management Plan (SWMP) and submits it to DEQ for review and approval prior to accepting the wastes; • DEQ approves the Special Waste Management Plan (SWMP); and • The permittee can demonstrate that the materials comply with the prohibition provisions listed in Section 6 of this permit.
5.4	**Salvaging and recycling**	This permit authorizes the permittee to conduct salvaging and recycling in a controlled and orderly manner. The permittee must notify DEQ prior to changing salvaging and recycling operations.
5.5	**Beneficial use of accepted waste**	The permittee may use a waste for beneficial purposes only after obtaining DEQ approval.
5.6	**Duration of authorization**	The authorization to accept solid waste will terminate at the time of site closure. After that time no solid waste may be accepted without written authorization by the DEQ.

6.0 PROHIBITIONS

6.1	**Hazardous waste disposal**	The permittee must not accept any hazardous wastes. In addition, the permittee must not accept any waste that exhibits hazardous properties or contains hazardous substances at levels above those which would be considered hazardous waste. Reference: Hazardous wastes are defined in ORS 466.005 and OAR 340 Division 101 and 40 Code of Federal Regulations (CFR) 258.20(b). Notes: • Many electronic devices contain hazardous materials. If these materials are recovered for recycling, they do not meet the RCRA definition of hazardous waste. However, if the hazardous materials are released or disposed, they may become hazardous waste and must be treated according to applicable hazardous waste rules and statutes including, recordkeeping and reporting requirements. • In the event discovered wastes are hazardous or suspected to be hazardous, the permittee must, within twenty-four (24) hours, notify DEQ and initiate procedures to identify and remove the waste. Hazardous wastes must be removed within ninety (90) days, unless DEQ approves otherwise. The permittee's temporary storage and transportation practices must comply with DEQ rules.
6.2	**Liquid waste disposal**	The permittee must not accept liquid waste for disposal. Definition: Liquid wastes are wastes that do not pass the paint filter test performed in accordance with EPA Method 9095B.
6.3	**Putrescible waste disposal**	The permittee must not accept putrescible waste or waste that contains putrescible materials for disposal. Reference: OAR 340-093-0030.
6.4	**Vehicle disposal**	The permittee must not accept discarded or abandoned motor vehicles for disposal.

6.5	**Large appliances**	The permittee must not knowingly accept large appliances such as refrigerators, washers, stoves, water heaters, heaters or furnaces for disposal.
6.6	**Radioactive material**	The permittee must not accept any radioactive material as defined in Section 13 of ORS 459.355.
6.7	**Used oil disposal**	The permittee must not knowingly accept used oil for disposal.
6.8	**Battery disposal**	The permittee must not knowingly accept lead-acid batteries for disposal.
6.9	**Tire disposal**	The permittee must not knowingly accept waste tires for disposal.
6.10	**Recyclable material disposal**	The permittee must not landfill or dispose of any source separated recyclable material brought to the disposal site. Exception: If the source separated material is unusable or not recyclable it may be landfilled. DEQ must agree to such disposal and pre-approve the identified sources of unusable source separated material prior to its disposal.
6.11	**Infectious waste collection**	The permittee must not accept infectious wastes for disposal at the landfill. Exception: Sharps may be collected or disposed when prepared and managed per the requirements in the DEQ approved Special Waste Management Plan for sharps.
6.12	**Explosives collection**	The permittee must not accept explosives at the landfill.
6.13	**Covered electronic devices collection**	The permittee must not knowingly accept the following covered electronic devices (CED) for disposal: • Computer monitors having a viewable area greater than four (4) inches diagonally; • Televisions having a viewable area greater than four (4) inches diagonally; • Desktop computers; or • Portable computers. Reference: Oregon Revised Statutes 459.247 and 459A.300-365.
6.14	**Open burning**	The permittee must not conduct any open burning at the site.

OPERATIONS AND DESIGN

7.0 OPERATIONS PLAN

7.1	**Operations plan submittal**	The current Operations Plan, dated May 2012, was approved on May 31, 2012. Within 90 days of the permit issue date, the permittee must prepare and submit an updated site Operations Plan to DEQ for review and approval. The updated plan must be consistent with the conditions of this permit. The DEQ-approved plan becomes an integral part of the permit.

7.2 Plan content The Operations Plan must describe facility operations, including the elements listed below, and demonstrate how the facility will comply with all regulatory and permit requirements:

General Topics	Specific Operating Procedures:
General operations	• Screening incoming waste to detect unauthorized or prohibited waste • Handling and removing unauthorized wastes discovered at the facility • Managing landfill gas • Managing landfill leachate • Designing surface water and erosion control structures • Responding to non-compliance events or situations
Disposal operations	• Waste unloading and handling • Detecting and preventing the disposal of regulated hazardous waste, and any other DEQ-prohibited waste • Disposing of special wastes • Disposal of cleanup materials contaminated with hazardous substances • Placing daily and intermediate cover • Detailed procedures for using, stockpiling, and tracking the receipt & use of DEQ-approved alternative daily cover (ADC). Including procedures to prevent overuse of ADC. • Reducing and controlling the risk of a landfill fire • Fill progression and phasing that is consistent with landslide stability recommendations, and takes into account other operational considerations
Special Waste Management Plan (SWMP)	A SWMP is required either to verify that a special waste can be accepted, managed and disposed of in an environmentally protective manner or because the permittee must have procedures in place to ensure that the prohibited special waste is not knowingly accepted or disposed of. A Special Waste Management Plan is required, at a minimum, for the following wastes. 1. Asbestos wastes (friable and non-friable) 2. Ash 3. Auto shredder waste 4. Cleanup materials contaminated with hazardous materials 5. Construction and demolition waste 6. Contaminated soils, including petroleum contaminated soil 7. Covered electronic devices 8. Drums; empty or containing waste 9. Hazardous Waste 10. Industrial waste sludge 11. Industrial solid wastes 12. Infectious wastes, including treated infectious wastes 13. PCB containing waste 14. Pesticide containers 15. Pesticide treated wood 16. Petroleum-bearing wastes: Over 25 gallons of petroleum-bearing wastes such as used oil filters, oil absorbent materials, tank bottoms or oil sludge 17. RCRA Exempt Waste

	18. Any other special wastes authorized by DEQ to be disposed by the permittee The Special Waste Management Plan must include at a minimum: • Procedures and policies for identifying and specific guidelines for characterization of each special waste stream; including determining whether the waste is compatible with the landfill liner and leachate management systems. This may also include waste sampling, testing and analysis. • Procedures for identifying and documenting the source of all special wastes • Physical and chemical characteristics of each special waste stream • Description of appropriate handling and disposal procedures including a discussion of the potential hazards with each special waste stream and how it will be managed in the landfill (if it will be disposed) or how it will be managed if discovered onsite. • Documentation of plan implementation, including waste characterization, procedures to reject prohibited wastes, procedures to accept and manage approved special wastes, quantities received, and quantities disposed. References: OAR 340-93-0190, OAR 340-95-020[3][j]
Ancillary operations	• Handling and removal of waste tires; • Management of transfer containers; • Procedures for dealing with cleanup of an oil or hazardous materials spill, or broken cathode ray tube (CRT) televisions or monitors; and • Identify a program for preventing acceptance of covered electronic devices for disposal. Note: This facility is not authorized to intentionally break, grind or shred CRTs. Procedures for protecting CRTs and other e-waste from breakage must be reflected in the facility Operation Plan.
Inspection and maintenance	• Washing equipment • Maintaining leachate and gas collection systems • Maintaining monitoring stations (wells, probes, devices, etc) • Periodically inspecting the continuity and integrity of primary leachate collection pipes • Maintaining surface water control structures
Operating record	• Establishing and maintaining the operating record of all documents needed to ensure compliance with DEQ rules and permit conditions. Records must include daily listing by load of the volume or weight of solid waste received and monthly and quarterly accumulations of amounts of daily waste received.

Contingency	• Providing fire protection equipment; and • Notifying DEQ about emergencies and fires.

Reference: OAR 340-095-0020 describes requirements for preparing an Operations Plan.

7.3 Operations and maintenance manual

Within 120 days of the Operations Plan's approval, the permittee must prepare an updated Operations and Maintenance (O&M) Manual which includes detailed inspection and maintenance procedures and an associated schedule for all facility components that require periodic inspection. The O&M Manual must include specific procedures for routine preventative maintenance and repairs and for response to emergency situations. The preventative inspection and maintenance program should address the following equipment and facilities: personnel safety equipment, operating equipment, support facilities, environmental control systems, environmental monitoring systems, the transportation system and emergency response equipment and systems. The permittee must keep a copy of the Operations and Maintenance Manual with the Operating Record, readily available for DEQ inspection and review.

7.4 Plan and manual updates

The permittee must update and revise both the Operations Plan and the Operations and Maintenance Manual as necessary to reflect current facility conditions and procedures.

The permittee must submit any associated revisions or updates to DEQ for review and approval.

7.5 Plan and manual compliance

The permittee must operate the facility in accordance with the approved Operations Plan and Operations and Maintenance Manual, and any amendments to these documents.

8.0 RECORDKEEPING AND REPORTING — OPERATIONS

8.1 Non-compliance reporting

The permittee must take immediate corrective action for any violations of permit conditions or DEQ rules and immediately notify DEQ's Northwest Region Solid Waste program staff by telephone followed up by written notification to:

Oregon Department of Environmental Quality
Manager, Solid Waste Program
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201
Telephone: 503-229-5353

DEQ response: DEQ may investigate the nature and extent of the compliance problem and evaluate the adequacy of the permittee's corrective action plans.

8.2 Permit display

The permittee must display this permit where operating personnel can easily refer to it.

8.3 Access to records

DEQ must have access, when requested, to all records and reports related to the permitted facility

8.4 Procedure

The permittee's record keeping and reporting procedures are as follows:

Step	Action
1	Keep the Operating Record at the facility or at another DEQ-approved location.
2	Place information required by OAR 340-095-0020(24) and this permit in the Operating Record.
3	During facility operations, record the amount of each waste type received daily. Record zero (0) if the waste is not received. Identify the following waste types and categorize them as either in-state or out-of-state wastes: • Domestic solid waste and construction and demolition waste • Industrial solid waste • Asbestos • Contaminated cleanup materials (except materials used for approved ADC) • Approved ADC qualified waste received • Approved ADC qualified waste used for daily cover • Other wastes that DEQ has approved prior to acceptance
4	Every quarter, record the amount of each material recovered for recycling.
5	Submit the information collected in Step 3 above on the Solid Waste Disposal Report/Fee Calculation form provided by DEQ. Pay solid waste fees as required by OAR 340-097. Date due: by the last day of the month following the end of the calendar quarter.
6	Submit the information collected in Step 3 and 4 above to the Wasteshed Representative on a DEQ provided or approved form. Date due: by January 25th of each year.
7	Retain copies of all records and reports for ten (10) years after their creation.
8	Update all records to reflect current conditions at the facility.

8.5 Submittal address

Send required submittals to:

Oregon Department of Environmental Quality
Land Quality
Solid Waste Program
811 S.W. Sixth Ave.
Portland, OR 97204
Telephone: (503) 229-5409

and

Oregon Department of Environmental Quality
Manager, Solid Waste Program
2020 SW 4th Ave, Suite 400
Portland, OR 97201
Telephone: 503-229-5353

8.6	**Complaint log**	The permittee must maintain a log recording all complaints received in writing (including e-mail), via telephone or in person by the facility operator or staff that specifically refer to dust, odor or other nuisance conditions caused by this facility. The log must also record the permittee's actions to investigate, make a determination as to the validity of the complaint, and resolve the nuisance problem, if possible, within two working days, but no longer than 10 working days after receiving the complaint. The log must note, when possible, if the complaint is specific to the landfill or TVWR. Reference: OAR 340-096-0040(4)(e)

9.0 SPECIFIC OPERATING CONDITIONS

9.1	**Discovery of prohibited waste**	If the permittee discovers prohibited wastes, the permittee must notify DEQ within twenty-four (24) hours of the discovery and begin to isolate or remove the waste. In addition the permittee must, if possible, take digital photos of the prohibited waste to document its quantity, nature, identity and source. Within sixty (60) days following the discovery, the permittee must transport non-putrescible, non-hazardous prohibited waste to a disposal or recycling facility authorized to accept such waste, unless otherwise approved or restricted by DEQ. The permittee must obtain DEQ's written approval to store putrescible, non-hazardous, prohibited wastes.
9.2	**Spills notification**	Oregon Revised Statute 466.635 and Oil and Hazardous Materials Emergency Response Requirements, Chapter 340, Division 142 require immediate notification to Oregon Emergency Response System (OERS) after taking any required emergency actions to protect human health and the environment when oil or hazardous materials are spilled. The spill must be immediately reported to OERS at 1-800-452-0311 if the spill is of a reportable quantity. Reportable quantities include: • *Any* amount of oil spilled to waters of the state; • Oil spills on land in excess of forty-two (42) gallons; • Two hundred (200) pounds (twenty-five (25) gallons) or more of spilled pesticide residue; and • Spills of hazardous materials that are equal to, or greater than, the quantity listed in the Code of Federal Regulations, 40 CFR Part 302 (List of Hazardous Substances and Reportable Quantities), and amendments adopted before July 1, 2002. For a complete list of hazardous materials required to be reported, please refer to OAR 340-142-0050.
9.3	**Access roads**	The permittee must provide all-weather access roads from the landfill property line to the active operational area and the environmental monitoring stations, and maintain them in a manner that prevents traffic hazards, dust and mud. The permittee must use appropriate means, including truck washing, as needed to prevent haul trucks from tracking mud on public roadways. Any truck washing activities must be conducted on a hard surface and any disposal of waste water must be accomplished in a manner approved by DEQ.
9.4	**Unloading area**	The area(s) for unloading incoming waste must be clearly defined by signs, fences, barriers or other devices. The size of the unloading area must be minimized as described in the DEQ approved Operations Plan.

9.5	**Daily cover**	At the end of each working day the permittee must cover all solid wastes with a six (6) inch, or thicker, layer of compacted soil or with a DEQ-approved alternative daily cover.
9.6	**Reporting of ADC Usage**	Alternative Daily Cover (ADC) usage must be measured and documented in accordance with the DEQ-approved Operations Plan. Starting with the January – March 2013 reporting period, the permittee must not claim ADC usage of the greater of 10% of "Total Tons Received in Reporting Period," or 15% of "Counting Waste" (i.e., residential and commercial domestic solid waste, and construction and demolition waste) on the ***Solid Waste Disposal Report/Fee Calculation*** form without first obtaining written DEQ approval. To obtain DEQ approval, submit an update to the ADC usage section of the Operations Plan that includes detailed methodology of the facility ADC usage including: descriptions of all ADC qualified material accepted, typical daily disposal cell construction dimensions, daily cover procedures, operational procedures for measuring and documenting daily ADC usage, conversion factors with supporting documentation and examples of daily reporting forms and calculations. Once DEQ has approved the update to the Operations Plan described above, the permittee may claim future ADC usage in excess of the 10% or 15% limit described provided that detailed documentation of daily ADC usage is included with each corresponding ***Solid Waste Disposal Report/Fee Calculation*** form in a reporting format acceptable to DEQ. Note: The language in this section does not supersede other requirements for pre-authorization to accept petroleum contaminated solids for use as ADC and/or completion of an ADC trial period for any new waste derived ADC types.
9.7	**Interim cover**	As specified in DEQ-approved design and operations plans, the permittee must place and maintain interim cover over fill areas that will not receive additional waste for greater than one-hundred and twenty (120) days.
9.8	**Surface water structures**	The permittee must maintain all stormwater drainage structures in good functional condition, report to DEQ any significant malfunctions or damage and complete repairs within sixty (60) days of discovery of the problem.
9.9	**Stormwater pollution control plan**	The permittee must update and implement the Storm Water Pollution Control Plan (SWPCP) consistent with site conditions and the stormwater permit requirements. Refer to the National Pollutant Discharge Elimination System (NPDES) Storm Water Discharge Permit No. 1200-Z. In addition, the permittee must keep a current copy of the SWPCP in the facility Operating Record.
9.10	**Asbestos waste management**	The permittee must off load and dispose of friable and non-friable asbestos-containing solid waste as specified in the DEQ-approved Operations Plan, Operations & Maintenance Manual, SWMP and in OAR 340-248.
9.11	**Leachate management systems**	The permittee must operate the disposal site in a manner that deters leachate production to the maximum extent practicable, and construct, operate and maintain in good functional condition all DEQ-approved leachate containment, collection, detection, removal, storage and treatment systems. The permittee must remove leachate from all landfill leachate collection systems, to minimize fluid buildup on the bottom liner and prevent the hydraulic head (fluid depth) from exceeding one (1) foot on the bottom liner (i.e. not the liner in the sump or trench).
9.12	**Litter control**	The permittee must at all times minimize windblown litter and collect it quickly and effectively to prevent scattering, nuisance conditions and unsightliness.

9.13	**Vector control**	The permittee must minimize vectors in the active disposal area, including insects, rodents, and birds.
9.14	**Air quality**	The permittee must control air emissions, including dust, malodors, air toxics, etc. related to disposal site construction, operation, and other activities, and comply with DEQ air quality standards including applicable visible emissions and nuisance requirements in OAR 340-208. According to OAR 340-208-0450, no person may cause or permit the emission of particulate matter larger than 250 microns in size at sufficient duration or quantity as to create an observable deposition upon the real property of another person when notified by the DEQ that the deposition exists and must be controlled.
9.15	**Access control**	The permittee must control public access to the landfill as necessary to prevent unauthorized entry and dumping.
9.16	**Landfill entrance sign**	A prominently displayed sign must indicate the following: • The name of facility; • The emergency telephone number; • The days and hours of operation; • The authorized and prohibited wastes; • The Solid Waste Permit number; • The operator's address; and • Any other information critical to the safe and efficient operation of the facility.
9.17	**Fire protection and reporting**	The permittee must provide complete and sufficient protection equipment and facilities in accordance with the DEQ-approved Operations Plan. Arrangements must be made with the local fire control agency to immediately acquire their services when needed. The permittee must implement preventative measures to ensure adequate on-site fire control, as determined by the local fire control agency. Fires must be immediately and thoroughly extinguished. Fires shall be reported to DEQ by telephone within twenty-four (24) hours and follow-up this notification with written notice by email or fax. Report to: Telephone 503-229-5353 Email DEQINFO@deq.state.or.us Fax 503-229-6124
9.18	**Water supply**	The permittee must provide water in sufficient quantities for fire protection, dust suppression, establishment of vegetation, and other site operations requiring water.
9.19	**Landfill gas management**	The permittee must control landfill gas (LFG) in accordance with the requirements of OAR 340-095-0030(4).
9.20	**Landfill gas control system operation and maintenance**	The permittee must operate and maintain the landfill gas control and monitoring systems in good working order as required to prevent nuisance odors, air emissions and LFG migration (see methane compliance limits in Section 18.5 & 18.6). If critical LFG equipment is significantly damaged or compromised, the permittee must replace or repair that equipment, within sixty (60) days of discovering the problem, and submit a written inspection report to DEQ.

9.21	**Load Covers**	The permittee must notify all in-coming haulers that loads must be covered or suitably cross-tied to prevent any load loss during shipment. Reference: OAR340-093-0220
9.22	**Vehicles**	All solid waste transfer vehicles and devices using public roads must be constructed, maintained, and operated so as to prevent leaking, shifting, or spilling of solid waste while in transit. Reference: Section 3.3
9.23	**Equipment**	Permittee must provide equipment of adequate size and design to properly operate the facility at all times. In the event of an equipment breakdown, alternative equipment must be provided, unless an exemption from DEQ is granted in writing.
9.24	**Drainage**	The permittee must divert surface drainage around or away from waste handling and storage areas, including the active face and must maintain surface water diversion ditches or structures in a serviceable condition and free of obstructions and debris at all times. Any significant damage must be reported to DEQ and repairs made as soon as possible.

10.0 SITE DEVELOPMENT AND DESIGN

10.1	**Site development plan**	Within 60 days of the permit issue date, the permittee shall prepare and submit a detailed work plan to DEQ for review and approval. The work plan shall summarize all previously completed and applicable documentation and proposed work elements to produce a comprehensive Site Development Plan. Within 180 days of DEQ approval of the workplan, the permittee must prepare and submit an update to the long-term Site Development Plan to DEQ for review and approval. Once approved, the plan becomes an integral part of this permit. Reference: The *Solid Waste Landfill Guidance, September 1996,* describes the basic elements of a Site Development Plan. Organizing the plan in accordance with the Guidance will expedite DEQ's review.
10.2	**Baseline design criteria**	New landfill disposal units must include the following engineering controls or alternate controls as approved by DEQ in writing: • A composite liner system, including a DEQ-approved geomembrane liner (at least sixty (60) mils thick for high density polyethylene, and at least thirty (30) mils thick for approved alternative geomembranes) and at least two (2) feet of compacted soil with an in-place permeability of 1×10^{-7} cm/sec or less, or a DEQ-approved alternative liner; • A primary leachate collection and removal system (LCRS) which fully covers the liner system and maintains a leachate depth of less than one (1) foot above the liner. All leachate collection pipes must be serviceable by cleanouts, riser pipes or other DEQ approved methods; • A leachate secondary collection and removal system(s) designed to effectively monitor the overlying composite-liner system's performance and (1) detect and collect leachate at locations of maximum leak probability; and (2) prevent groundwater intrusion and related monitoring biases; • One or more leachate collection sumps with a double composite liner system and a leak detection and removal system. Each composite liner must meet the minimum design criteria previously cited in this subsection;

- An operations layer that covers and protects the primary LCRS and liner system from physical damage; and
- A leachate surface impoundment (if applicable) with a double liner and leak detection and removal system. At least one liner must meet the minimum composite liner criteria described above.

10.3 Design plans

At least six (6) months prior to the anticipated construction date for new disposal units, closure of existing units, or development of other ancillary facilities, the permittee must submit engineering design plans to DEQ for review and approval. The design plans must be prepared and stamped by a qualified Professional Engineer with current Oregon registration and specify and/or provide the following:

- All applicable performance criteria, construction material properties and characteristics, dimensions, and slopes; and
- The design basis and all relevant engineering analyses and calculations.

10.4 Construction requirements

The permittee must construct all improvements in accordance with:

- The approved plans and specifications;
- Any DEQ imposed conditions of approval; and
- Any future DEQ approved amendments to the plans and specifications.

Unless otherwise approved, construction work must begin within eighteen (18) months of plan approval.

10.5 Construction documents

Prior to constructing any landfill engineering controls (e.g., final cover, new disposal unit, or other waste containment facilities, leachate management structures/equipment or other improvements), the permittee must submit complete construction documents and receive DEQ's written approval. The construction documents must:

- Be consistent with the applicable DEQ-approved design plan(s), including accurate translation of design specifications into construction documents
- Define the construction project team
- Specify material and workmanship requirements to guide the Constructor in executing work and furnishing products
- Include a Construction Quality Assurance (CQA) plan that describes how the project team will monitor the quality of materials and the Constructor's work performance and assure compliance with project specifications and contract requirements

Reference: Follow the current *Solid Waste Guidance* to expedite DEQ's review of the construction documents.

10.6 Construction inspection

During construction of a new landfill disposal unit, final cover system, or any other landfill controls or engineered features, the permittee must provide DEQ with a summary and schedule of planned construction activities to facilitate DEQ's inspection and oversight.

10.7 Construction report submittal

Within ninety (90) days of completing construction of a new landfill disposal unit, a final cover system, or other engineering controls, the permittee must submit to DEQ a Construction Certification Report prepared by a qualified independent party. The report must document and certify that the construction of all required components and structures complies with this permit and the DEQ-approved design specifications.

10.8 Construction report content

The construction report must include:

- An executive summary describing the construction project and any major problems encountered;
- A list of the governing construction documents

- A summary of all construction and CQA activities
- The manufacturer's written certifications that all geosynthetic materials conform with project specifications
- Test data documenting that soil materials conform with project specifications
- A summary of all CQA observations, including daily inspection records and test data sheets documenting that materials deployment and installation conform with project specifications
- A description of the problems encountered and the corrective measures implemented
- The designer's acceptance reports for errors and inconsistencies
- A list/description of any deviations from the design and material specifications, including justification for the deviations, copies of change orders and recorded field adjustments, and copies of DEQ's written approvals for deviations and change orders
- Signed certificates for subgrade acceptance prior to placement of soil liner and for acceptance of the soil liner prior to deployment of geomembrane liner
- Photographs and as-constructed drawings, including record surveys of the subgrade, soil liner, granular drainage layer and protective soil layer
- The certification statement(s) and signatures of the CQA consultant and designer. One of these representatives must be a Professional Engineer with current Oregon registration.

10.9 Approval to use new disposal units

The permittee must not dispose of solid waste in newly constructed disposal units until DEQ has accepted the Construction Certification. If DEQ does not respond to the Construction Certification Report within thirty (30) days of its receipt, the permittee may place waste in the unit.

11.0 RECYCLING REQUIREMENTS

11.1 Materials

The permittee must provide a place for receiving the following recyclable materials:

- ferrous scrap metal
- non-ferrous scrap metal (including aluminum)
- motor oil
- newspaper
- corrugated cardboard and kraft paper (brown paper bags)
- container glass
- hi-grade office paper
- tin cans
- batteries (lead-acid and rechargeables)
- electronic waste

11.2 Receiving location

The place for receiving recyclable material must be located at the disposal site or at another location more convenient to the population served by the disposal site. The recycling center must be available to every person whose solid waste enters the disposal site.

11.3 Material use

All source separated recyclable materials must be reused, recycled or recovered for energy. The permittee shall not landfill or dispose of any source separated recyclable material. Source separated material may not be crushed, broken, ground up or otherwise altered so that the material cannot be reused or recycled.

11.4	**Recycling information**	The permittee must provide, to disposal site users, the following recycling information on printed handbills: • The on-site or off-site location of the recycling center; • The recycling center's hours of operation; • A list of acceptable materials for recycling; • Instructions for preparing source separated recyclable material; and • Reasons why people should recycle.
11.5	**Sign**	A prominently displayed sign must indicate the following: • The availability of recycling at the disposal site or another location; Note: the sign must indicate the recycling center location, if not at the disposal site • The materials accepted at the recycling center; and • The recycling center's hours of operation (if different than disposal site hours).
11.6	**Storage**	Unless DEQ approves otherwise, all recyclable materials, except car bodies, white goods and other bulky items must be stored in containers.

SITE CLOSURE

12.0 CLOSURE CONSTRUCTION AND MAINTENANCE

12.1	**Worst-case closure plan development**	The permittee must develop a conceptual "worst-case" closure plan and a conceptual post-closure plan(s), obtain DEQ approval of the plan(s), and maintain up-to-date copies of these plan(s) in the facility file. Reference: The plans must comply with OAR 340-095-0050.
12.2	**Notification of plan updates**	The permittee must notify DEQ and receive DEQ approval when the conceptual "worst-case" closure and conceptual post-closure care plans are updated and placed in the file.
12.3	**Closure permit**	In accordance with OAR 340-095-0050, the permittee must apply for a closure permit at least five (5) years prior to the landfill's anticipated final closure.
12.4	**Closure plan approval**	At least six (6) months prior to final closure of any portion of the landfill, the permittee must submit detailed engineering plans, specifications, and a closure schedule to DEQ for review and approval. The design plans must be prepared and stamped by a qualified Professional Engineer with a current Oregon registration and specify and/or provide the following: • All applicable performance criteria, construction material properties and characteristics, dimensions and slopes; and • The design basis and all relevant engineering analyses and calculations. Reference: The *Solid Waste Landfill Guidance, September 1996,* describes Closure Plan preparation. Following that format will expedite DEQ's review of the plan.
12.5	**Closure schedule**	The permittee must close each landfill area or unit in accordance with the DEQ-approved schedule.

12.6	**Final cover**	Unless DEQ approves an alternate design, the final landfill cover must be as described below: • Graded to compensate for estimated differential settlement and maintain positive drainage. Final (post-settlement) slopes must range between two (2) percent and thirty (30) percent. In addition, the closure components from bottom to top must be: • Foundation subgrade, consisting of intermediate cover soils scarified and recompacted • Geosynthetic clay liner • Geomembrane barrier consisting of a 60-mil thick LLDPE or HDPE geomembrane • Geosynthetic drainage layer or 12" thick drainage layer • Drainage layer piping if needed to meet design requirements • Vegetative/topsoil layer consisting of an 18-inch soil layer, the top six (6) inches of which is capable of supporting vegetation
12.7	**Vegetation**	The permittee must establish and maintain a dense, healthy growth of native vegetation over the closed areas of the landfill consistent with the proposed final use.
12.8	**Surface contour maintenance**	The permittee must maintain the landfill cover's final surface contours as needed to prevent erosion and surface-water ponding and must repair and seed erosion damaged areas (cuts) to assure that all waste remains covered. The permittee must repair and maintain all settlement- or erosion-affected areas by adding soil, re-grading, fertilizing or seeding as needed.
12.9	**Slope stability**	The permittee must maintain the stability of the landfill slopes and the overall structural integrity of the landfill.
12.10	**Deed record**	Within thirty (30) days after the disposal site's final closure, the permittee must modify the property deed record on file with the county to reflect the presence of the waste and its precise location at the site.

13.0 FINANCIAL ASSURANCE

13.1	**Financial assurance plan**	To confirm that there is adequate financial assurance to provide for the costs of site closure and post-closure care, the permittee must provide the following evidence to DEQ upon request: • A copy of the financial assurance mechanism; and • A written certification that the financial assurance meets all state requirements. In addition, the permittee must maintain the financial assurance plan in the facility file. Reference: The plan must be prepared in accordance with OAR 340-095-0090. Acceptable mechanisms are described in OAR 340-095-0095.
13.2	**Recertification of financial assurance**	The permittee must review and update their financial assurance in accordance with OAR 340-0095-0090(6)d. Unless DEQ approves otherwise, prior to April 8 of each year, a notarized annual recertification of financial assurance must be submitted to DEQ demonstrating that this review has been completed.

13.3	**Use of financial assurance**	The permittee must not use the financial assurance for any purpose other than to finance the permitted facility's approved closure, post-closure, and corrective action activities or to guarantee that those activities will be completed.
13.4	**Long-term financial responsibility**	The permittee must continuously maintain financial assurance for the facility until the permittee or other person owning or controlling the site is no longer required by DEQ to demonstrate financial responsibility for closure, post-closure care, or corrective action.

ENVIRONMENTAL MONITORING

14.0 SITE CHARACTERIZATION

14.1	**Approved landfill footprint**	The current DEQ-approved landfill footprint and waste unit boundaries are defined in Drawing 4-1 of the June 7, 2004 report entitled "Summary of Solid Waste Facility Permit Requirements for the Hillsboro Landfill", prepared by Shaw EMCON/OWT, Inc. This drawing identifies Phase I, Cell II (A-D), Cell III (A-D), Cell IV (A-D), Cell V (A) and Cell VI (A-D).
14.2	**Workplan**	The currently DEQ approved characterized areas are Phase 1, Cell II (A-D), Cell III (A-D), Cell IV (A-D) and Cell V (A) as described in Section 14.1 of this Permit. The permittee has indicated that the boundary between Cell V and Cell VI will change with the submittal and final approval of the Site Development Plan per Section 10.1. Regardless of future cell identification, the area shown as Cell VI (A-D) in the drawing referenced in Section 14.1 of this permit will need to be characterized and approved by DEQ prior to construction. At least twelve (12) months prior to any new landfill construction or expansion beyond the currently characterized area, the permittee must submit a detailed work plan to DEQ for review and approval. The workplan must summarize all existing site characterizations completed to date, describe any additional site characterization required to properly define the site and include at least the following elements: • A description of the landfill expansion; • A proposal for monitoring all relevant media within the expansion area; • A detailed description of the planned investigation; and • A detailed project schedule. DEQ may waive or modify this requirement if the permittee provides adequate justification for an alternative approach.
14.3	**Site characterization report (SCR)**	Within six (6) months of the approval of the Site Characterization workplan, the permittee must submit the completed SCR to DEQ for review and approval. This report must be based on the DEQ-approved workplan and any conditions of the approval. The report must be prepared and stamped by a Geologist or a Certified Engineering Geologist, with current Oregon registration. The permittee must submit the SCR and receive DEQ's approval before starting construction of the new landfill area. Once approved, this report and any conditions of approval become an integral part of the permit. Reference: The *Solid Waste Landfill Guidance, September 1996,* describes the applicable elements of a Site Characterization Report. Organizing the report in that manner will expedite DEQ's review of the report.

15.0 ENVIRONMENTAL MONITORING PLAN (EMP)

15.1	**EMP compliance**	The permittee must conduct all environmental monitoring at the facility in accordance with the approved EMP, including any conditions of approval, amendments and updates. The monitoring of this site should be conducted in accordance with the May 20, 2011 EMP, as conditionally approved by DEQ in a letter dated January 13, 2012.
15.2	**EMP revisions and updates**	The permittee must revise the current EMP as necessary to reflect current and future environmental conditions, facility development and regulatory requirements. In addition, the EMP must be revised after the Site Characterization is complete and approved by DEQ per the requirements specified in Sections 14.2 and 14.3. A Geologist or Certified Engineering Geologist, with current Oregon registration, or a Professional Engineer with appropriate expertise in hydrogeological investigations and current Oregon Registration must prepare and stamp the EMP revisions and submit to DEQ for review and approval.
15.3	**EMP public comment period**	EMP changes, if substantial, may require a permit modification application with associated public comment period.
15.4	**Long-term monitoring plan**	By May 30, 2016, the permittee should review the established concentration limits listed in Attachment 1, and determine if it is appropriate to redevelop compliance limits based on the unimpacted background groundwater quality for each location. After any DEQ approval for additional or revised concentration limits, the permittee must update the EMP to reflect the long-term monitoring program and submit the updated plan for DEQ review and approval. The long-term groundwater monitoring program should, at a minimum, consist of those parameters with an established concentration limit, and those parameters included in the Field Indicator Group of Attachment 2. Once every five years, the permittee shall monitor for the full suite of parameters, identified in Groups 1a, 1b, 2a, 2b and 3 of Attachment 2 in this permit. This monitoring should coincide with the DEQ Laboratory split sampling events. Note: Also see DEQ's Internal Management Directive for establishing concentration limits at Subtitle D Landfills.
15.5	**Additional monitoring points**	The permittee must incorporate any new or replacement monitoring point or device into the EMP. The updated monitoring device information will be submitted to the DEQ for review and approval and the approved modification will be subsequently incorporated into the EMP as an addendum.

16.0 ENVIRONMENTAL SAMPLING REQUIREMENTS

16.1	**Notification of sampling events**	The permittee must notify DEQ, in writing, at least ten (10) working days prior to a scheduled sampling event.

16.2 Split sampling events

The permittee must split samples with DEQ when requested, and must schedule all requested split-sampling events with the DEQ laboratory at least forty-five (45) days prior to the sampling event.

Oregon Department of Environmental Quality
Laboratory, Groundwater Monitoring Section
3150 NW 229th Ave., Suite 150
Hillsboro, OR 97124
Phone: (503) 693-5700
Fax: (503) 693-4999

The following sampling events must be conducted as split sampling events with DEQ:

- Spring 2015
- Fall 2020

16.3 Monitoring schedule

The permittee must refer to the approved EMP for environmental monitoring procedures. Monitoring must be performed according to frequency and parameters outlined in the DEQ-approved EMP and includes, but is not limited to groundwater, surface water and landfill gas. Monitoring scheduling benchmarks are defined below:

If sampling in the...	Schedule the sampling event	
	On, or after....	But on, or before...
Winter	January 1	February 28
Spring	April 1	May 31
Summer	July 1	August 31
Fall	October 1	November 30

New compliance groundwater wells will need to be monitored quarterly until concentration limits are established. Detection wells may be installed for various reasons extraneous to compliance monitoring described in the EMP and the regulations, and it may not be necessary to sample these wells quarterly until background can be established.

16.4 Monitoring after EMP approval

The permittee must monitor the facility in accordance with: 1) the approved EMP; 2) any conditions of DEQ's approval; and 3) any DEQ-approved amendments and updates to the EMP.

16.5 Changes in sampling or split sampling

The permittee must submit a written request and obtain DEQ's written approval before changing the sampling program, including sampling frequency, parameters, or locations. Approved changes will become an integral part of the EMP.

Based on data received, DEQ may add to or delete from the list of scheduled sampling events, sampling locations, and sampling parameters, and to conduct unscheduled sampling or split sampling events.

If the split-sampling schedule changes, DEQ will try to notify the permittee at least 30 days prior to the next scheduled event.

17.0 ESTABLISHING PERMIT-SPECIFIC CONCENTRATION LIMITS (PSCLs), ACTION LIMITS (ALs), CONCENTRATION LIMIT VARIANCES (CLVs) AND SITE-SPECIFIC LIMITS (SSLs)

17.1	**Gathering data**	For each new compliance well, the permittee must monitor the background water quality in accordance with the approved EMP and propose an appropriate approach for establishing statistically-derived concentration limits. This background monitoring must continue until all necessary data sets have been collected, and PSCLs, ALs, and/or SSLs are proposed for each parameter of concern. The permittee then must demonstrate to DEQ's satisfaction that the selected background-data set is valid and unaffected by facility releases.
17.2	**Statistical analysis**	To ensure only high quality data is used when establishing compliance concentration limits (PSCLs, ALs, and SSLs), the permittee must perform statistical evaluations of the monitoring results for each sampling event. The permittee should use methods outlined in EPA Statistical Analysis of Groundwater Monitoring at RCRA Facilities (March 2009) or other DEQ accepted statistical methods. DEQ's 2011 Guidance Document "Developing Concentration Limits at Permitted Solid Waste Facilities" provides some examples of acceptable methods.
17.3	**Proposing PSCLs, ALs, and/or SSLs**	For each new compliance well, the permittee must propose for DEQ's review and approval, a PSCL, AL, or SSL pursuant to the guidelines specified in OAR 340-040. The proposal must address all required parameters. Once a statistically valid data set (at least nine (9) quarterly acceptable data points) is established from the appropriate background well(s) or intra-well(s), the permittee may generate a PSCL, AL, or SSL for each designated, long-term monitoring parameter.
17.4	**Changing PSCLs, ALs, and/or SSLs**	If the permittee demonstrates to DEQ's satisfaction that background groundwater quality has significantly changed since the PSCL, AL, or SSL was established, and if the change is unrelated to the permitted facility's influence, the permittee can propose to DEQ a revised level for the affected PSCL(s), AL(s), or SSL(s).
17.5	**Establishing and changing CLVs**	The permittee should refer to DEQ's Groundwater Quality Protection Rules [OAR 340-040-0030(4)] for guidance in establishing and changing Concentration Limit Variances (CLVs).

18.0 ENVIRONMENTAL MONITORING STANDARDS

18.1	**Applicable regulatory standard**	The permittee must not allow the release of any substance from the landfill into groundwater, surface water, or any other media which will result in a violation of any applicable federal or state air or water limit, drinking water rules, or regulations, beyond the solid waste boundary of the disposal site or an alternative boundary specified by DEQ. Reference: OAR 340-095-0040.

18.2 Review of results

The permittee must review the analytical results after each monitoring event according to the following table.

If data show results are...	Then...
-above any one PSCL, CLV, or AL, or -if three or more SSLs at a single monitoring location are exceeded, or - if any new monitoring location or any monitoring of the full suite monitoring results indicate 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 at values that are an order of magnitude higher than background.	1. Notify 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 DEQ in writing, resampling is not required
None of the above	Continue groundwater monitoring with next scheduled sampling event

18.3 Resampling results

Upon receipt of data from resampling, the permittee must review the results according to the following table.

If resampling data show results...	then: ...
that confirm the exceedance of at least one permit-specific concentration limit (PSCL) or concentration limit variance (CLV),	1. Notify DEQ in writing within 10 days of receipt of laboratory data, or within 60 days of the sample date (whichever occurs first); and, 2. Submit a Preliminary Assessment workplan to DEQ for approval within 30 days of the date of laboratory confirmation (unless another time period is authorized). The workplan must specify how the objectives of OAR 340-40 will be met by the proposed investigation. This may include the monitoring of Groups 4 & 6 in Attachment 2, in addition to routine detection monitoring parameters.

that confirm at least any one AL or more than two SSLs were exceeded, or confirm a significant change in water quality results noted in the *full suite* sampling event once every 5 years or in a new monitoring location,	1. Notify DEQ in writing within 10 days of receipt of laboratory data, or within 60 days of the sample date (whichever occurs first); and 2. Submit an Informal Preliminary Assessment workplan to DEQ for approval within 30 days of the date of laboratory confirmation (unless another time period is authorized). The workplan must specify how the objectives of OAR 340-40 will be met by the proposed investigation
that do not confirm the results noted in the routine sampling event	1. Continue with routine monitoring; and, 2. Discuss the data from the routine sampling event and the resampling results in the next annual environmental monitoring report (AEMR).

18.4 Leachate secondary collection system (LSCS

If the permittee observes liquids in the leachate secondary collection system (LSCS), the permittee must respond in accordance with the approved EMP procedures for sampling, analysis and reporting.

The permittee must design each LSCS-equipped landfill cell or sub-unit to allow for discrete sampling of the LSCS liquid and gas without mixing, co-mingling or compositing of samples with other liquid, leachate or gas sources.

18.5 Methane limits

The methane concentration must not exceed:

- Twenty-five (25) percent of methane's Lower Explosive Limit in onsite structures (excluding gas control structures or gas recovery system components); or
- Methane's Lower Explosive Limit at the facility property boundary.

Note: Methane's Lower Explosive Limit is equal to a concentration of five (5) percent by volume in air.

18.6 Methane exceedance

If methane levels exceed the specified limits, the permittee must:

1. Take immediate steps to protect human health and safety and notify DEQ within twenty-four (24) hours;
2. Within seven (7) days of detection, confirm the measures taken to protect human health and safety (unless DEQ approves an alternative schedule), and describe the methane test results and response measures in the facility operating record; and
3. Within sixty (60) days of the methane exceedance, develop and implement a remediation plan, incorporate the plan into the monitoring records, and submit a progress report to DEQ.

18.7	**Certified environmental laboratory data**	To assure the best possible data quality, DEQ recommends that the permittee contract with environmental labs certified under the Oregon Laboratory Accredited Program (ORLAP) or the National Environmental Laboratory Accreditation Program (NELAP). The permittee should include a copy of the lab's certification with every data submittal. Use of an ORLAP or NELAP approved lab will facilitate DEQ's future review of EMP or associated updates, the AEMRs, and any required Remediation Investigation/ Feasibility Study (RI/FS) documents. The 2011 EMP specifies that Test America Laboratories, Inc, an ORLAP certified lab, will be the lab to produce the analytical results. If the permittee chooses to use a non-ORLAP or NELAP laboratory, then that lab must provide their Quality Assurance and Control plan to the DEQ laboratory for review and approval. Any analyses from this non-accredited laboratory will need to conform to the conditions of DEQ's approval.

19.0 RECORDKEEPING AND REPORTING – ENVIRONMENTAL MONITORING

19.1	**Annual Environmental Monitoring Report (AEMR)**	Prior to March 15 of each year, the permittee must submit to DEQ an AEMR for the past year's monitoring period (January 1 to December 31). The report must conform to the approved EMP format and be prepared and stamped by a Geologist or a Certified Engineering Geologist, with current Oregon registration or by a Professional Engineer with appropriate expertise in hydrogeological investigations and current Oregon Registration.
19.2	**Statement of compliance**	The AEMR must include a brief (approximately one-page) cover letter that: • Compares the analytical results with the relevant monitoring standards (PSCLs, CLVs, ALs, or SSLs) • Documents any exceedances of or federal or state standards for relevant media • Documents any significant change in water quality, air quality or methane levels in monitored media.
19.3	**Annual Environmental Monitoring Report contents**	The AEMR must reflect the facility's current conditions, present accurate data that corresponds with the original field and lab data, and include the following elements: • A review of the past year's significant events at the site • An evaluation of the monitoring network performance and a summary of any recommended changes • A summary of all the past year's sampling data for, but not limited to groundwater, surface water, leachate, perimeter landfill gas monitoring probes and methane monitoring of on-site structures • A summary of any data quality problems (e.g., QA/QC failures, flagged data, switched samples, etc.) • Piezometric maps for each sampling event and each groundwater bearing zone monitored • Time history plots in groundwater for all leading indicator parameters • An anion-cation balance for each sample event at all monitoring points for which there is adequate data. Include an additional explanation for any balance outside of ±10% in error • Copy of the lab certification, if applicable (ORLAP or NELAP); • A copy of all the past year's field and lab data, including all chain of custody forms • An electronic record (CD) of all current and historical environmental monitoring data in a searchable format • The status of NPDES compliance monitoring DEQ may accept electronic submittals for some of these data, as approved in the EMP.

19.4	**Annual leachate management report**	The permittee must prepare an annual summary report for the leachate management program and submit the report to DEQ prior to March 15 each calendar year. Note: Annual leachate management report may be included as part of the AEMR submission.
19.5	**Annual leachate management report contents**	The annual report must briefly summarize the significant leachate management events that occurred at the site during the last year, including: • Performance of the monitoring, collection, conveyance, storage and treatment systems. • Alterations, compliance problems, or resolutions of problems related to the operation or performance of the monitoring, collection, conveyance, storage, and treatment systems. • Monthly and annual volumes of leachate collected and disposed from the primary and leachate secondary collection system, summarized by individual leachate sump. This summary should include leachate accepted for disposal on site from off-site sources. • Summarized and detailed logs for all fluid level monitoring of the primary leachate collection system and leachate secondary collection system, separated by each sump, as conducted in accordance with the approved Operation Plan.
19.6	**Split sampling submittal**	Within ninety (90) days of any split sampling event, the permittee must submit the following information to DEQ's laboratory: • A copy of all information pertinent to the sample collection handling, transport and storage, including field notes; • Copies of all laboratory analytical reports; • Copies of all laboratory QA/QC reports; • A copy of the lab certification (ORLAP or NELAP, see Certified Environmental Lab Data condition 18.7 of this permit); • A hydrogeologic map of the site showing groundwater flow directions and water table contours; and • Any other data or reports requested by DEQ.
19.7	**Lab address**	Report all required split sampling information to: **Oregon Department of Environmental Quality Laboratory** **Groundwater Monitoring Section** **3150 NW 229th Ave., Suite 150** **Hillsboro, OR 97124** **Phone: 503-693-5700** **Fax: 503-693-4999**
19.8	**DEQ response to split samples**	If the permittee submits all required split sampling data and requests DEQ's results, DEQ's lab may provide, to the permittee, copies of the following information: • DEQ's analysis of the split sample • The QA/QC report • The analytical report • The field data sheets

20.0 ENVIRONMENTAL MONITORING NETWORK

20.1	**Monitoring device installation**	The permittee must install additional groundwater monitoring wells, landfill gas monitoring probes, or other monitoring devices no later than ninety (90) days, or as site conditions allow for reasonable construction, after DEQ notification or approval of the submitted request for approval to install. Well locations and construction methods must comply with DEQ's requirements. For future disposal unit(s) or cell(s) beyond the characterized landfill footprint (see Section 14.2 of this permit), the permittee must install DEQ-approved background, detection and/or compliance wells at least twelve (12) months before refuse disposal occurs in the new cell(s).
20.2	**Monitoring stations and equipment**	To assure that every sample is representative of the site's environmental conditions, the permittee must protect, operate, and maintain all environmental monitoring stations and equipment in accordance with DEQ's requirements and so that samples representative of actual environmental conditions can be collected.
20.3	**Access to monitoring stations and equipment**	To facilitate sample collection and/or inspection and maintenance activities, the permittee must maintain reasonable all-weather access to all monitoring stations and associated equipment.
20.4	**Reporting equipment damage**	Within fourteen (14) days of discovering any damaged monitoring equipment, device or station, the permittee must submit to DEQ a report describing the damage, the proposed repair or replacement measures, and the schedule to complete this work. Example: a well's impaired function or altered position/location.
20.5	**Monitoring well construction**	The permittee must complete any monitoring well or gas monitoring probe abandonment (decommissioning), replacement, repair, or installation in a manner that complies with the Water Resources Rules, OAR 690-240.
20.6	**Reporting well construction and repairs**	The permittee must document all monitoring well or gas probe repair and construction activities, including driller's logs, well location information, and construction information in a report prepared and stamped by a Geologist or Certified Engineering Geologist, with current Oregon registration. The permittee must submit the report to DEQ within thirty (30) days of the action and include this documentation in the next AEMR.
20.7	**Well decommissioning or replacement**	The permittee must submit a written recommendation to DEQ prior to decommissioning or replacing any well or gas monitoring probe in the monitoring network. After receiving DEQ's approval, the permittee must decommission or replace any well or gas probe that meets the following criteria: • The well or gas probe was installed in a borehole with a screen that hydraulically intersects two saturated strata • The permittee lacks supporting documentation demonstrating that the well or gas probe was properly installed and constructed • The well or gas probe was damaged beyond repair or destroyed • Other reasons as determined by either the permittee or DEQ

COMPLIANCE SCHEDULE

21.0 SUMMARY OF DUE DATES –

The permittee must comply with the event-driven schedule shown below as well as any compliance schedules for the routine reporting requirements specified in other sections of the permit.

Due Date	Activity	See section...
Within 90 days of permit issuance	Updated Operations Plan, Leachate Management Plan and Special Waste Management Plan	7.1 Operations Plan Submittal
Within 120 days of Operations Plan approval	Prepare an updated Operations and Maintenance Manual	7.3 Operations and Maintenance Manual
Within 60 days of permit issuance	Prepare and submit a work plan for a Site Development Plan update	10.1 Site development plan
Within 180 days of DEQ approval of work plan	Review and submit Site Development Plan update	10.1 Site development plan
By May 30, 2016	Review the established concentration limits and determine the need to redevelop compliance limits	15.4 Long-term Monitoring Plan
URGENT:		
Immediately	OERS notification of reportable spill	9.2 Spills notification
Immediately upon methane exceedance identification	Take steps to protect human health and safety, notify DEQ within 24 hours	18.6 Methane exceedance
Immediately upon identification of permit violation	Take corrective action for permit condition violation and notify DEQ	8.1 Non-compliance reporting
Within 24 hours of fire	Notify DEQ as well as immediately and thoroughly extinguish fire	9.17 Fire protection and reporting
Within 24 hours of discovery of hazardous or suspected hazardous waste	Notify DEQ, initiate procedures to identify and remove the hazardous waste	6.1 Hazardous waste disposal
Within 24 hours of discovery of prohibited waste	Notify DEQ of prohibited waste, begin to isolate and remove, take digital photos	9.1 Discovery of prohibited waste
Within 7 days of methane exceedance	Confirm protective measures, describe results and measures in facility operating record	18.6 Methane exceedance
Within 10 days of receipt of lab results with exceedance(s)	Notify DEQ of monitoring exceedance(s)	18.2 Review of results 18.3 Resampling results

Within 14 days of discovery of monitoring equipment or station damage	Submit report to DEQ	20.4 Reporting equipment damage
Within 30 days of the date of laboratory confirmation of a significant change in water quality results (unless another time period is authorized)	Submit workplan for informal Preliminary Assessment to DEQ	18.3 Resampling results
Within 60 days of methane exceedance	Develop and implement remediation plan, submit progress report to DEQ	18.6 Methane exceedance
Within 60 days of discovery of landfill gas equipment damage/ compromise	Replace or repair equipment, submit written inspection report to DEQ	9.20 Landfill gas control systems operation and maintenance
Within 60 days of discovery of prohibited waste	Transport prohibited waste to authorized facility	9.1 Discovery of prohibited waste
Within 60 days of discovery of surface water structural damage/ malfunction	Notify DEQ and complete repairs	9.8 Surface water structures
Within 90 days of discovery of hazardous or suspected hazardous waste	Remove hazardous waste	6.1 Hazardous waste disposal
Within 30 days of the date of laboratory confirmation (unless another time period is authorized)	Submit Preliminary Assessment workplan to DEQ	18.3 Resampling results
RECURRENT:		
By the last day of month following end of calendar quarter	Submit Solid Waste Disposal Report/Fee Calculation Form to DEQ	8.4 Procedure
By Jan 25 of each year	Submit amount of material recovered for recycling to DEQ Wasteshed Representative	8.4 Procedure
By Mar 15 of each year	Submit an AEMR	19.1 AEMR
By Mar 15 of each year	Submit an Annual Leachate Management Report	19.4 Annual leachate management report
By Apr 8 of each year	Submit annual financial assurance recertification report and, if applicable, updated mechanism	13.2 Recertification of financial assurance

SAMPLING:		
At least 10 working days prior to scheduled sampling event	Notify DEQ in writing	16.1 Notification of sampling events
At least 45 days prior to split sampling event	Schedule split sampling event with DEQ laboratory	16.2 Split sampling events
Within 90 days of split sampling event	Submit required data/documents to DEQ laboratory	19.6 Split sampling submittal
Spring 2015 Fall 2020	Conduct split sampling event with DEQ laboratory	16.2 Split sampling events
EVENTS:		
Prior to constructing any engineering controls	Submit complete construction documents	10.5 Construction Documents
Prior to decommissioning or replacing any well or gas monitoring probe in the monitoring network	Submit written recommendation to DEQ	20.7 Well decommissioning or replacement
Within 90 days of DEQ notification of need for or approval of the submitted request for approval to monitoring well or probe	Install groundwater monitoring well and/or probe	20.1 Monitoring device installation
Within 30 days of any well construction	Submit well construction report	20.6 Reporting well construction and repairs
Within 90 days after completion of any major construction	Submit Construction Certification Report	10.7 Construction report submittal
At least 6 months before any new disposal unit and/or closure construction	Submit engineering design plans and, if applicable, closure schedule	10.3 Design plans 12.4 Closure plan approval
Within 6 months of DEQ approval of SCR workplan	Submit a Site Characterization Report (SCR)	14.3 Site characterization report
At least 12 months prior to new construction or expansion	Submit a Site Characterization Report Workplan	14.2 Workplan
At least 12 months before waste disposal is to occur in a cell constructed outside of the currently characterized footprint	Install appropriate background, detection and monitoring well(s)	20.1 Monitoring device installation
Within 18 months of plan approval	Begin construction	10.4 Construction requirements

SELDOM:		
Within 10 days of ownership or operator change	Notify DEQ	4.6 Changes in ownership or address
5 years prior to closure	Submit closure permit application	12.3 Closure permit
Within 30 days of final site closure	Modify property deed record	12.10 Deed record

ATTACHMENTS

21.0 ATTACHMENT LIST

21.0 Attachment list

Attachments to the permit include :

Number	Description
1	Concentration Limits
2	Parameter Groups

ATTACHMENT 1: Concentration Limits

Monitoring Well Location

Limit Type	Parameter	MW-3R	MW-9R	MW-10	MW-11	P-8
PSCL	Barium – total (mg/L)	1.00				1.00
PSCL	Vinyl Chloride (mg/L)	0.002	0.002	0.002	0.002	0.002
AL	Barium – total (mg/L)	0.052		0.057	0.11	
AL	Volatile Organic Compounds (above PQL)	above PQL	above PQL	above PQL	above PQL	above PQL
SSL	Bicarbonate Alkalinity (mg/L)	151.36	150.00	193.54	201.08	172.35
SSL	Ammonia as Nitrogen (mg/L)	1.69	1.18	1.47	0.74	0.78
SSL	Chloride (mg/L)	6.33	7.61	5.08	9.10	12.08
SSL	Potassium – dissolved (mg/L)	3.93	2.81	3.47	3.74	4.17
SSL	Sodium – dissolved (mg/L)	13.39	14.66	23.44	14.76	12.89
SSL	Sulfate – dissolved (mg/L)	1.00	1.00	1.00	1.00	1.00
SSL	Total Dissolved Solids (mg/L)	210.00	226.01	269.64	263.62	242.90
SSL	Total Organic Carbon (mg/L)	3.31	6.90	4.27	2.40	5.50

Definitions:

PSLC = Permit Specific Concentration Limit
AL = Action Limit
SSL = Site Specific Limit
PQL = Practical Quantification Limit

ATTACHMENT 2: Parameter Groups

In this attachment

This attachment describes the parameter groups and any associated requirements for environmental monitoring. The May 20, 2011 Hillsboro Landfill EMP and DEQ's conditional approval dated January 13, 2012, describe the monitoring program for this facility.

Note: Method means EPA SW 846 Method [suggested methods are in square brackets].

Group 1a: Field indicators

The following parameters comprise the field indicators parameter group:

- Elevation of water level
- pH
- Temperature
- Specific Conductance
- Dissolved Oxygen
- Eh

These parameters must be measured in the field at the time samples are collected, either down-hole in situ, in a flow-through well, or immediately following sample recovery, with instruments calibrated to relevant standards

Group 1b: Leachate indicators

The following parameters comprise the laboratory indicators parameter group:

- Hardness (as $CaCO_3$)
- Total Alkalinity (as $CaCO_3$)
- Total Organic Carbon (TOC)
- pH (lab)
- Specific Conductance (lab) [Method 9050]
- Total Dissolved Solids (TDS)
- Total Suspended Solids (TSS)
- Chemical Oxygen Demand (COD)

Sample handling, preservation, and analysis are determined by requirements for each individual analyte: EPA or AWWA Standard Methods techniques must be followed.

Group 2a: Common anions and cations

The following parameters comprise the common anions and cations parameter group:

- Calcium (Ca)
- Sulfate (SO_4) [Method 9035]
- Ammonia (NH_3)
- Sodium (Na)
- Nitrate (NO_3) [Method 9210]
- Silica (SiO_2)
- Iron (Fe)
- Manganese (Mn)
- Magnesium (Mg)
- Chloride (Cl) [Method 9250]
- Carbonate (CO_3) [pH dependent]
- Potassium (K)
- Bicarbonate (HCO_3)

Dissolved concentrations must be measured. Samples must be field-filtered and field-preserved according to standard DEQ and/or EPA guidelines and analyzed by appropriate EPA or AWWA Standard Methods techniques. Results must be reported in mg/L and meq/L.

Group 2b: Trace metals

The following parameters comprise the trace metals parameter group:

Antimony (Sb)	Chromium (Cr)	Selenium (Se)
Arsenic (As)	Cobalt (Co)	Silver (Ag)
Barium (Ba)	Copper (Cu)	Thallium (Tl)
Beryllium (Be)	Lead (Pb)	Vanadium (V)
Cadmium (Cd)	Nickel (Ni)	Zinc (Zn)

If the Total Suspended Solids concentration is...	then analyze for...
less than or equal to 100.0 mg/L in the sample	total concentrations (unfiltered)
Greater than 100.0 mg/L in the sample	both total (unfiltered) and dissolved (field-filtered)

Samples must be field-preserved according to standard DEQ and/or EPA guidelines and analyzed by EPA Method 6010 or DEQ-approved equivalent. Results must be reported in mg/L.

Group 3: Volatile organic constituents

Analysis for all compounds detectable by EPA Method 8260A or EPA Method 524.2, including a library search to identify any unknown compounds present. EPA Method 8260 comprises the volatile organic constituent parameter group. Facilities that want to use EPA Methods 8021 or 8240B as an alternative must obtain approval by DEQ prior to use.

Group 4: Assessment monitoring

Assessment monitoring occurs when there has been a confirmed exceedance of a PSCL or a CLV. The following analyses comprise the assessment monitoring parameter group:

Semi-volatile Organic Constituents, including Phenols, EPA Method 8270
Mercury, EPA Method 7470
Cyanide, EPA Method 9010
Nitrite

All Method 8270 analyses must include a library search to identify any unknown compounds present.

Group 5: surface water and leachate

The following parameters comprise the surface water parameter group:

Total Kjeldahl Nitrogen (TKN)	Total Coliform Bacteria [EPA Method 9131]
Total Phosphorus (P)	Fecal Coliform Bacteria [EPA Method 9131]
Orthophosphate (PO_4)	E. Coli
Biological Oxygen Demand (BOD)	
Total Halogenated Organics (TOX) [EPA Method 9020B]	

Group 6: Other Assessment parameters

The following comprise additional assessment parameters:

Dioxins and Furans [EPA Methods 8280 and/or 8290]
Phenolics [EPA Methods 9065, 9066, and 9067]
PCBs [EPA Methods 8080 and 8270]
Pesticides, Herbicides and Fungicides [EPA Methods 8080, 8141, 8150, 8151, 8270]

I. GENERAL DATA

A. Corporate Data

1. Corporation's name and mailing address:

- *Hillsboro Landfill, Inc., 3205 SE Minter Bridge Rd. Hillsboro, OR 97123*

2. Principal contact for corporation (Give name, title, and telephone number):

- *Michelle Wittenbrink, District Manager, 503-313-2670*

3. Describe corporation's ownership structure of facility:

- *The Hillsboro Landfill is currently owned and Operated by Hillsboro Landfill, Inc. a subsidiary of Waste Management of Oregon.*

B. Site Data

1. Facility address and location (give detail on approach trucks would take):

- *3205 SE Minter Bridge Road, Hillsboro, OR 97123*

2. Audit contact at facility (give name, title, and telephone number):

- *Jeff O'Leary, Environmental Protection Specialist, 503-857-5870*

3. Date facility opened:

- *Early 1960's*

4. Ownership history:

- *Hillsboro landfill has changed owners and operators several times over the site history. The owner has been Hillsboro Landfill, Inc. since 1993.*

5. Past use of property:

- *The landfill has been in operation since the early 1960s when the landfill was originally a construction and demolition waste landfill where the waste was placed in soil lined trenches. Today, the landfill is designated as a special purpose landfill and is authorized to accept industrial waste and asbestos in addition to construction and demolition waste as well as other dry wastes that are not putrescible or hazardous.*

6. Is the facility **owned** or leased? If leased, list owner's name, address and telephone number:

- *Facility is Owned.*

7. Normal site hours:

- *Monday-Friday 6:00 AM to 4:00 PM, Closed Saturday & Sunday*

8. Total site size:

- *The current property owned by the landfill is 403 acres. The current approved acreage for waste placement is 152 acres.*

9. Do operations in addition to waste treatment/disposal take place at the site? If yes, list other operations.

- *Tualatin Valley Waste Recovery (TVWR) facility is a material recovery facility (MRF) that is located within the landfill property.*

C. Site Financial Data

1. Financial assurance information for facility closure.

Type of instrument:

- *Surety Bonds and Stand By Trust Fund.*

Amount:

- *Varies by year. Contact site for updated information.*

Funding requirements (if applicable):

- *30 Years of Post Closure Care as required by DEQ.*

Closure cost estimate:

- *Varies by year. Contact site for updated information.*

D. Site Environmental Data

1. Describe surrounding land use - All surrounding land uses are agricultural/residential – all sides.

North: Agricultural/Residential

South: Agricultural

East: Residential

West: Agricultural

2. Indicate population density within 1-mile radius (high, medium, low):

- *High*

3. How far, and in what direction, is the nearest residential community?

- *.1 miles East/Northeast of Hillsboro Landfill.*

4. Do neighbors use private groundwater wells or municipally-supplied water?

- *Combination of municipal and private groundwater wells.*

5. Nearest surface water source and its use (Select closest stream, river, and/or lake; give distance in miles):

- *Tualatin River---Borders the facility property.*

6. Nearest drinking water source (Indicate groundwater or surface water source: give distance in miles):

- *Existing on-site drinking water wells.*

7. Summarize available site geology/hydrogeology/hydrology/climate:

- *There are three significant geological units at the landfill: the Valley Fill; the Willamette Silt and the Tualatin River Alluvium. The oldest unit, the Valley Fill, is believed to be approximately 1000 feet thick under the site, and consists of silty fine sand and silts in weakly cemented layers. Several of the deep borings at the landfill have encountered this zone.*
- *Overlying the Valley Fill is the Willamette Silt, which varies in thickness over the site from 35-60 feet. The Willamette Silt was deposited after large-volume glacial-outburst floods originating in western Montana (Lake Missoula), periodically flowed down the Columbia River drainage and inundated the Willamette Valley. This silt deposit is laterally continuous around the Valley, except where eroded by streams or rivers.*
- *The Tualatin River Alluvium consists of layers of silt, clay and sand with minor amounts of gravel interbedded. This alluvium is adjacent to the river channel and present at the portion of the site west of the Willamette Silt embankment due to river erosion. The landfill compliance wells are established in this material.*
- *In the Willamette Silt, on the eastern part of the landfill, there is an unconfined aquifer which is hydraulically connected to the shallow groundwater of the alluvium to the west. Depths to groundwater in this shallow system can range from 3 to 10 feet below grade. Groundwater in these units flows generally west-southwest towards the Tualatin River.*
- *Summers are typically dry and warm with average temperatures around 75-80F. Winters are typically wet and mild. The site averages approximately 42 inches of rain a year.*

E. Site Management Data

1. On-site Staffing

6_____	Administrative Personnel
1_____	Environmental Protection Specialist
1_____	Engineers and Other Technical Professionals (note site shares regional engineer)
0_____	Chemists/Laboratory Technicians
15____	Operations/Production Personnel
0_____	Transportation Personnel
1_____	Sales Persons

2. Self Inspection. Does the site perform self inspections or audits? If yes, with what frequency? If no, is a program proposed?

- *Yes-Inspections vary depending on permit requirements and internal audits are typically performed every 2 years.*

F. Site Prmits and Regulatory Data

1. List all relevant environmental permits on Table 1.

TABLE 1
PERMIT SUMMARY

AGENCY	PERMIT NUMBER	EFFECTIVE/ EXPIRATION DATES	AREA OF COVERAGE
DEQ	112	Expires: 10/1/2022	Solid Waste
DEQ	34-0004-ST-01	Expires: 3/1/2017	Air Permit
Clean Water Services	1200-Z	Expires: 6/30/2017	Stormwater Discharge Permit
Clean Water Services	133146	Expires: 5/5/2020	Industrial Wastewater Discharge Permit
Metro Designated Facilities Agreement	928984	Expires: 12/31/2019	Disposal agreement between HL and METRO
Washington County Franchise agreement	BCC 12-0915	Expires: 8/2022	Disposal agreement between HL and Washington County
**Copies of Permits and Operating Agreements will be provided as requested.			

2. List names for the principal permitting agency for the site:

- *Oregon DEQ, Portland, OR, Tim Spencer*
- *Metro, Portland, OR, Will Ennis*
- *Clean Water Services, Hillsboro, OR, Kathy Caldwell*

3. Please give dates of most recent compliance inspections relative to each of the applicable permitting agencies listed on Table 1.

- *Please contact HL for copies of the recent site inspections*

4. How many formal violation notices or fines has the site been issued in the last two years? List violations, dates of issuance and penalties (attach additional sheets if necessary):

- *None, as of February 2014*

5. Is the site currently under a compliance agreement or other enforcement action from any environmental regulatory agency? If so, summarize:

- *N/A*

6. Are there local land use permits, building codes, or zoning conditions which must also be met? If so, describe:

- *Washington County Land Use Conditions*

7. Are any environmentally-related, third-party liability suits pending against the site? If yes, give brief summary:

- *N/A*

II. GENERAL FACILITY STANDARDS

A. Security

1. Describe the type of fencing around the facility and whether or not warning signs are posted on it:

- *No trespassing sings are posted on the perimeter fencing which is primarily comprised of chain link.*

2. Access is controlled at the facility gate by:

_____	Guards
X_____	Key or electronic lock
X_____	Security cameras
X_____	Facility employees
X_____	Internal, restricted areas
X_____	Other – Lockable gate across the entrance road

3. Is facility guarded? If yes, when is it guarded and by whom?

- *During business hours by HL staff.*

4. Does the facility have an intruder alarm or warning system? If so, describe

- *Buildings are alarmed and if triggered will notify Waste Management Corporate Security in case of an emergency situation.*

5. How many access gates are on site?

- *Approximately 4 gates on site*

B. Safety

1. Is protective clothing such as hard hats, gloves, splash protection, goggles, etc., available?

- *Yes*

2. Are there safety showers, emergency eyewash stations, fire blankets, and first-aid kits located in work areas?

- *Yes*

3. Does the site have a safety plan covering all site operations?

- *Yes*

4. Substance-abuse program for employees:

X____ Pre-employment

X____ For cause

_____ Fit for duty

X____ Random

_____ Annual

5. Safety statistics (Available upon request):

Statistic	2011	2012	2013
Job restriction			
Days of restrictions			
Injuries			

C. Emergency Response

1. Indicate if the following fire protection equipment is available on site.

X____ Pressurized hydrants/monitors

X____ Fire truck

_____ Chemical/foam extinguishers

X____ Water sprinkler system

_____ Foam dispensing system

2. How many miles to nearest outside emergency fire protection assistance?

- *Approximately 2 Miles*

3. The site has emergency response agreements with:

X____ Local hospital

X____ Police

X____ Spill response contractor

X____ Fire Department

4. Has a copy of the emergency contingency plan been provided to the appropriate agencies and programs?

- *Yes*

5. Has the site had any emergencies in the last year? If so, briefly summarize emergency and response:

- *N/A*

D. Environmental Monitoring

1. Groundwater Monitoring
   a. If monitoring is conducted, at what frequency and for what parameters?

- *HL maintains an in depth Environmental Monitoring Plan (EMP) approved by the DEQ which includes the solid waste permit environmental monitoring requirements. Semi-Annually-Sampling, parameter list and the EMP is available upon request.*

   b. Has monitoring indicated groundwater contamination? If yes, please list specific compounds and concentration ranges?

- *There have been some limited impacts noted in the shallow groundwater downgradient of the unlined portion of the landfill. This includes elevated levels of chloride, iron, manganese, and total dissolved solids which are sometimes above secondary water quality standards in a few of the detection and compliance wells. Based on the intensive monitoring conducted on some of the compliance wells before waste was placed in the cell to be monitored, several of the metals (i.e., iron and manganese in MW-11) found in groundwater are more likely attributable to naturally occurring conditions than landfill activities.*

2. Surface Water Monitoring-Does the site perform surface water Monitoring?

- *Yes, Annual surface water sampling of the Tualatin River. No site related impacts have been noted been caused.*

3. Stormwater Monitoring
   a. Does the facility have a stormwater discharge permit? Please describe which type (group, individual, general):

- *Yes, General 1200-Z Stormwater Permit. See site specific SWPCP for details (available upon request).*

b. Is stormwater monitoring required by permit? If so, at what frequency and for what parameters?

- *Yes, Quarterly. See site specific SWPCP for details (available upon request).*

4. Sewer Discharge Monitoring

a. Does the site have a permit to discharge to any off-site treatment facility? If so, give name and location:

- *Yes, Wastewater is discharged into the Sanitary Sewer System. POTW-Rock Creek Facility*

b. Is the discharge monitored? If yes, identify key parameters:

- *Yes for TSS, TDS, pH, BOD and Arsenic*

c. How often and what types of samples are collected (daily, weekly, monthly, grab, composite)?

- *Monthly, Composite Sample*

d. Has the site had chronic problems in meeting sewer discharge standards? If so, briefly describe:

- *None at this time*

5. Air Monitoring

a. Does the site conduct air monitoring of specific point sources? If so, list sources, how conducted, and frequency:

- Monthly landfill gas well and flare sampling

b. Does the site conduct ambient air monitoring?

- N/A

c. Has monitoring indicated any off-site pollution problems? If yes, briefly describe:

- N/A

d. Does the site conduct industrial-hygiene type air monitoring? If so, how and at what frequency?

- N/A

e. Does the site monitor process vents, tank vents, valves, piping, etc. If so, how and at what frequency?

- N/A

E. Waste Acceptance

1. Outline the procedures or sequence of events to accept a new *[Special]* waste.

- *In order to prevent unacceptable waste from entering the facility, the Hillsboro Landfill requires that all qualifying special waste streams must be profiled using a Generator's Waste Profile form. All relevant information must be accurately and completely filled out, and the generator must sign a certification statement prior to review and processing. The completed Profile is reviewed to determine whether the special waste may be accepted at the facility, and to provide any specific handling conditions that may be required.*

2. List parameters incorporated into the fingerprint analysis for incoming wastes:

- *See waste profile sheet (available upon request)*

3. Briefly summarize implementation of the Land Disposal Restriction (Land Ban) requirements:

- *Signage/handbills/verbal notification*

4. Describe the procedures for sampling bulk loads and drum lots (consider solids/liquids and compositing protocols):

- *N/A*

5. General information regarding acceptance of a new waste stream:

Yes Profile submission fee? (Yes/No)

Yes Generator required to perform analysis? (Yes/No/Optional)

If questions Representative sample required? (No/Yes/if questions)

Corporate Profile review? (On-site/corporate)

No___ Agency approval required? (Yes/No/Pre-approved list)

Both__ Waste codes used/required? (U.S. EPA/state/both)

1-2___ Typical profile approval time? (Number of days)

6. List waste types excluded by the site's permit:

- *Hazardous waste as defined in ORS 466.005a and OAR 340 Division 101*
- *Putrescible waste as defined in OAR 340-93-0030 (72), formerly (63)*
- *Liquid wastes, except if solidified onsite*
- *Used oil, lead batteries, tires and electronic waste for disposal*
- *Source separated recyclables for disposal*

F. Transportation

1. Indicate all waste-transportation options:

X____ Site-owned vehicles

X____ Third-party carriers

2. Does the site maintain a list of approved third-party carriers?

- *Yes*

3. In-house trucking capability (indicate number of each): Transfer stations & Hauling Division should be contacted

2_____	Semi-trailers (box type)
1_____	Straight trucks (flatbed)
1_____	Dump trucks
30____	Roll-off boxes
2_____	Other (waste compactor, bull dozer, articulated dump trucks)

G. Waste Receipt and Shipping

1. Receiving/shipping facilities (indicate number of each): Trucks dumped on work face.

X_____	Truck bulk loading/unloading racks

2. What is the typical lead time for scheduling a waste shipment?

- *Dependent upon material and testing turnaround time.*

3. Is there an on-site scale to weigh vehicles? If so, who and what frequency is thes cale calibrated?

- *Yes, scales are calibrated quarterly. Certified annually by Oregon certification requirements.*

SCHEDULE A

CONTAINERS

1. Estimate the number and type(s) of waste containers typically on site.

5_____	Drums
1_____	Hoppers
30_____	Roll-off boxes
_____	Other

2. Are containers placed on an impermeable liner or concrete pad? Describe:

- *Concrete Pad and/or liner*

SCHEDULE B

TANKS

1. Indicate the number of tanks used for storing the following:

Above-ground		Underground (Includes in-ground tanks/sumps)	
0	reclaimed products	0	reclaimed products
0	raw materials	0	used oil
0	wastes	0	wastes
1	blended fuel	0	blended fuel
2	wastewater (leachate)	0	wastewater
1	freshwater	0	freshwater
3	TOTAL	0	TOTAL

2. Do above-ground tanks have feed cut-off systems? If yes, are they manual or automatic?

- *Yes- Onsite SPCCP Plan has specific details.*

3. Do above-ground tanks have secondary containment? If yes, describe:

- *Yes-Onsite SPCCP Plan has specific containment details.*

4. Do above-ground tanks have high-level alarms? If yes, are they visual, audible, or both?

- *Yes-Both audible and visual*

5. Tank-Systems Self-Inspection Summary:

Tank-System Component	Present (Y/N)	Inspection Frequency
Above-ground tanks	Y	Monthly
Ancillary equipment (e.g. pumps) in secondary containment	Y	Monthly
Ancillary equipment outside secondary containment	Y	Monthly
Above ground piping in secondary containment	Y	Monthly
Unwelded, above-ground piping outside containment	N	Monthly
Welded, above-ground piping outside containment	Y	Monthly
Underground piping in secondary containment	N	N/A
Underground piping outside containment	N	N/A

6. For all tanks, is a leak detection method used? If yes, what method?

- *Visual Observation*

7. Do any tanks have interior protection? If yes, which ones and what type?

- *Some Double Walled Tanks, See onsite SPCCP Plan for details*

8. Do tanks have exterior corrosion protection? If yes, what type?

- *Most tanks have protective paint coating*

9. Are tanks properly registered with the appropriate regulatory agencies?

- *N/A*

10. Have there been any leaks or spills associated with the site's tanks within the last two years? If yes, summarize the incident(s) and response(s):

- *N/A*

SCHEDULE C

SPECIAL PURPOSE LANDFILL

1. Landfill primary liner:

- *Natural, in-place soil*
- *Recompacted clay liner*
- *Synthetic liner*
- *Combination liner (describe) – Composite low-perm soil overlain by GCL, overlain by 60-mil HDPE liner and LCS*

2. Does the landfill have a leachate collection system?

- *Leachate is collected at the bottom of the waste units and drains to 10 leachate collection sumps in Cells II through IV. Phase I is unlined, but has two toe drains that were installed between the older portion of the landfill and Cell II. The toe drains are intended to capture liquids to minimize subsurface migration of leachate from these areas under the new lined landfill units. All the leachate is pumped into the sanitary sewer system and ultimately treated at the Clean Water Services wastewater treatment plant. The landfill maintains an industrial wastewater discharge permit with Clean Water Services for this disposal.*

4. Describe vector controls:

- *The current SWDP prohibits disposing of putrescible wastes that normally attract birds and vectors to landfills. HL operating techniques, such as placing daily cover and limiting the size of operational areas, discourages birds and vectors from frequenting the site. HL uses certain hazing techniques to control birds and vectors, such as predatory bird noise makers, live predatory birds and decoys to discourage birds from the landfill. Other measures such as a third-party vector control company may be implemented if birds or vectors become problematic.*

5. Does the site have methane collection system? If yes, briefly describe:

- *The landfill has a landfill gas collection system, which includes an array of vertical and horizontal landfill gas wells connected by a pipe system that conveys the landfill gas to a flare onsite. The flare burns the landfill gas and is permitted under a DEQ Air Contaminant Discharge Permit and uses appropriate air quality protection measures.*

6. Are hazardous wastes co-disposed with non hazardous wastes? Describe:

- *N/A-HL does not accept hazardous waste.*

7. Are incoming wastes chemically/physically tested? If not, is any other screening performed? Describe:

- *Certain Special Wastes require testing to ensure they acceptable and are non-hazardous*

SCHEDULE D

OTHER FACILITY CAPABILITIES

1. Describe any other significant facility capabilities (i.e., lab-pack/household hazard waste consolidation activities, waste oil/waste antifreeze accumulation, etc.):

- *Onsite Material Recovery Facility for Construction/Demolition debris*
- *Onsite liquids solidification unit.*
- *Sediment ponds used for stormwater management.*
- *Truck wheel rinse basin – trucks roll through water to rinse tires before leaving site.*

WASTE MANAGEMENT HILLSBORO LANDFILL

3205 SE Minter Bridge Road
Hillsboro, OR 97123

HOURS OF OPERATION

Contact 503 640 9427 or
wmsolutions.com

Hillsboro Landfill

Hillsboro Landfill provides customers with professional, safe and convenient disposal services. The landfill is engineered with overlapping environmental protection systems that meet or exceed EPA Subtitle D Solid Waste Disposal Facility regulations. Systems include engineered liners and covers, leachate collection and removal, and landfill gas collection and control. This "special purpose" landfill accepts a variety of material for disposal, however it does not accept putrescible waste (i.e. food waste), or hazardous waste. Hillsboro Landfill is permitted to accept and solidify free liquids by permit/appointment only.

Containment Design

Our double-liner system protects the environment by ensuring that all waste and wastewater (leachate) is contained and isolated from soil and groundwater. Hillsboro Landfill uses synthetic membrane and clay liners built to strict engineering standards. All construction is monitored and documented by independent third-party engineering firms and subjected to review and approval by the Oregon Department of Environmental Quality (DEQ).

Groundwater Monitoring

34 wells are onsite to provide groundwater evaluation and groundwater quality monitoring. Rigourous testing provides added assurance of groundwater protection surrounding the landfill. Monitoring results are submitted to the Department of Environmental Quality (DEQ).

Landfill Gas Management

Hillsboro Landfill has an active gas collection system, which captures landfill gas from a series of vertical and horizontal gas well collectors from within the landfill. The gas system collects approximately 700–800 cubic feet per minute of landfill gas that is controlled by an onsite blower and flare system.

Leachate Collection & Treatment

All waste cells have a leachate collection and removal system, which includes an automated pumping system that maintains sump levels below regulatory requirements. Collected leachate is pumped and conveyed to an offsite wastewater treatment plant.

YEAR OPENED
1965

PROJECTED LIFE REMAINING
35.5 years

FACILITY ACREAGE
394.2 acres

PERMITTED FOOTPRINT
152 acres

REMAINING PERMITTED CAPACITY
12,385,000 cubic yards

TONS PROCESSED ANNUALLY
450,000 tons

OWNERSHIP
Hillsboro Landfill, Inc.

PERMIT TYPE & PERMIT #
DEQ Solid Waste Permit #112

NUMBER OF EMPLOYEES
30

Solidification

Hillsboro Landfill has recently been approved by the Oregon DEQ to accept wastes for solidification. This approval allows for the acceptance of non-hazardous liquid wastes, sludges, and semi-solids for solidification and subsequent landfill disposal.

ALL-WEATHER ACCESS

A dedicated area, with all-weather access, for acceptance of various types of waste has been established

IN-GROUND MIXING BINS

The solidification operation consists of in ground mixing bins for direct acceptance and solidification for liquids, solids, and semi-solids.

20,000 GALLON LIQUID HOLDING TANK

There is also a 20,000 gallon liquid holding tank to accommodate tankers and vacuum trucks, allowing them to offload and leave, reducing standby times. This tank is equipped with a 4-inch discharge pump rated at 450 gpm and several sets of fittings to allow for easy connection.

In addition to solidification operations, the facility can provide washout and industrial cleaning services should the need arise.

Disposal of liquids for solidification can be scheduled by appointment only.

TYPICAL WASTES THAT ARE APPROVED FOR ACCEPTANCE:

Car Wash Cleanout Waste
Catch Basin Grit
Grease Trap Waste
Ink, Paint and Pigment Sludges
Non-Hazardous Industrial Liquids
Refinery Sludges*
Sedimentation Pond Cleanouts
Tank Cleanouts

Acceptable Material

- Asbestos – Friable & Non-Friable by appointment only
- Auto Shredder Waste
- Clean & Contaminated Soil
- Construction & Demolition Wastes
- Drummed Waste with Solids
- Industrial Process Waste
- Liquid Waste by appointment only
- Residual Waste from a Dry Waste Material Recovery Facility
- Sludge
- Wood Waste

Unacceptable Material

- Batteries
- Biosolids
- Electronic Waste
- Explosives
- Hazardous Waste
- Infectious Waste
- Putrescible Waste (e.g. food waste)
- Radioactive Waste
- Tires
- White Goods (e.g. refrigerators, air conditioners, etc.)

* Wastes must be below 10,000 ppm TPH

WASTE MANAGEMENT

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Additional Services Provided

- Tualatin Valley Waste Recovery Center
- Public Recycling Drop-Off Area

Promoting Wetlands and Wildlife

This site includes 120 acres of wetlands and wildlife habitat. It is home to 100 bird species and mammals including the Great Blue Heron. Our wildlife habitat and wetlands have earned prestigious certification from the Wildlife Habitat Council. These wetlands are also important to the community because they act as a relief valve for neighborhood stormwater and for floodwaters from the Tualatin River.

Approval Process

Hillsboro Landfill has a defined waste screening protocol which protects both our employees and the environment. For all industrial and special waste streams, the generator or agent must complete a Generator's Non-Hazardous Waste Profile (available online at wmsolutions.com) for review and approval by our technical staff.

Community Partnerships and Involvement

Hillsboro Landfill is proud to be an active supporter of the following events, charities and service groups:

- Earth Day
- Hillsboro Chamber of Commerce
- Hillsboro Public Library
- Jackson Bottoms Wetland Preserve and their Annual "Tweet of Dreams"
- Loaves and Fishes Center, Hillsboro
- Oregon Refuse & Recycling Association
- Solid Waste Association of North America
- Stop Oregon Litter and Vandalism (SOLV) of Washington County
- Tuality Healthcare Foundation "CAT Walk" for Cancer Awareness and Treatment
- Washington County Solid Waste Advisory Committee

Hillsboro Landfill is the recipient of two prestigious honors: the 2010 WM Environmental Excellence Award and certification from the Wildlife Habitat Council. Both awards recognize Hillsboro Landfill's operational excellence and success in improving wildlife habitat and educating the community. With over 100 acres of protected wildlife habitat along the Tualatin River, this Waste Management site is home to large populations of many animals. The site even contains a blue heron rookery, along with large expanses of habitats for waterfowl and other native bird species. Hillsboro Landfill's wetland complex is a key component of the Jackson Bottom corridor system, connecting the Jackson Bottom Wetlands Preserve to the north with the Minter Bridge Natural Area to the south.

CONTACT

TSC Portland
7227 NE 55th Avenue
Portland, OR 97218
800 685 8001 or 800 963 4776
TSCPortland@wm.com

COMMUNITY RELATIONS

Jackie Lang
503 493 7848 or jjlang@wm.com

WASTE MANAGEMENT

THINK GREEN®

Chemical Waste Management of the Northwest, Inc. (CWMNW)

WASTE MANAGEMENT

THINK GREEN.®

REVISED MARCH 2017
This information provides an overview of the facility. This is not a contract and the information may change without notice at WM's sole discretion.

Table of Contents

Table of Contents (Continued)

Introduction

Chemical Waste Management of the Northwest, Inc., (CWMNW) is a fully permitted treatment, storage and disposal facility (TSDF) located in the semi-arid climate of north-central Oregon. CWMNW offers regional hazardous waste management services to customers in the states of Washington, Oregon, Montana, Idaho, Utah, Wyoming, Hawaii, and Alaska, and the provinces of Western Canada. In addition, CWMNW offers national hazardous waste services through Waste Management's (WM's) extensive rail transportation network.

CWMNW offers clients a wide range of treatment and management capabilities and significant landfill capacity. Management of hazardous wastes and substances has become increasingly complex over the years and government enforcement actions are prevalent. As the necessity for destruction and secure disposal of wastes increases, so do the regulatory compliance issues concerning these wastes.

The purpose of this package is to provide information to generators, customers and potential customers who either use the facility, or are seeking information about the facility.

General Information

Name of Facility

Chemical Waste Management of the Northwest, Inc. (CWMNW)

US EPA ID#

ORD089452353

Location

ADDRESS
17629 Cedar Springs Lane
Arlington, Oregon 97812

MAILING ADDRESS
17629 Cedar Springs Lane
Arlington, Oregon 97812

LATITUDE
45.6156

LONGITUDE
120.236

Website

https://www.wmsolutions.com/locations/details/id/247

Phone

CUSTOMER SERVICE

1 800 963 4776

MAIN OFFICE

541 454 2030

Hours of Operation

CWMNW offices are open Monday through Friday from 8:00 am to 4:30 pm. The facility is operational and trucks are usually received between 7:00 am and 4:00 pm. Receiving hours will vary during the year depending on available daylight hours. Unloading of arriving waste shipments will be undertaken as workload, lighting and weather conditions permit. Check with the facility for current truck acceptance hours. Special arrangements will be made on a case-by-case basis for weekend acceptance, and late operations.

BUSINESS HOURS (OPERATING/RECEIVING)

Operating hours are from 7:00 am to 4:00 pm, Monday through Friday. Receiving hours vary during the year depending on available daylight hours. Special arrangements will be made on a case-by-case basis for projects requiring extended landfill operations.

HOLIDAYS

CWMNW observes most federal holidays and the Arlington facility will normally be closed during these periods. CWMNW suggests marking the following days on your calendar so that production and waste storage limitations do not present problems: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

Technical Service Center (TSC)

The TSC assists customers with profiling, quotes, credit, and industrial service agreements.

Scheduling is done through:

Amanda Payne
206 763 0590

Yemaya Evans
206 830 6040

General Scheduling Guidelines

Each operating unit, i.e., Decant, Stabilization, Landfill, has determined the volume they can process each day. These numbers are maintained on a matrix by the Customer Service Department. Any overbook of a category needs management's approval.

SLOT ALLOCATION

Available slots are allocated on a first come, first served basis. Emergencies are coordinated through the Customer Service Manager and the appropriate Operating Unit Supervisors.

SUBMITTING SCHEDULE REQUESTS

Call Customer Service at 1 800 963 4776. A voice prompt will direct callers through the scheduling process.

Contacts

DISTRICT MANAGER

Robert Mulholland
541 454 3265

TECHNICAL MANAGER

Gary Fisher
541 454 3234

ENVIRONMENTAL MANAGER

James Denson
602 757 3352

WASTE APPROVAL MANAGER

Kristen Castner
503 493 7834

TECHNICAL SERVICE CENTER

800 946 7382

ENGINEERING ENVIRONMENTAL

541 454 3211

Facilities, Design, Construction and Operations

Facility Description

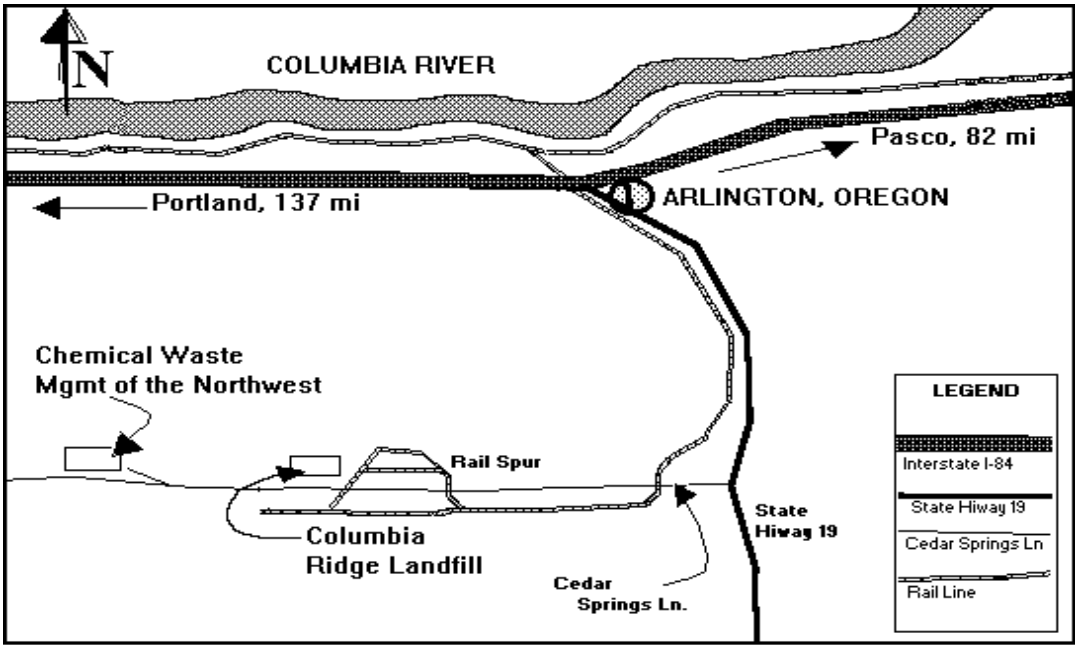
CWMNW is a fully permitted treatment, storage and disposal facility (TSDF) offering regional hazardous waste management services to customers in the states of Washington, Oregon, Montana, Idaho, Utah, Wyoming, Hawaii, and Alaska, and the provinces of Western Canada, and national hazardous waste services through Waste Management's rail transportation network. The CWMNW facility offers a wide range of treatment and management capabilities and significant landfill capacity. The facility is located in the semi-arid climate of north-central Oregon. A facility map is provided in "Site Maps & Aerials" in the Appendices.

NUMBER OF EMPLOYEES

CWMNW is located immediately adjacent to and west of Waste Management's Subtitle D Columbia Ridge Landfill (CRL). Together, the CRL and CWMNW facilities employ 120 full and part-time employees plus various contractors and contract labor. Some employees alternate work at both facilities based on workload.

FACILITY LOCATION

CWMNW is located in north-central Oregon, 12 miles south and west of the Oregon/Washington state boundary and the city of Arlington, Oregon. The map below shows the site's location in relation to the Columbia River, Portland, Oregon, Pasco, Washington and the major east-west interstate, I-84. The site is 2½ hours driving distance from Portland and 1½ hours driving distance from Pasco.



FACILITY ACREAGE

The total size of the facility is 1,288 acres, with 320 acres currently permitted for hazardous waste management activities. The site is buffered by over 11,000 acres of undeveloped WM property, which surrounds the area. Including Waste Management's Subtitle D Columbia Ridge Landfill, the company owns over 14,000 acres of property.

TRUCK ACCESS

The access route is Interstate 84 to Arlington, exit 137 onto State Highway 19 south to Cedar Springs Lane, Cedar Springs Lane west to the facility. Scheduling of truck shipments into the facility is recommended.

RAIL ACCESS

The CWMNW facility is directly served by rail through use of the WM owned rail siding that serves both the CWMNW and CRL facilities. All unloading operations from rail are conducted on WM owned property. All rail

shipments must be scheduled and Waste Profiles must be approved prior to shipment of material. CWMNW bound sealed intermodal containers are unloaded from the rail spur and transported approximately one mile by truck to the CWMNW site. WM uses Taylor and Myjack top-picks to remove 20-foot, 40-foot, and 48-foot intermodal containers from flatcars. Containers are placed on trucks and transported about ½ mile on company owned roads to the CWMNW site. Upon entry to CWMNW, all containers and trucks that transport waste are directed to the certified truck scales and the inspection station.

In 2003, WM completed upgrades to increase handling capabilities for material shipped by rail to the site. These improvements included extension of rail siding, expansion of the wastewater/ stormwater management system, expansion of rolling stock and containers, and paving improvements. WM's current operational material handling capacity for rail shipment is approximately 12,000 tons/day. Bulk materials are off-loaded by excavators located on an overhead platform at the rail siding and placed in trucks and transported approximately ½ mile to the CWMNW site.

Site History Including Landfill Cells

CWMNW opened in 1976 as Chem-Security Systems, Inc., under the ownership of Chem-Nuclear Systems, Inc. In October 1982, the company was acquired by Waste Management. Following a corporate restructuring in 1986, the company was reorganized to Chemical Waste Management, Inc. and in 1990, the name was changed to Chemical Waste Management of the Northwest, Inc. In 1994 WMI changed its name to WMX Technologies, Inc. In 1995, WMX Technologies re-purchased all publicly held stock of CWMNW, and Chemical Waste Management became a wholly owned subsidiary of WMX Technologies, Inc. In 1998, WMX Technologies merged with USA Waste. The merged companies are now known as Waste Management.

The site had previously been developed as a source of pozzolan, a volcanic ash used to reduce the amount of cement needed for the construction of the John Day Dam in 1967. Total property size of the facility is 1,288 acres, with 320 acres permitted for hazardous waste management activities.

The company maintains one residence on the facility. Arlington, Oregon is the nearest community, lying approximately 7 air miles, or 12 road miles to the northeast. The nearest major waterway is the Columbia River, which is approximately 7 air miles, or 12 road miles to the north.

PLANS TO CONSTRUCT ADDITIONAL LANDFILLS AT THE SITE

Plans are in place to construct Cell 4 of Landfill L-14.

CURRENT AVAILABLE LANDFILL CAPACITY

Provided below is an overview of CWMNW's current and anticipated permitted landfill capacity as of May 2016/2017:

Current available capacity

384,500 c.y.

Scheduled capacity to be on-line in 2016/2017

Additional 5.3 million c.y.

Scheduled capacity to be on-line in 2016

Additional 1,313,000 c.y. to be constructed.

Unscheduled

Additional 3,698,000 c.y. of capacity can be permitted with customer commitments. Beyond landfill L-14, additional landfill development and long-term disposal capacity is intended elsewhere within the permitted area.

LANDFILL CELLS THAT EXIST AT THIS SITE

Landfills at the CWMNW facility are used for the permanent disposal of solid RCRA hazardous, industrial and TSCA regulated wastes, as well as wastes regulated only by the state the waste was generated in (State-only hazardous) and non-regulated wastes.

OPENING OF THE FACILITY

The CWMNW facility was opened in 1976 as Chem-Security Systems, Inc. under the ownership of Chem-Nuclear Systems, Inc.

FACILITY OWNERSHIP

Waste Management (WM) is North America's leading provider of comprehensive waste management environmental services. WM owns or operate 249 landfill sites, which is the largest network of landfills in North America. Waste Management employed approximately 40,600 people as of December 31, 2015.

LANDFILL CELL LISTING

Unit	Design Size (ft) (approximate)	Capacity[1] (cy) (approximate)	Liner / Regulated Content	Unit Status	Effective
L-1	60 x 500 x 25	27,790	Earth	Closed	August 1988
L-3	65 x 500 x 32	39,155	Earth	Closed	August 1988
L-5	160 x 500 x 34	99,365	Earth RCRA, TSCA, non-regulated	Closed	August 1988
L-6	175 x 700 x 30	136,262	Earth	Closed	August 1988
L-7	255 x 525 x 48	296,426	Earth RCRA, TSCA, non-regulated	Closed	June 1991
L-8	120 x 600 x 30	104,866	Earth Potliner	Closed	April 1990
L-9	200 x 600 x 50	162,946	Earth RCRA, TSCA, non-regulated	Closed	June 1991
L-10	600 x 400 x 66	585,000	Earth RCRA, non-regulated	Closed	August 2002
L-12	900 x 440 x 52 See Exhibit 11 for L-12 design plan	754,738	Compacted clay & bentonite, double layer HDPE RCRA, TSCA, non-regulated	Active	
L-13	850 x 900 x 78 See Exhibit 12 for L-13 design plan	2,211,563	Compacted clay & bentonite, double layer HDPE RCRA, TSCA, non-regulated	Active	
L-14 Cell 1, 2, 3	980 x 284 x 134 See Exhibit 13 for L-14 design plan	3,0285,227	Compacted clay & bentonite, double layer HDPE RCRA, TSCA (applied for), non-regulated	Active	

[1]Capacity is total capacity of the landfill during its active life and includes mounding of waste above grade.

MATERIAL PLACEMENT IN CELLS

Materials are placed in the landfills in horizontal lifts with all waste placements identified on a 3-dimensional coordinate system utilizing sections, depths and quadrants. Grid maps are created for each landfill unit, and are specific to that unit. 3-D grid maps for L-13 and L-14.

Direct landfill wastes must meet all current standards (i.e., LDR treatment standards) for landfill disposal in accordance with federal and state regulations.

Landfill Design Requirements

Landfill design meets or exceed the requirements of 40 CFR Part 264/265 and the minimum technology standards of the Hazardous and Solid Waste Amendments (HSWA) of November 8, 1984 and EPA guidance documents EPA/530-SW-85-014 (May 24, 1985), EPA/600/2-87/097 (December 1987) and EPA/530-SW-89-047 (July 1989). Typical landfill liner bottom and closure cap systems are in use at CWMNW.

Leachate Collection and Management

Landfill leachate systems are divided into: (1) primary leachate collection systems; and (2) leachate detection systems. Primary systems (sometimes denoted as just "collection systems") collect naturally occurring water, which passes through waste that is placed directly on top of the system. Detection systems (sometimes denoted as "secondary leachate collection systems") collect fluid that permeates through a liner system from both the waste and from groundwater sources. While it was once thought that detection systems should be dry, experience and computer modeling have shown that fluids will collect in these systems from permeation as well as consolidation of clay liners.

CWMNW maintains detailed records of the geometry of each primary and detection system. The depths and elevations of sump bottoms, sump crests, submersible pump screens and transducers have been determined from as-built module drawings and by measurements made down riser pipes. Based upon this geometry, CWMNW establishes the Compliance Level for each primary system and the Trigger Level (sometimes denoted as the "Action Level") for each primary and detection system.

Once the downhole fluids from primary and detection systems are brought to the surface, they are conveyed to a storage tank. From the storage tank, leachate is treated through the on-site treatment plant and after it meets F039 standards it is reapplied to the landfill for dust suppression.

Fluids collecting in the exposed active landfill are tested, treated if necessary, and disposed in the surface impoundment for solar-evaporation.

Water Supply for use at the Facility

The Frenchman Springs aquifer supplies three wells with water for the site usage, 560-620 ft. below ground surface.

Hydrogeology

SITE HYDROGEOLOGY

The uppermost zone of saturation consists of a relatively thin, local system located approximately 200 feet below the ground surface within the basal portion of the Selah Member of the Ellensburg Formation. This zone is continuous beneath the entire area where waste management activities occur or are planned. This saturated zone is apparently thin or absent in the northern one-third of the site that is outside the waste management area.

A deeper, regional system exists within the Priest Rapids and Frenchman Springs Basalt Members of the Wanapum Formation. The regional ground water is associated with interflow zones within the basalts. Where waste management activities occur, the configuration of the water table beneath the entire area tends to reflect that of the top of the Priest Rapids Basalt.

The hydraulic conductivity of the Selah is on the order of .0001 cm/sec. The hydraulic conductivity within the upper part of the Priest Rapids Basalt is on the same order of magnitude, or greater than that of the Selah. Based on the observed pressure head distribution at the base of the Selah, it is reasonable to expect the hydraulic conductivity of the low hydraulic zone at the Selah/Priest Rapids interface to be in the range of .0000001 to .00001 cm/sec.

SITE GEOLOGY

The property is bounded on the south by the east-west trending Alkali Canyon whose valley floor lies at an elevation of 700 feet above mean sea level (MSL). The upland plateau is at an elevation of approximately 980 feet MSL with the relief of about 130 feet. In the southern portion of the property bounded by Alkali

Canyon, relief is on the order of 280 feet. The property is bounded on the east by a solid waste landfill.

Geologic units encountered within the site area, from oldest to youngest, include basalts with occasional sedimentary interbeds to the Frenchman Springs and Priest Rapids Basalt Members of the Wanapum Formation, fluvial-lacustrine volcaniclastic deposits of the Selah and the Rattlesnake Ridge Member of the Ellensburg Formation, the Pomona Basalt Member of the Saddle Mountains Basalt Formation, various fluvial and volcaniclastic sedimentary units of the Dalles Formation, and minor surficial deposits of colluvial, alluvial, and eolian origin.

Groundwater Monitoring Program

BEGINNING OF GROUND WATER MONITORING

Ground water studies began in 1969, seven years before the facility was permitted.

CWMNW has continuously monitored the ground water beneath the facility since 1976. CWMNW has installed over 200 monitoring wells to date, and over 190 of these wells are monitoring the ground water in aquifers below the facility. CWMNW conducts semi-annual and annual sampling of selected up-gradient and down-gradient wells in the groundwater monitoring program. In addition, the facility also frequently monitors its water supply wells.

Procedures for withdrawing, preserving, packaging, and shipping samples to the laboratory are all specified in CWMNW's comprehensive Ground Water Monitoring Plan.

GROUNDWATER LOCATION

Three ground water systems lie beneath CWMNW's Arlington Facility.

The Selah Member Aquifer of the Ellensburg Formation is the uppermost aquifer found below the surface of the facility. This is a relatively thin, local system (180-250 feet below the surface) that typically produces less than one gallon per minute. It is therefore not economical to use as a primary ground water resource, but is ideal for monitoring CWMNW's impact on the ground water, acting as an early warning system before usable ground water resources are affected. Pursuant to federal regulations, CWMNW is required to monitor this aquifer.

The Frenchman Springs Basalt Aquifer, found within the Priest Rapids and Frenchman Spring Members of the Wanapum Formation, is the most commonly developed aquifer for irrigation within the area of the Arlington Facility, and is tapped for the site's drinking water wells. It lies at a depth of 560-620 feet below the ground surface. CWMNW also monitors this lower aquifer. It should be noted that this water flows to the southwest, away from the Columbia River in the Selah Aquifer.

The Grande Ronde Basalt Aquifer, also found within the Wanapum Formation, lies approximately 1,000 feet below the ground surface in the area of the Arlington facility. It is tapped for water supplies by the City of Arlington and by several irrigation wells south of the facility on Shutler Flats.

Seismic Activity

Seismic Zone the Facility is Located in

- The facility is located in Seismic Zone 2B.

Meteorological Information

Meteorological Information for the Site

- The dominant wind direction at the facility is from the west, at a speed of approximately 10-12 miles per hour.
- The average annual rainfall is 9 inches.
- The average annual evaporation is 60 inches.

General Siting Considerations

Existing Surrounding Land-Uses

- **Surrounding land use:** Agriculture, solid waste landfill.
- **Water supply in area, and at facility:** Well water located at 600 feet. Columbia River located approximately 7 miles north of site; not hydrogeologically connected.
- **Ground water usage in vicinity of site:** Irrigation, stock water and domestic water

Air Quality Assurance

Air Quality: CWMNW has an Air Contaminate Discharge Permit for operation of the Organic Thermal Desorber Unit. It is regulated by ODEQ. CWMNW has no close neighbors and is in a very remote location.

Storage

CWMNW is permitted to store containerized RCRA and TSCA solids and liquids. All containers held in storage are inspected daily and inventoried weekly to ensure containers are not leaking or damaged. The movements of containers into and out of storage are tracked and recorded. Both movement tracking and physical inventories are maintained in hardcopy and electronic format.

CONTAINER

Container Management

Containers are stored within each unit in single layers, two containers wide, separated by 2.5-foot aisle space. All containers of solid hazardous wastes must be at least 90 percent full and contain no free liquids prior to placement in a landfill. Verification is determined by opening and inspecting each container. The exception to this rule is lab packs, which must be accompanied by a generator certification that the contents are properly packed.

EXISTING CONTAINER STORAGE AREA STATUS AND CAPACITY

Storage Unit Designation	Function	Capacity (55-gallon drums or containers specified)
S-2	Storage of Solids & Liquids	778
S-6	Storage of Solids & Liquids	672 20-yard containers
S-10	Storage of Solids & Liquids	3,034

TANKS

Tank Management

All active tanks are monitored regularly. All underground tanks meet UST regulatory requirements.

TANK NO.	SERVICE	PERMITTED CAPACITY (GALS)
Organic Recovery Unit Tanks		
5300-01, 5300-02, 5300-03	Oil Storage	5,300
5210-01	Process Oil	2,000
5200-01	Oil Water Separator	16,000
4200-01	Quench	1,700
4230-01	VRU Sump	3,600
5200-02	Green Weir	16,990
5200-03	Sm. Heated Can	5,674
5200-04	Lg. Heated Tank	10,000
Waste Water Treatment Plant Storage and Processing Tanks		
ST901, ST902, ST903, ST904	Storage	10,500
ST905	Storage	2,500
ST906, ST907	Storage	6,500
ST908	Storage	7,000
EFT950, EFT951	Effluent	10,500
CF1, CF2	Carbon Filter Tanks	1,700
MT1, MT2	Mix Tanks	5,200
IPC3	Incline Plate Clarifier	1,500
TH800	Sludge Thickener	2,600
T4	Surge Tank	1,690
SF1, SF2	Sand Filter Tanks	400
In-Ground Stabilization Tanks/All Mix Tanks		
T-S-1A, T-S-1B	SU Bins	15,000
T-S-2A, T-S-2B	SU Bins	15,000
T-S-3A, T-S-3B	SU Bins	15,000
T-S-4A, T-S-4B	SU Bins	15,000
T-S-5A, T-S-5B	SU Bins	15,000
T-S-6A, T-S-6B	SU Bins	15,000
Reclaimed Oil Tank Storage		
Oil 4	Storage Tank	6,000
Oil 8	Storage Tank	20,000
Oil 9, Oil 10	Storage Tank	11,500
Oil 11, Oil 12	Storage Tank	20,000

SURFACE IMPOUNDMENTS

Surface Impoundments Management

Solar Evaporation Impoundments, commonly referred to as surface impoundments or 'ponds' are used for the management of aqueous wastes. Concentrations of hazardous constituents in aqueous wastes accepted for solar evaporation are limited to levels allowed under the current EPA restrictions for waste disposal to land. No ignitable or reactive wastes are accepted for impoundment. Final disposal of waste residuals in the pond involves the in-situ stabilization of the sludge with reagents and landfill disposal of the treated bulk solids.

SURFACE IMPOUNDMENT LISTING

ID	Dimensions (ft)	Calculated Freeboard (ft)	Operating Capacity[1]	Liner System & Monitoring Frequency	Status
P-A	290 x 290 x 12.6	778	4,250,000	Compacted clay & bentonite; 3 layers HDPE synthetic; Leachate collection and detection monitored daily.	Active Approved: 1/29/88
P-B	290 x 290 x 12.6	2,042	4,250,000	Compacted clay & bentonite; 3 layers HDPE synthetic; Leachate collection and detection.	Active Approved: 1/29/88

[1]Capacity in gallons. Value reflects total capacity minus freeboard allowance.

Receiving

REQUIREMENTS FOR SHIPMENT SCHEDULING

All shipments should be scheduled with the Transportation department at 206-763-0590. A minimum of 48 hours notice is requested. Loads will not be accepted for scheduling unless ALL paperwork is complete and in place (i.e. profile approved and signed, contract approved and signed).

STORAGE CAPACITY

Storage capacity is limited. Scheduling of storage material must be cleared through the on-site facility services group through Robert Mulholland, District Manager at 541-454-3265, at least 48 hours in advance of shipment. Stabilization and encapsulation space is subject to availability. Trucks for these treatment services must arrive BEFORE 12 noon. Late trucks may be held over and processed the next working day. Stabilization loads that require TCLP testing can be accepted for processing on Fridays, but may incur additional storage charges.

RECEIVING WASTE LOADS

- Loads arriving at the facility will radio security of their arrival and scheduled delivery time.
- Truck will park in front of the receiving area and the driver will walk his paperwork to the clerks.
- Paperwork is reviewed and a "receipt ticket" generated. The driver is given the necessary paperwork and asked to proceed to the sample rack.
- After sampling, trucks move to the Truck Staging Area while awaiting results of a fingerprint and process analysis performed on their respective samples.
- Once finger printing determines the waste is consistent with its profile, trucks are called to pull onto the inbound scale.
- After weighing, the truck is directed to its respective area for off-loading.
- Following off-loading, trucks are rinsed (if requested or necessary), weighed, and allowed to exit the site.

CWMNW also offers a pre-shipment manifest review program for customers to eliminate manifest discrepancy paperwork delay when loads reach the site.

Transportation

CONVENIENT TRANSPORTATION PROVIDED

With its large integrated transportation network, transportation alternatives to CWMNW are diverse and convenient. The site is accessible by both rail and truck transportation, and our site transportation specialist's work with customers to develop the most cost-effective transportation option available.

CONTAINER SHIPMENT GUIDELINES

To insure the safety of all handlers of the hazardous waste from the generator to the Arlington facility, and to minimize the likelihood of accidental spills in transport, CWMNW can accept shipment via a number of transportation methods as discussed below.

BOTTOM DUMP VEHICLES

The Arlington facility is unable to handle the unloading of bottom dump vehicles.

REQUIREMENTS FOR BULK DUMP TRUCKS AND ROLL-OFF BOXES

Bulk solids must be delivered to the site in end-dump trailers or end-dumping roll-off boxes. To insure that the trailer maintains its integrity and does not emit hazardous wastes to the environment while in transit, all solid waste loads should be lined with minimum 6-mil. visquene, plastic, or the equivalent completely encasing the load. Dusty material must be bagged and sealed to insure minimal air dispersion of waste during off-loading. Any questions on trailer lining or bagging should be directed to the appropriate sales office for resolution. To prevent leaks, trailer tailgates should be tightly secured with spreader chains or other equivalent devices. To minimize the incidence of spills, all loads should be carefully inspected for leakage prior to departure from the generator's site and periodically enroute. Under no circumstances will drummed hazardous waste be accepted in bulk dump trucks. Dump trucks and roll-off boxes are required to be tarped.

REQUIREMENTS FOR FLATBED SHIPMENTS

According to the Occupational Safety and Health Administration, it is the transporter's responsibility to provide flatbed vehicles with sound cargo decks. Transporters should be aware that as a safety measure, facility employees are not permitted to work on cargo decks. The DOT regulations specify that incompatible wastes should be segregated with physical barriers, and containers must be properly secured. As specified in previous sections, the condition of containers should be carefully checked.

TANKER TRUCK DELIVERY REQUIREMENTS

Tanker trucks carrying bulk liquids should be scheduled to accommodate pre-discharge compatibility testing required for all solar evaporation impoundment (pond) waste streams.

FLATBED TRUCK DELIVERY REQUIREMENTS

Flatbeds should arrive BEFORE 12 noon. Late trucks may be held over and processed the next working day. Overtime charges will be assessed for weekend work, unloading trucks after 4:30 p.m. on weekdays, or other situations that require holding the site open past normal operating hours.

OVERNIGHT PARKING[1]

Overnight parking is allowed in the staging area at the facility's main gate for truck-trailer units accompanied by a driver. No unattended trucks allowed.

WEEKEND DELIVERIES

Weekend waste acceptance, or other special arrangements must be obtained prior to receipt of shipments. Contact the Operations Manager to make special arrangements. For other assistance, contact your Customer Service Representative.

LIQUIDS ABSORBENTS

Absorbent is accepted in any solid bulk shipment.

RAIL DELIVERY[2]

Unloading operations from rail will be conducted on WM owned property. CWMNW bound sealed intermodal containers are unloaded from the rail spur and transported approximately one mile by truck to CWMNW. In 2003, WM increased handling capabilities for material shipped by rail. These improvements included extension of rail siding, expansion of the wastewater/storm water management system, expansion of rolling stock and containers, and paving improvements. WM's current operational material handling capacity for bulk offloading from 100-ton gondolas is approximately 12,000 tons/day. Bulk materials are off-loaded by excavator at the rail siding and placed in trucks and transported approximately one mile to the CWMNW site.

TRANSPORTATION EPA IDENTIFICATION NUMBER

CWMNW does not have a transportation department.

OREGON TRANSPORTATION IDENTIFICATION NUMBER

CWMNW does not have a transportation department.

IMPLEMENTATION OF HM232

CWMNW has reviewed this requirement. However, CWMNW does not maintain a transportation department. Transportation services are provided through a network of sub-haulers.

STATE AGENCY ISSUED STATE MANIFEST FORMS

The state agency does not issue state manifest forms.

[1]The city of Arlington does not permit trucks loaded with hazardous waste or substances to be parked overnight within city limits. All truck and pups will be tarped, even when empty, when leaving the site. Untarping within the city limits of Arlington is expressly prohibited.

[2]All rail shipments must be scheduled. Waste Profiles must be approved prior to shipment of material.

Health and Safety

CWMNW employs a full-time Certified Safety Professional (CSP) who oversees the company's health and safety programs at the site.

See the Appendices for CWMNW's Contingency Plan information.

ON-SITE EMERGENCY RESPONSE CAPABILITIES

An Emergency Response Team (ERT) exists that consists of an Incipient Fire Brigade, HAZMAT Team trained to the Operations Level, Rescue Squad, and EMT. Also, equipment such as sprinkler systems, fire extinguishers, fire truck, ERT trailer, and SCBAs are maintained and stationed at strategic locations throughout the facility. Training is in accordance with 29 CFR 1910.120 (q)(6)(ii) and 1910.156 (c)(i)

OFF-SITE RESPONSE CAPABILITIES

HAZMAT spill, fire, and medical are available locally. CWMNW notifies local fire, ambulance, and police of contingency plan updates. Ambulances participate in annual contingency drills. The fire department also conducts annual tours of the site. The Regional Oregon HAZMAT Team is located in Hermiston, Oregon.

PERSONAL PROTECTIVE EQUIPMENT SUPPLY AND UTILIZATION

CWMNW provides all PPE. Employees are trained by the site's Certified Safety Professional (CSP) to select and use correct equipment.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN (SPCC)

CWMNW does maintain a spill prevention control and countermeasure plan (SPCC).

SPILL CONTAINMENT DESIGN

Routine inspections, testing of tank systems, secondary containment for storage areas, and control of surface water flow minimize the risk of spills. Storm water from active portions of the facility flows to a storm water retention pond.

SITE SAFETY AUDITS OR INSPECTIONS

The Safety Committee conducts quarterly inspections of buildings, offices, and operational areas. Quarterly work observations are also conducted. Other facility management areas are audited periodically by CWMNW personnel. Additionally, the facility is subject to annual audits by the Corporate Environmental and Health and Safety Department.

OSHA RECORD

2013: 1 recordable

2014: 2 recordable

2015: 2 recordable

OSHA'S LAST INSPECTION

May 8, 2006.

FACILITY STORAGE OF ANY CHEMICALS IN EXCESS OF THE SARA THRESHOLD PLANNING QUANTITY

The facility stores fuel and some reagents in excess of the SARA threshold planning quantity.

OTHER SAFETY REGULATIONS

No firearms, drugs, or alcohol are allowed on site. Violation of this rule will be grounds for immediate expulsion from the site. Littering is prohibited. Trash containers are provided for trash disposal.

Employees and contractors must be clean-shaven so their respirator will make a complete seal against the face. Beards, mustaches and sideburns that prohibit respirator protection and are not allowed. The entire operations area of the site is a no smoking area. Smoking is allowed only in the smoke shack and the area immediately adjacent to the smoke shack.

SAFETY VISION STATEMENT

SAFETY: Our Cornerstone For Success

Safety is equal to all other key components of successful performance.

Each employee is responsible for safe behavior.

Each manager is personally accountable for:

Promoting a safe environment;

Maintaining a zero tolerance for unsafe actions and decisions;

Directly participating in all aspects of safety programs;

Managers at all levels will set the standard in our industry.

RULES REGARDING DRIVER SAFETY DURING MATERIAL DELIVERY

The following safety equipment must be used when unloading waste materials. All safety equipment is to be provided by the driver. The facility will not provide safety equipment. Drivers without safety equipment will not be allowed on the facility.

- Long sleeved shirts and long pants
- Hard hat
- Safety glasses (no contact lenses may be worn)
- Chemical resistant gloves
- Tyvek coveralls
- ½ Face respirator with appropriate cartridges
- Splash goggles (bulk liquids)
- PolyTyvek suit (bulk liquids, corrosives and pesticides)
- Rubber steel toed boots, or rubber over-boots for bulk liquids
- Safety toes shoes
- High visibility vest (ANSI Class II)

Drivers will have an appropriate respirator before they are allowed on site. Unless told otherwise, the unloading of all waste material requires a half-face respirator. Respirators are to be worn at all times at the sampling area and in the active landfill area.

Personal Protective Equipment (PPE) Level signs will be obeyed at all times. PPE Level signs are located at buildings and disposal areas. These signs consist of the PPE Level accompanied by written instructions identifying the required levels of personal protection. Questions concerning the protection level indicated should be directed to a CWMNW employee before proceeding. Listed below is an example of a PPE sign:

AREA/BUILDING Minimum Level Of PPE When In Operation	
Level B	Supplied Air Respirator
X **Level C**	Air Purifying Respirator
	X Respirator Worn
	Respirator Carried On Person
Level D	Hardhat, Safety Glasses, "Hi-Viz" Vest, Safety Toed Boots and Chore Gloves

[1]With appropriate cartridges and gloves for the waste or material being handled

Safety equipment must be worn during de-tarping, sampling, and unloading. Any driver who refuses to utilize the proper protective equipment or follow site rules will not be allowed to unload his/her truck.

DE-TARPING, SAMPLING AND UNLOADING PROCEDURES

Drivers will check in at the sampling area, and obtain approval from a material handler to proceed.

Drivers must de-tarp their own trucks, unless other arrangements have been made in advance (depends on material being hauled). A material handler will inspect your truck, and will answer questions on the use of safety gear or the unloading procedures. Drivers will then be instructed to pull trucks into the sampling station.

After sampling, drivers will receive clearance to weigh trucks from the material handler. Drivers must notify the scale clerk on Channel 1-Base 1 that they are preceding onto the scales. Drivers must identify themselves, truck number and hauling company. After weighing, drivers will be instructed where to wait until the sample analysis is complete.

Drivers will not enter tanks or other confined spaces without the appropriate permits.

DRIVER SAFETY RULES

- In the event of an emergency, drivers will be required to follow all emergency instructions given by any CWMNW employee.
- Drivers wearing contact lenses will not be allowed in the operational areas.
- No drivers or passengers under 18 years of age are allowed in the operational area. Drivers are strongly advised against bringing passengers, especially young children, to the facility with them.
- No passengers, other than team drivers, are allowed within the controlled area.
- Speed limit is 25 MPH on the road from lower office ascending to the top of the hill. The speed limit in all other areas, from the top of the hill throughout the site is 15 MPH. The speed limit descending the hill to exit the facility is 15 MPH. Speed limit signs are posted.
- Parking brakes must be set when leaving vehicle unattended.
- Unsafe conditions should be reported to a CWMNW employee.
- Report all accidents idents, and spills immediately to a CWMNW employee when leaving the active area.
- Questions concerning CWMNW Safety Rules should be directed to a CWMNW employee before proceeding.
- Following disposal paperwork will be sent to the receiving clerk via the underground pneumatic tube system. After receiving completed paper work, drivers should use the CB radio to inform the clerk prior to exiting the facility. If the driver does not have a CB Radio, the driver should tell the clerk when papers are picked up.

Vans will be processed only during daylight hours. Vans may have to be completely unloaded to facilitate fingerprint sampling. Arrivals must allow for sufficient time to unload and sample during daylight conditions. The truck and driver must remain on site until waste verification is complete. Trucks must be tarped prior to leaving and no untarping is allowed within the city limits of Arlington.

Drivers discharging waste will take all precautions to see that waste is discharged at its designated area and that spills do not occur.

Qualified CWMNW personnel will directly supervise all vehicle-unloading operations. Drivers must follow the instructions provided by these personnel.

Containerized loads will be unloaded by CWMNW personnel. Each drum will be opened and inspected. This is a long process, and drivers should realize that extra time will be required in handling flatbeds of drums.

In the event that containers are found to be leaking, the vehicle will be parked and the leak contained until safe unloading procedures can be implemented. If decontamination of vehicles is necessary, CWMNW personnel will advise the generator and the transporter of the possible options available and procedures by which decontamination can occur.

End-dump drivers should not unlock double locks or dog bolts on tailgates until they are in the unloading area.

During liquid discharge operations, drivers are to remain at their vehicle valve controls in case of spills or leakage. Drivers must wear all required personal protective equipment while connecting hoses, discharging waste, disconnecting hoses and during washout operations.

All trucks entering the landfill will have the tires washed in the truck wash when leaving the active area, except those hauling PCB materials.

If there is a co-driver, both drivers must have complete safety gear and personal protective equipment.

Security

UNAUTHORIZED ENTRY PREVENTION

Site ingress and egress is controlled with a locked main gate. The facility is surrounded by a barbed wire fence, and the area designated for hazardous waste management operations (“active area”) is surrounded by a chain link fence topped with barbed wire. Persons entering or exiting the facility must check in via intercom or CB radio prior to going through the gate. Persons entering and exiting are logged on a gate log.

RESTRICTED ACCESS TO SITE INSPECTORS

There are no restrictions to access on this site, but active areas require PPE, OSHA 40 hour training certifications, respirator fit tests documentation, and site escorts. Most areas can be effectively viewed without entering, so these additional requirements do not apply to the majority of audits and tours.

IMPLEMENTATION OF HM232

CWMNW has reviewed the implementation of HM232 (2003 DOT security requirement). However, CWMNW does not maintain a transportation department. Transportation services are provided through subcontractors.

Analytical Capabilities and Waste Acceptability

Analytical Capabilities

CWMNW provides all analytical services including receipt and process analyses for the CWMNW Facility. The laboratory also conducts biennial customer waste recertification analysis and may complete pre-acceptance analysis as well.

INSTRUMENTATION AND ANALYSIS

Hewlett-Packard Gas Chromatograph, Inductively Coupled Plasma Spectrometer, Sims Mercury Cold Vapor, 2 GC Mass Specs and Wet Chemistry capabilities are located in the laboratory.

CORROBORATIVE TESTING

CWMNW requires corroborative testing on wastes that have been treated or naturally meet treatment standards prior to approval. CWMNW has the instrumentation to test for the inorganic metal constituents that may fall into this category. Contact the CWMNW customer service representative for additional information.

TYPES OF ANALYSIS CONDUCTED IN THE LABORATORY

PCBs, SVOCs, VOCs, sulfides, cyanides, TCLP metals, and finger print characteristics (as needed).

INCOMING WASTES SAMPLING AND ANALYZING

Proper characterization of each waste stream is the responsibility of the generator. Samples of waste are routinely taken from incoming loads and checked for 'fingerprint characteristics' such as free liquids, color, physical state, and pH. More detailed analysis of incoming wastes may be conducted when necessary, to verify the material manifested matches that of the representative sample analyzed and approved during the pre-acceptance testing. Variations in specific waste loads will be checked through additional testing.

Case-by-case discrepancies (non-conforming wastes) from the original profile will be brought to the attention of the Technical Manager, and the generator will be contacted in order to resolve these discrepancies. If the physical state of the material changes enough to require a different disposal method, these changes will be addressed with the generator, and the generator's approval will be required for further handling of the waste. Submission of a new waste profile may be required along with additional information on the process generating the waste for wastes that are non-conforming.

Waste Acceptance Criteria

PRE-DISPOSAL REQUIREMENTS

CWMNW's internal policies require preliminary approval for disposal for each new waste stream and advance notification of delivery before the facility can accept the waste. A work set consisting of a Generator's Waste Profile, a representative sample of the waste, and a statement from the generator certifying the sample as representative of the waste stream. This information provides the basis for obtaining the approvals.

GENERATOR'S WASTE PROFILE EXAMPLE

Example waste approval profiles can be found on the next 3 pages.

WASTE MANAGEMENT

EZ Profile™

Requested Facility: _____ ❑ Unsure Profile Number: _____

❑ Multiple Generator Locations (Attach Locations) ❑ Request Certificate of Disposal ❑ Renewal? Original Profile Number: _____

A. GENERATOR INFORMATION (MATERIAL ORIGIN)

1. Generator Name: _____
2. Site Address: _____
   (City, State, ZIP) _____
3. County: _____
4. Contact Name: _____
5. Email: _____
6. Phone: _____ 7. Fax: _____
8. Generator EPA ID: _____ ❑ N/A
9. State ID: _____ ❑ N/A

B. BILLING INFORMATION ❑ SAME AS GENERATOR

1. Billing Name: _____
2. Billing Address: _____
   (City, State, ZIP) _____
3. Contact Name: _____
4. Email: _____
5. Phone: _____ 6. Fax: _____
7. WM Hauled? ❑ Yes ❑ No
8. P.O. Number: _____
9. Payment Method: ❑ Credit Account ❑ Cash ❑ Credit Card

C. MATERIAL INFORMATION

1. Common Name: _____
   Describe Process Generating Material: ❑ See Attached

2. Material Composition and Contaminants: ❑ See Attached

1.	
2.	
3.	
4.	
Total comp. must be equal to or greater than 100%	≥100%

3. State Waste Codes: _____ ❑ N/A
4. Color: _____
5. Physical State at 70˚F: ❑ Solid ❑ Liquid ❑ Other: _____
6. Free Liquid Range Percentage: _____ to _____ ❑ N/A
7. pH: _____ to _____ ❑ N/A
8. Strong Odor: ❑ Yes ❑ No Describe: _____
9. Flash Point: ❑ <140˚F ❑ 140˚–199˚F ❑ ≥200˚ ❑ N/A

D. REGULATORY INFORMATION

1. EPA Hazardous Waste? ❑ Yes* ❑ No
   Code: _____
2. State Hazardous Waste? ❑ Yes ❑ No
   Code: _____
3. Is this material non-hazardous due to Treatment, Delisting, or an Exclusion? ❑ Yes* ❑ No
4. Contains Underlying Hazardous Constituents? ❑ Yes* ❑ No
5. From an industry regulated under Benzene NESHAP? ❑ Yes* ❑ No
6. Facility remediation subject to 40 CFR 63 GGGGG? ❑ Yes* ❑ No
7. CERCLA or State-mandated clean-up? ❑ Yes* ❑ No
8. NRC or State-regulated radioactive or NORM waste? ❑ Yes* ❑ No

***If Yes, see Addendum (page 2) for additional questions and space.**

9. Contains PCBs? → If Yes, answer a, b and c. ❑ Yes ❑ No
   a. Regulated by 40 CFR 761? ❑ Yes ❑ No
   b. Remediation under 40 CFR 761.61 (a)? ❑ Yes ❑ No
   c. Were PCB imported into the US? ❑ Yes ❑ No
10. Regulated and/or Untreated Medical/Infectious Waste? ❑ Yes ❑ No
11. Contains Asbestos? ❑ Yes ❑ No
    → If Yes: ❑ Non-Friable ❑ Non-Friable – Regulated ❑ Friable

E. ANALYTICAL AND OTHER REPRESENTATIVE INFORMATION

1. Analytical attached ❑ Yes
   Please identify applicable samples and/or lab reports:

2. Other information attached (such as MSDS)? ❑ Yes

F. SHIPPING AND DOT INFORMATION

1. ❑ One-Time Event ❑ Repeat Event/Ongoing Business
2. Estimated Quantity/Unit of Measure: _____
   ❑ Tons ❑ Yards ❑ Drums ❑ Gallons ❑ Other: _____
3. Container Type and Size: _____
4. USDOT Proper Shipping Name: ❑ N/A

G. GENERATOR CERTIFICATION (PLEASE READ AND CERTIFY BY SIGNATURE)

By signing this EZ Profile™ form, I hereby certify that all information submitted in this and all attached documents contain true and accurate descriptions of this material, and that all relevant information necessary for proper material characterization and to identify known and suspected hazards has been provided. Any analytical data attached was derived from a sample that is representative as defined in 40 CFR 261 - Appendix 1 or by using an equivalent method. All changes occurring in the character of the material (i.e., changes in the process or new analytical) will be identified by the Generator and be disclosed to Waste Management prior to providing the material to Waste Management.

If I am an agent signing on behalf of the Generator, I have confirmed with the Generator that information contained in this Profile is accurate and complete.

Name (Print): _____ Date: _____

Title: _____

Company: _____

Certification Signature

THINK GREEN.®

QUESTIONS? CALL 800 963 4776 FOR ASSISTANCE

Revised June 30, 2015

WASTE MANAGEMENT

EZ Profile™ Addendum

Only complete this Addendum if prompted by responses on EZ Profile™ (page 1) or to provide additional information. Sections and question numbers correspond to EZ Profile™.

Profile Number: _____

C. MATERIAL INFORMATION

Describe Process Generating Material (Continued from page 1): If more space is needed, please attach additional pages.

Material Composition and Contaminants (Continued from page 1): If more space is needed, please attach additional pages.

5.	
6.	
7.	
8.	
9.	
Total composition must be equal to or greater than 100%	≥100%

D. REGULATORY INFORMATION

Only questions with a "Yes" response in Section D on the EZ Profile™ form (page 1) need to be answered here.

1. EPA Hazardous Waste
   a. Please list all USEPA listed and characteristic waste code numbers:

   b. Is the material subject to the Alternative Debris standards (40 CFR 268.45)? ❑ Yes ❑ No
   c. Is the material subject to the Alternative Soil standards (40 CFR 268.49)? → If Yes, complete question 4. ❑ Yes ❑ No
   d. Is the material exempt from Subpart CC Controls (40 CFR 264.1083)? ❑ Yes ❑ No
      → If Yes, please check **one** of the following:
      ❑ Waste meets LDR or treatment exemptions for organics (40 CFR 264.1082(c)(2) or (c)(4))
      ❑ Waste contains VOCs that average <500 ppmw (CFR 264.1082(c)(1)) – will require annual update.
2. State Hazardous Waste → Please list all state waste codes: _____
3. For material that is Treated, Delisted, or Excluded → Please indicate the category, below:
   ❑ Delisted Hazardous Waste ❑ Excluded Waste under 40 CFR 261.4 → Specify Exclusion: _____
   ❑ Treated Hazardous Waste Debris ❑ Treated Characteristic Hazardous Waste → If checked, complete question 4.
4. Underlying Hazardous Constituents → Please list all Underlying Hazardous Constituents:

5. Industries regulated under Benzene NESHAP include petroleum refineries, chemical manufacturing plants, coke by-product recovery plants, and TSDFs.
   a. Are you a TSDF? → If yes, please complete Benzene NESHAP questionnaire. If not, continue. ❑ Yes ❑ No
   b. Does this material contain benzene? ❑ Yes ❑ No
      1. If yes, what is the flow weighted average concentration? _____ ppmw
   c. What is your facility's current total annual benzene quantity in Megagrams? ❑ <1 Mg ❑ 1–9.99 Mg ❑ ≥10 Mg
   d. Is this waste soil from a remediation? ❑ Yes ❑ No
      1. If yes, what is the benzene concentration in remediation waste? _____ ppmw
   e. Does the waste contain >10% water/moisture? ❑ Yes ❑ No
   f. Has material been treated to remove 99% of the benzene or to achieve <10 ppmw? ❑ Yes ❑ No
   g. Is material exempt from controls in accordance with 40 CFR 61.342? ❑ Yes ❑ No
      → If yes, specify exemption: _____
   h. Based on your knowledge of your waste and the BWON regulations, do you believe that this waste stream is subject to treatment and control requirements at an off-site TSDF? ❑ Yes ❑ No
6. 40 CFR 63 GGGGG → Does the material contain <500 ppmw VOHAPs at the point of determination? ❑ Yes ❑ No
7. CERCLA or State-Mandated clean up → Please submit the Record of Decision or other documentation with process information to assist others in the evaluation for proper disposal. A "Determination of Acceptability" may be needed for CERCLA wastes not going to a CERCLA approved facility.
8. NRC or state regulated radioactive or NORM Waste → Please identify Isotopes and pCi/g: _____

WASTE MANAGEMENT

Additional Profile Information

Profile Number: _____

C. MATERIAL INFORMATION

Material Composition and Contaminants (Continued from page 2): If more space is needed, please attach additional pages.

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40.	
Total composition must be equal to or greater than 100%	≥100%

D. REGULATORY INFORMATION

1. EPA Hazardous Waste
   a. Please list all USEPA listed and characteristic waste code numbers (Continued from page 2):

SUBMITTAL OF PAPERWORK

Generators are required to keep a copy of the completed profile for their records of all wastes that are to be shipped to CWMNW and to maintain a copy of each manifest and all accompanying paperwork for each shipment including Land Disposal Restriction (LDR) forms, PCB attachments, asbestos shipping records, and lab pack certifications and inventories (as applicable). The original profile and the properly labeled sample should be sent to the facility address as noted.

United Parcel Service (UPS) accepts hazardous materials (lab samples are not "wastes") packaged according to Department of Transportation specifications. UPS can provide shipping instructions for lab samples as well as copies of UPS shipping manuals.

Under normal conditions, with paperwork completed correctly and samples received in good condition, generators should allow approximately one week to obtain approval. The required paperwork and sample should be submitted well in advance of any shipment deadlines the waste generator or treater may have.

After CWMNW has reviewed the information submitted on the profile and any attachments, received available analytical data, and obtained a sample for analysis, CWMNW will complete the remaining four pages of the profile work set. The five page profile set will be sent to the generator for final review and signature. The profile work set must be returned to CWMNW prior to acceptance of the waste at the facility. This information will give the generator landban information and proper shipping information associated with the waste.

Once disposal approval is obtained, the waste is acceptable for multiple shipments for a specified period of time, as long as the waste constituents stay within the parameters shown on the approved profile.

SUBMISSION OF NEW PROFILE OR RECERTIFICATION PAPERWORK

When the waste approval decision is about to expire, a notification letter will be sent to the generator along with a copy of the completed waste profile. The generator should review the waste profile and make all necessary corrections and modifications. The updated profile should then be sent to the site. If the waste changes at any time, or the process generating the waste undergoes change, a new profile must be submitted, along with a sample.

TYPES OF SAMPLES NEEDED FOR DISPOSAL APPROVAL

CWMNW may require a one-quart representative sample of the waste in order to determine its acceptability for disposal at the Arlington facility. The sample must be collected in accordance with "Test methods for the Evaluation of Solid Waste Physical/Chemical Methods" SW846 and/or 40 CFR 261. A waste approval fee may be charged for evaluating samples depending on waste type and treatment decision. If a sample is required, a label must be completed and attached to the sample with the following information:

SAMPLE CONTAINER LABEL

Generator Name: _____

Waste Name: _____

Profile Number: _____

Date Sample Taken: _____

Sampler's Name: _____

Sampler's Signature: _____

Customer Service is able to provide pre-printed labels. Call 503 493 7825 (customer service) or 541 454 3249 (on-site facility services).

EXCEPTIONS TO SAMPLE REQUIREMENTS

Wastes which do not require samples are considered "miscellaneous special wastes". Miscellaneous special wastes include:

- **Lab Packs.** Small containers of waste in overpacked containers packaged in accordance with 40 CFR 264.316 and not prohibited under the Land Disposal Restriction specified in 40 CFR 268.
- **Polychlorinated Biphenyl (PCB) contaminated equipment, articles, or debris.**
- **"RCRA empty" containers** as defined in 40 CFR 261.7.
- **Controlled Substances regulated by any political subdivision** including drugs, whether legal or illegal, and/or materials from clandestine labs.
- **Commercial Products or Chemicals** including off-specification, outdated, unused or banned products.
- **Non-Hazardous Materials** under Oregon laws and regulations.
- **Asbestos waste from demolition or cleaning.** The unopened containers are visually inspected for integrity.
- **Contaminated Debris from demolition, decommissioning or cleaning, such as piping, tanks, concrete, or wood (not including liquids).** This does not include associated contaminated soils excavated and removed for disposal.
- **Debris as defined in 40 CFR 268.2(g).** These materials are visually inspected.
- **Exclusions listed in 40 CFR 261.4.** Materials or solid waste covered under an exclusion.
- **Conditionally Exempt Small Quantity Generators (CESQG).** Materials or hazardous wastes generated by CESQG as detailed in 40 CFR 261.5.

% OF INCOMING WASTE SAMPLED

100% of bulk loads are either sampled or visualed, all drums are opened and 10% are sampled.

PARAMETERS FOR ANALYSES ON SALES SAMPLES

Fingerprint includes flammability, cyanide, sulfide screens, water reactivity, pH,/ TCLP metals on samples for stabilization.

PARAMETERS FOR ANALYSES ON INCOMING WASTE

Fingerprint includes flammability, cyanide, sulfide screens, water reactivity, pH,/ TCLP metals on samples for stabilization.

REJECTION OF WASTES

Every effort is made to communicate with the customer to resolve discrepancies and to process the waste prior to rejection. The wastes could be rejected if (1) it is non-conforming with the profile and cannot be managed at our facility or transshipped to an alternate facility, or (2) the generator requests that the wastes be rejected.

Prohibited and Unacceptable Wastes

PROHIBITED WASTE STREAMS

Some waste streams are unsuitable for disposal at CWMNW due to the extreme hazards associated with them and/or government regulations or permit conditions restricting land disposal. The generator must divert such wastes to more appropriate disposal facilities. The affected waste streams include, but are not limited to:

- Explosives designated as Class A explosives which present a maximum hazard of detonation cannot be accepted (49 CFR §173.53). Some categories of Class B or Class C explosives may be accepted for disposal on a case-by-case basis.
- Radioactive or nuclear waste materials are not acceptable for disposal.
- Pressurized containers and gas cylinders are not acceptable for disposal. Such containers may be received empty and unpressurized. Caps, plugs, valves, or other pressure-securing attachments must be removed prior to shipment to permit inspection at the disposal site.

- Biological and etiological wastes such as non-PCB municipal sludge, non-PCB septic sludge, hospital etiological agents, animal carcasses, or other sanitary wastes are not accepted for disposal.
- Reactive materials with unreacted solid wastes (such as sodium metal, potassium metal, white phosphorus, and silicon tetra-halides) cannot be landfilled at the facility. For such wastes, CWMNW may provide treatment services prior to final disposal on a case-by-case basis. Cyanide and sulfide bearing wastes are acceptable within certain limits. The CWMNW customer service representative can provide a list of current restrictions.

LDR Requirements and Restrictions

RCRA regulations contained in 40 CFR Part 268 classify the federal Land Disposal Restrictions, and identify hazardous wastes that are restricted from land disposal. The section defines those limited circumstances under which an otherwise restricted waste might continue to be land disposed. The Land Disposal Restrictions apply to generators, transporters, storers, treaters and disposers of hazardous waste, and it is extremely important to understand these regulations and how they affect the waste you generate or transport. When LDR waste is shipped to the site, each affected waste shipment must be accompanied by the appropriate LDR Notification and Certification Form.

Examples of these forms are included in the Exhibits section of this document and are:

- Land Disposal Notification and Certification Form (UTS), [Phase II, Post-1994 Restrictions]
- Lab Pack Disposal Certification Form (UTS), [Phase II, Post-1994 Restrictions]
- Lab Pack Drum Inventory (UTS), [Phase II, Post-1994 Restrictions]
- Land Disposal Notification and Certification Form (UTS), Supplemental Page, [Phase II, Post-1994 Restrictions]
- F039/Underlying Hazardous Constituent Form (UTS)

Contact the CWMNW customer service representative for details on LDR regulations, requirements and restrictions and for assistance in determining if your waste streams are affected.

Free Liquids

In accordance with EPA final rule dated April 30, 1985, all solids being placed in a secure landfill must pass a free liquids test, as designated by EPA, prior to acceptance. Because vibration during transport of waste shipments can cause free liquids to separate from some solids, a sample from the received waste shipment must again pass this test before final disposal can occur. Please contact your customer service representative for more details on the Free Liquids Ban and for the testing method presently being used for determining a waste's free liquid content.

ACCEPTANCE OF PCB WASTES

CWMNW can dispose of most PCB remediation waste from self-implemented clean-ups, PCB bulk product waste, PCB household waste, and PCB waste from research and development. Other PCB waste can be stored for transshipment to an authorized facility.

Waste Analysis Plan

CWMNW has a Waste Analysis Plan set forth in accordance with 40 CFR 264.13. This plan is available at the facility at all times.

Services and Treatment Capabilities

Bioremediation

Bioremediation of hazardous and industrial waste utilizes microorganisms such as bacteria, fungi, and yeast, to ingest organic chemicals; breaking them down into less toxic or non-toxic constituents. Once treatment is completed, analytical testing is conducted to confirm compliance with land disposal restrictions. Once confirmed, the residuals are properly land disposed of. Large waste volumes are biologically treated using a bio-pad and WM's BioSite℠ process; while smaller scale projects are better suited for WM's trademarked Bio-in-a-box℠ treatment technology. Materials commonly treated utilizing the bioremediation process include soils, catalysts, molecular sieves, refinery wastes, and other materials containing organic contaminants.

CAMU

As provided by RCRA regulations, certain hazardous waste generated as a result of clean-up activities may be land disposed in a Corrective Action Management Unit (CAMU) without meeting the applicable land disposal restrictions (LDR) treatment standards that otherwise would apply to the disposal of those waste materials. CAMU eligible remediation waste are defined as "all solid and hazardous wastes, and all media (including groundwater, surface water, soils, and sediments) and debris, that are managed for implementing clean-up" at 40 CFR 264.552(a)(1). CWMNW has received a permit modification from the State of Oregon that allows acceptance of CAMU eligible materials on a project-by project basis.

Macroencapsulation

The Macroencapsulation process at Waste Management utilizes a containment unit made from high density polyethylene (HDPE) to ensure the non-leachability of waste meeting the RCRA definition of debris found at 40 CFR Part 268.2(h). Hazardous debris of irregular shapes or debris that cannot be microencapsulated because all exterior and interior surfaces cannot be coated with encapsulation agents are placed into the WM patented one piece, 20 cubic yard containment box (often referred to as a "vault"). Void spaces surrounding the debris are filled with non-cohesive soil or soil-like fillers, sand, cement, other such reagents, or in some cases pre-stabilized wastes meeting treatment standards. A lid made of HDPE is placed on top of the filled containment vault and heat-welded closed. The secure container is transferred to the RCRA Subtitle C landfill for safe, permanent disposal. Macroencapsulation is appropriate for almost any hazardous debris that fits into the 20 cubic yard "vault", including pipes, hoses, concrete, filters, rags, motors, crushed containers, and other debris materials. Process residuals except in minimal quantities are not allowed.

Microencapsulation

Hazardous waste materials meeting the RCRA definition of debris found at 40 CFR Part 268.2(h) that can be coated (both internally and externally) can be managed via microencapsulation. This process involves coating waste materials of simple geometric shapes with a customized mixture of proprietary fixation reagents that significantly reduce the potential leachabilty of hazardous constituents into the surrounding landfill environment. Some fixation reagents used in the microencapsulation process include lime kiln dust, Portland cement, fly ash, or similar materials. Once the coating process has been completed, the encapsulated waste materials are transferred to the RCRA Subtitle C landfill for safe, permanent disposal. Most hazardous debris is treatable utilizing WM's microencapsulation technology and it is the preferred treatment method for debris that can be fully coated on all surfaces, such as bricks, rocks, and smaller pieces of concrete.

Organics Recovery by Thermal Desorption

Thermal Desorption is a physical separation process involving indirect heating of wastes materials to volatilize water and organic contaminants from solid waste materials. After heating the waste materials in the unit's kiln to accommodate the liquids/solid separation; a vacuum system is utilized to transport the volatilized liquids to a gas condensing system, where the water and organics are further separated into two distinct fractions.

The water phase is re-used in the process, while the organics are collected and sent off-site for fuel blending or for disposal by incineration. The solid residual materials are transferred to the RCRA Subtitle C landfill for safe, permanent disposal. Wastes appropriate for thermal desorption treatment include but are not limited to certain refinery wastes, wood treating wastes, and other wastes contaminated with volatile organic compounds, semi-volatile organic compounds, and poly-cyclic aromatic hydrocarbons (PAHs). Organically contaminated wastes that also contain heavy metal contamination are first treated by thermal desorption, and the residual solids are then stabilized to meet land disposal treatment standards before being permanently disposed of in the RCRA Subtitle C landfill.

PCB/TSCA

The CWMNW facility can dispose of PCB Remediation Wastes generated from self-implemented clean-ups, PCB Bulk Product Waste, PCB Household Waste, and PCB Waste generated from Research and Development. Other PCB waste can be stored for transshipment to facilities authorized to accept those TSCA wastes.

Secure Landfill

The CWMNW facility is one of the most secure treatment and disposal facilities in the world and is built on top of layers of basalt from various formations. Landfill disposal cells are used for the secure, permanent disposal of solid RCRA hazardous, industrial, certain TSCA regulated (see PCB/TSCA section for a more specific description), and non-regulated wastes; as well as State-only hazardous waste. Active disposal cells have composite liners consisting of compacted clay and bentonite, and double layer High Density Polyethylene (HDPE). Each cell is a part of a "disposal unit" that also includes a sophisticated leachate collection system, groundwater monitoring wells, and a state-of-the-art leak detection system. Once wastes are profiled, reviewed, and approved for landfill acceptance, the materials are placed in the disposal cells in horizontal lifts with all waste placements identified on a 3-dimensional coordinate system. Information from this system is utilized to create 3-D maps that can be utilized to locate waste materials in each landfill unit.

Solar Evaporation

Solar evaporation technology uses clean, renewable solar energy to reduce the volume of liquid waste.

The CWMNW facility operates two solar evaporation units that are each designed to exceed EPA minimum technology guidance for surface impoundments. The Liner system design consists of four separate liners and two leachate collection and removal systems. Waste suitable for treatment by solar evaporation at the facility must be aqueous , <10 % solids, concentrations of hazardous constituents are limited to the levels allowed under current EPA restrictions for disposal to land. The total capacity of two solar evaporation units is 8,500,000 gallons. Certification of the unit walls (dikes) is conducted daily via inspections as required by the site RCRA permit and gauge readings measuring freeboard in each unit are recorded by site personnel daily. CWMNW climate allows for an annual evaporation rate of 58 inches and average rainfall of 9 inches .

Solidification

Waste Management's trademarked LiquiFix^{SM} solidification process is utilized to solidify waste containing free liquids into solid materials that pass the Paint Filter test before being landfilled. The process utilizes drying agents, usually in the form of cement or cement by products such as cement kiln dust, fly ash, or Portland cement, to dry liquid, sludge, or waste of other physical state that contains free liquids into solid materials that can be managed in landfills. Waste streams routinely treated via WM's Liquifix^{SM} technology are generally RCRA non-hazardous wastes and include off-spec products, brine wastes, ink sludge, grease trap wastes, non-hazardous paint sludge, certain waste water treatment sludge, and a multitude of other waste streams.

Spent Potliner Treatment

Waste Management is permitted to accept and treat USEPA RCRA hazardous Waste Code K088 - Spent Potliner Material generated from Primary Aluminum Production Operations at the CWMNW facility. K088 wastes are treated in the on-site containment building, where they are crushed and then treated using a patented cyanide oxidation process followed by solidification. After successful treatment, waste materials are transferred to the RCRA Subtitle C landfill for safe, permanent disposal.

Stabilization

The stabilization process occurs when waste are mixed with lime bearing materials such as cement, cement kiln dust, lime, flyash, other proprietary agents, and water inducing chemical reactions that result in the reduction of mobility (or leachability) of hazardous components within a hazardous waste matrix. Process recipes are developed for each waste stream and post treatment TCLP analysis are performed to confirm the recipe will treat the waste stream to below Land Disposal Restriction standards. After stabilization of the waste has occurred, the stabilized material is transferred to the RCRA Subtitle C landfill for safe, permanent disposal. The stabilization process is conducted in six (6) in-ground concrete bins. Each concrete bin is constructed of 12-inch thick walls and a uniform 100-mil HDPE liner has been installed beneath each bin, with an associated drainage layer above the synthetic liner, and a sump for the collection of leaks or spills. Each bin contains two 15,000 gallon tanks constructed of carbon steel that are inspected, maintained, and tested to insure the integrity of each unit.

Waste by Rail

The CWMNW facility is directly served by rail through use of a Waste Management owned rail siding. All unloading of waste operations, including both liquid or solid waste shipped by drum or in bulk containers, are conducted on Waste Management owned property. All rail shipments must be approved and scheduled for shipment prior to acceptance of wastes shipped by rail.

Taylor and Myjack top-picks are used to remove sealed 20, 40, and 48-foot intermodal containers from flatcars. Bulk materials are off-loaded by excavators located on an overhead platform at the rail siding. Offloaded bulk materials and containers are transported by truck approximately one mile on company owned roads to the CWMNW facility. All trucks and containers transporting waste are directed to the certified truck scales and the inspection station to continue the receiving process.

Upgrades to increase handling capabilities for rail-shipped materials include extension of the rail siding, expansion of the wastewater/stormwater management system, addition of over head lighting for safety, and paving improvements. Additionally, Waste Management has increased the amount of rolling stock and containers that can be used by customers for rail shipments, and also is in the process finalizing engineering for a intermodal containers specific for the use of transporting drums by rail. The handling capacity for wastes received by rail at CWMNW is approximately 12,000 tons/day.

Appendices

Regulatory & Permit

PERMITS

Description	Permit #	Issued By	Agency Contact	Issued	Expires
Part B Operating Permit	ORD 089452353	ODEQ	**Elizabeth Druback, Mgr:** 541 298 7255 x222; **Dan Duso, Inspector:** 541 278 4618; **Rich Duval, Engineer:** 541 278 4613; **Barb Puchy, Permit Writer:** 503 229 5790	8/21/2006	Submitted for renewal
PCB Disposal Permit	PCB-1	ODEQ	**Elizabeth Druback, Mgr** 541 298 7255 x222; **Dan Duso, Inspector:** 541 278 4618; **Barb Puchy, Permit Writer:** 503 229 5790	8/21/2006	Submitted for renewal
PCB Letter of Approval (Disposal)	N/A	EPA	**Daniel Duncan:** 206 553 6693	3/25/82	N/A
Commercial Storer Application	N/A	EPA	**Daniel Duncan:** 206 553 6693	7/31/90	N/A
Soils Permit	P330-13-00014	U.S. Dept. of Agriculture	**Melissa Morrison:** 503 326 2814	1/10/2013	03/09/2019
Underground Storage Tanks	GBFH GBFJ	ODEQ	**Michael Kortenhof, Manager:** 811 SW Sixth Ave. Portland, OR 97204-1390	12/5/1998	N/A
ACDP – ORU	11-0002-SI-01	ODEQ	**Linda Hayes-Gorman, Eastern Region Air Quality Mgr.:** 541 388 6146	2/7/2014	2/1/2019

[1]Capacity is total capacity of the landfill during its active life and includes mounding of waste above grade.

ADMINISTRATIVE AGENCIES

State and Federal Authorization is provided by:

Part B Permit
Department of Environmental Quality
Hazardous Waste Division Executive Building
811 SW Sixth Avenue
Portland, OR 97204

Department of Environmental Quality
Eastern Regional Office
2146 N.E. Fourth Street
Bend, OR 97701

Letter of Approval - TSCA
U.S. Environmental Protection Agency Region 10
Office of Waste and Chemicals Management
1200 Sixth Avenue MS WCM-128
Seattle, WA 98101

RCRA OPERATING STATUS PART B PERMIT ISSUED MARCH 31, 2000
A copy of the signature page from the permit is included.

CERCLA STATUS
Approved. (EPA Region 10 verifies approval).

THE OREGON DEQ AND USEPA PERFORM JOINT SEMI-ANNUAL AUDITS
DEQ inspects the facility at irregular intervals.

PERMIT COMPLIANCE HISTORY

The facility's compliance history is a matter of public record. Updated information is available from the facility, the DEQ or the USEPA.

In 1997, WM's adjacent Columbia Ridge Landfill and Recycling Center successfully completed a pilot project as part of the EPA's Environmental Leadership Program (ELP). The Oregon project was one of only 12 such projects selected nationwide. Under the ELP, developed by EPA to encourage and publicly recognize environmental leadership, the project explored ways for EPA, the ODEQ (Sate agency), and WM facilities to work together to develop environmental auditing and compliance programs.

Facility management keeps abreast of regulatory developments through the Corporate Compliance Program, regulatory training programs and seminars both in-house, corporate issue, and externally provided, and through utilization of regulations on CD-ROM, as well as written documents obtained from various agencies and document providers.

Training

FEDERAL TRAINING REQUIREMENTS

Federal training requirements are met at this site.

SPECIAL TRAINING

There are special trainings administered to those working where waste is active at this site such as; first aid, CPR, site health and safety, and hazwopper training is provided.

Fire Protection Training Provided to Site Personnel

Site Emergency Response Team personnel are trained to the equivalent of an industrial incipient.

All employees are trained on the use of fire extinguisher.

Other Training and Preparedness Performed

New employees are required to complete 8 hours of orientation, 16 hours of health and safety training, and the first 30 days on the job training is closely monitored and documented. Training is updated annually utilizing techniques such as observation of job performance, verbal testing, classroom situational training, and written quizzes. The various department managers and supervisors perform the training. All employees are trained in personal safety equipment usage, and are fully supervised until all training is complete. Training Records are kept for three years following termination of employment.

CWMNW maintains an on-going self-inspection program which utilizes department employees as well as management to self-assess both the process and the equipment within a given area. The department self-inspections are performed monthly and submitted to the site's Health and Safety Manager.

A Safety Committee consisting of volunteers from each department on site convenes on a monthly basis to review incidents, accidents and near misses, and provide feedback and recommendations for improvements in facility safety. The Safety Committee also performs a department self-inspection on quarterly basis.

Emergency procedures and contingency plans are detailed in the site's Part B Permit, Contingency Plan. Local fire and emergency response teams have been provided with copies of the Contingency Plan. These providers take part in the contingency training program, including an annual review of the Contingency Plan, and an annual preparedness drill.

An emergency siren is utilized for fire alarms and as an early warning system. CB radio communications are maintained throughout the facility with both site personnel and truck drivers. A communications network is established which provides voice communications through telephone lines to both individual work locations and through paging speakers strategically located throughout the buildings. Our firefighting system includes one fire truck, fire extinguishers, and an Emergency Response Team.

In the event of an on-site spill of hazardous material, a determination is made of the material spilled, followed by decisions on appropriate protective gear needed for clean-up activities. If fire is involved, and can be safely managed, the Emergency Response Team is called into action. Technicians contain and isolate the spill, clean up the spill, and dispose of the materials properly.

Financial Assurance

FINANCIAL STRENGTH OF THE CORPORATION IN OWNERSHIP

CWMNW is a wholly owned subsidiary of Waste Management, a publicly held company, with stock traded on the New York exchange. WM employs nearly 52,000 employees worldwide.

Specific mechanisms used for financial assurance for closure/post closure include a Surety Bond.

Closure/Post-Closure plans and cost estimates have been submitted to the Oregon Department of Environmental Quality (ODEQ) for all regulated units.

INSURANCE AGENCY PROVIDING LIABILITY COVERAGE

In accordance with Permit Condition II.P.(I) and 40 CFR 264.147(a), CWMNW maintains a Certificate of Liability Insurance providing coverage for Sudden Accidental Occurrences. CWMNW also provides coverage for non-sudden occurrences. The insurance agency is American International Specialty Lines Insurance Company, New York, NY. General Liability, Auto Liability, and Worker's Compensation Insurance is provided by Lockton Insurance Agency of Houston.

POLICY LIMITS

The limits are $5 million per occurrence and $6 million aggregate for both sudden and non-sudden occurrences.

OTHER SUBSIDIARIES OF WASTE MANAGEMENT

Waste Management is the leading provider of comprehensive waste management services in North America.

Insurance

ACORD

CERTIFICATE OF LIABILITY INSURANCE

1/1/2016

DATE (MM/DD/YYYY) 12/10/2014

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	LOCKTON COMPANIES 5847 SAN FELIPE, SUITE 320 HOUSTON TX 77057 866-260-3538
CONTACT NAME:	
PHONE (A/C, No, Ext):	FAX (A/C, No):
E-MAIL ADDRESS:	

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A: ACE American Insurance Company	22667
INSURER B: Indemnity Insurance Co of North America	43575
INSURER C: ACE Property & Casualty Insurance Co	20699
INSURER D: ACE Fire Underwriters Insurance Company	20702
INSURER E:	
INSURER F:	

INSURED 1300299 WASTE MANAGEMENT HOLDINGS, INC. & ALL AFFILIATED, RELATED & SUBSIDIARY COMPANIES INCLUDING WASTE MANAGEMENT DISPOSAL SERVICES OF OREGON, INC.
18177 CEDAR SPRINGS LANE
ARLINGTON OR 97812

COVERAGES ORARLI01 CERTIFICATE NUMBER: 12364274 REVISION NUMBER: XXXXXXX

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR X XCU INCLUDED X ISO FORM CG00010413 GEN'L AGGREGATE LIMIT APPLIES PER: POLICY X PRO-JECT X LOC OTHER	Y	Y	HDO G27341251	1/1/2015	1/1/2016	EACH OCCURRENCE	$ 5,000,000
							DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 5,000,000
							MED EXP (Any one person)	$ XXXXXXX
							PERSONAL & ADV INJURY	$ 5,000,000
							GENERAL AGGREGATE	$ 6,000,000
							PRODUCTS - COMP/OP AGG	$ 6,000,000
								$
A	AUTOMOBILE LIABILITY X ANY AUTO X ALL OWNED AUTOS SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS X MCS-90	Y	Y	MMT H08830472	1/1/2015	1/1/2016	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
							BODILY INJURY (Per person)	$ XXXXXXX
							BODILY INJURY (Per accident)	$ XXXXXXX
							PROPERTY DAMAGE (Per accident)	$ XXXXXXX
								$ XXXXXXX
C	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED RETENTION $	Y	Y	XOO G2742305A	1/1/2015	1/1/2016	EACH OCCURRENCE	$ 15,000,000
							AGGREGATE	$ 15,000,000
								$ XXXXXXX
B A D	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N N If yes, describe under DESCRIPTION OF OPERATIONS below	N/A	Y	WLR C4814181A (AOS) WLR C48141821 (CA & MA) SCF C48141833 (WI)	1/1/2015 1/1/2015 1/1/2015	1/1/2016 1/1/2016 1/1/2016	X PER STATUTE OTH-ER	
							E.L. EACH ACCIDENT	$ 3,000,000
							E.L. DISEASE - EA EMPLOYEE	$ 3,000,000
							E.L. DISEASE - POLICY LIMIT	$ 3,000,000
A	EXCESS AUTO LIABILITY	Y	Y	XSA H08830460	1/1/2015	1/1/2016	COMBINED SINGLE LIMIT $9,000,000 (EACH ACCIDENT)	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
BLANKET WAIVER OF SUBROGATION IS GRANTED IN FAVOR OF CERTIFICATE HOLDER ON ALL POLICIES WHERE AND TO THE EXTENT REQUIRED BY WRITTEN CONTRACT WHERE PERMISSIBLE BY LAW. CERTIFICATE HOLDER IS NAMED AS AN ADDITIONAL INSURED (EXCEPT FOR WORKERS' COMPEL) WHERE AND TO THE EXTENT REQUIRED BY WRITTEN CONTRACT. ***FOR BID PURPOSES ONLY***

CERTIFICATE HOLDER

12364274

FOR BID PURPOSES ONLY
C/O WASTE MANAGEMENT DISPOSAL SERVICES OF OREGON, INC.

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

ACORD 25 (2014/01)

Community Relations

WM is the largest employer in Gilliam County. WM actively participates in all aspects of the local community. The facility conducts periodic community liaison meetings to educate and inform the public. These meetings are held as concerns and specific issues arise. Key CWMNW managers also participate in community forums and local activities.

Contingency Plans

As part of the Part B Permit, CWMNW maintains a contingency plan. Additionally, employees are trained on the Emergency Response Plan and Evacuation Plan annually.

The Arlington Facility will maintain a copy of the Contingency Plan detailing procedures to "minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water." (40 CFR 264 Subpart D).

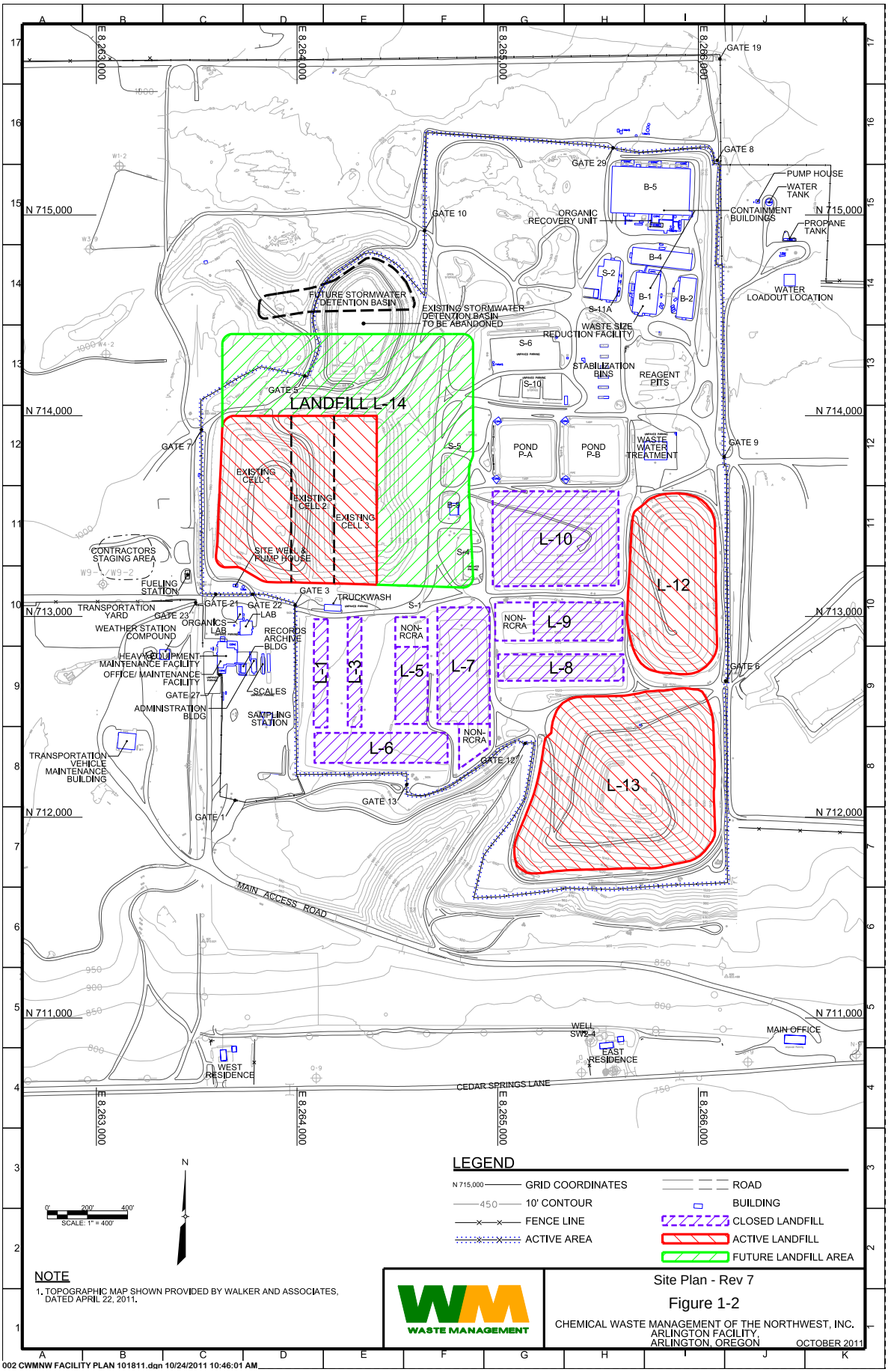
The Contingency Plan is intended to cover the hazardous waste at the facility as well as wastes being transported to the facility from Columbia Ridge Landfill rail yard. The provisions of this plan would be implemented for incidents on the haul road and cover wastes being handled at the transfer station at Columbia Ridge Landfill and Recycling Center's rail yard adjacent to CWMNW.

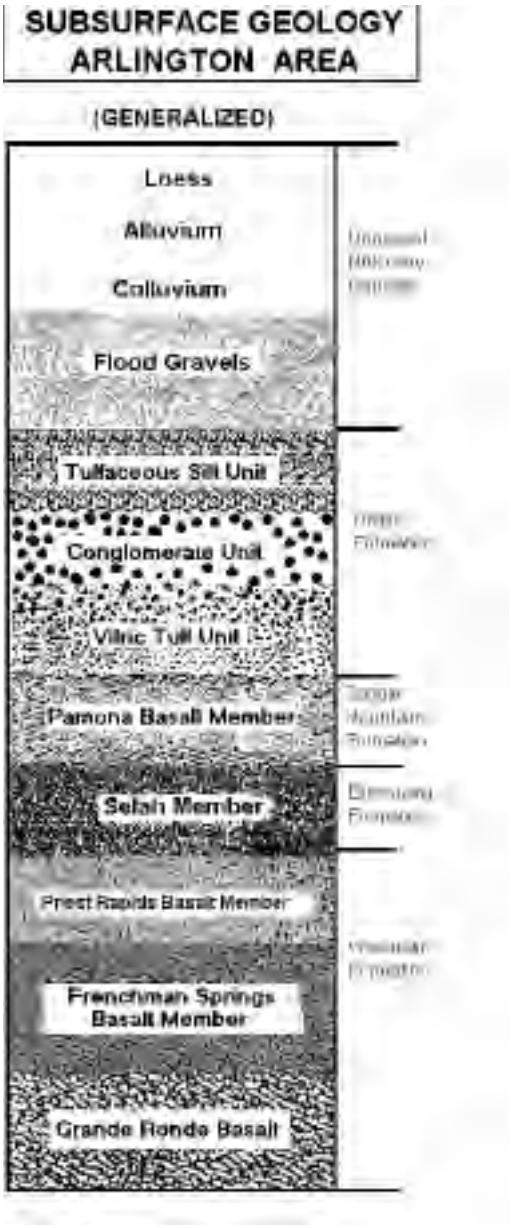
In the event of an emergency which results in fire, explosion, or accidental material release, response activities are initiated following observation of the event. An assessment of the situation is performed immediately by the Emergency Coordinator (EC). Response activities are directed as appropriate and the decision is made whether or not to implement the Contingency Plan.

The Contingency Plan provides an explicit description of the response procedures to be implemented in an emergency situation, which will protect the public, personnel at the facility, and the environment. The Contingency Plan will be implemented as detailed in this plan, as determined by the EC. The facility has various structural and operational measures in place to minimize the possibility of such an emergency situation occurring, as described in this Plan. This plan also provides notification requirements for releases or discharges of hazardous waste that might threaten human health of the environment and for releases of a reportable quantity of a hazardous substance, hazardous material or oil.

The Contingency Plan is available on request.

Site Maps & Aerials





Post Closure Monitoring

Complete Closure/Post Closure information is available at the site. A brief summary of the post closure plan immediately follows.

Time After Closure	Activity	Frequency	Total Number of Inspections
0 to 10 years	Site Inspection	Semiannually	20
	Groundwater Monitoring	Semiannually	20
	Cover Monitoring	Monthly	1,200
10 to 30 years	Site Inspection	Annually	20
	Groundwater Monitoring	Semiannually	40
	Cover Monitoring	Semiannually	1,200

Regulatory Contacts

PERMITS

Description	Permit #	Issued By	Agency Contact	Issued	Expires
Part B Operating Permit	ORD 089452353	ODEQ	**Elizabeth Druback, Mgr:** 541 298 7255 x222; **Dan Duso, Inspector:** 541 278 4618; **Rich Duval, Engineer:** 541 278 4613; **Barb Puchy, Permit Writer:** 503 229 5790	8/21/2006	Submitted for renewal
PCB Disposal Permit	PCB-1	ODEQ	**Elizabeth Druback, Mgr** 541 298 7255 x222; **Dan Duso, Inspector:** 541 278 4618; **Barb Puchy, Permit Writer:** 503 229 5790	8/21/2006	Submitted for renewal
PCB Letter of Approval (Disposal)	N/A	EPA	**Daniel Duncan:** 206 553 6693	3/25/82	N/A
Commercial Storer Application	N/A	EPA	**Daniel Duncan:** 206 553 6693	7/31/90	N/A
Soils Permit	P330-13-00014	U.S. Dept. of Agriculture	**Melissa Morrison:** 503 326 2814	1/10/2013	03/09/2019
Underground Storage Tanks	GBFH GBFJ	ODEQ	**Michael Kortenhof, Manager:** 811 SW Sixth Ave. Portland, OR 97204-1390	12/5/1998	N/A
ACDP – ORU	11-0002-SI-01	ODEQ	**Linda Hayes-Gorman, Eastern Region Air Quality Mgr.:** 541 388 6146	2/7/2014	2/1/2019

[1]Capacity is total capacity of the landfill during its active life and includes mounding of waste above grade.

Records & Reports

WASTE TRACKING

All loads are tracked electronically and by hard copy. All electronic data is backed up daily, with copies of backup tapes retained off-site for data security. Hard copies are retained indefinitely. The facility utilizes fireproof file cabinets for the operating records. Historical data is retained in a separate building (archive building) consisting of fire-retardant materials in high-density, fireproof vertical files.

Incoming shipments are issued a unique "load number" on a computer generated receipt ticket commonly referred to as the "Load Inspection Sheet". This unique number is used for tracking individual loads. The load number is hand written, input via data entry, or otherwise noted on all paperwork and electronic data associated with the load. Exact disposal locations are documented utilizing a 3-dimensional grid system, with grid coordinates recorded in the operating record.

CWMNW utilizes a manifest-tracking program to ensure that all manifests for incoming loads have been returned to the generator within the 30 days specified by regulation. Manifests are returned to the address listed in Section 3 of the manifest.

All TSCA waste receipts are issued a Certificate of Disposal (CD) following placement in a landfill or surface impoundment. CDs for RCRA and non-regulated wastes are available upon request. CDs for waste placed directly in a landfill or surface impoundment are routinely returned with the original manifest. CDs for treated wastes (stabilized, micro or macroencapsulated, bioremediated wastes) are sent to the generator after treatment and final placement in a landfill unit.

Off-site shipment tracking system: Site specific off-site shipment records are maintained which identify the generator, profile number, load number, date the waste was received (if the waste is not generated by CWMNW) and date the waste was shipped.

All documentation related to customer waste treatment disposal is maintained with the appropriate manifest. Records of site generated waste are maintained and reported to DEQ quarterly and annually.

OPERATIONAL RECORDS MAINTENANCE

Records are maintained in the Environmental Department in a fire retardant storage building, in fire-proof cabinets. Records will be held until closure of the facility. CWMNW has permission from the DEQ to destroy hard copies of documents older than 3 years that have been stored on the facility's imaging system, but has not yet disposed of any documents. Records older than 3 years are stored with Iron Mountain.

RETAINMENT OF MANIFEST COPIES

Manifest copies will be retained indefinitely.

MANIFEST SYSTEM EMPLOYED FROM RECEIPT OF LOAD TO FILING

A manifest is delivered to the receiving clerk after a load enters the facility; signed copy is given to transporter before his departure; a signed original and generator's copies are submitted as required; manifest and paperwork associated with the load are imaged onto an optical disk; manifest and paperwork are filed manually by facility receiving ticket number.

WASTE TRACKING SYSTEM

All documentation related to customer waste treatment and disposal is maintained with the appropriate manifest. Records of site generated waste are maintained and reported to DEQ annually.

Chemical Waste Management of the Northwest, Inc. (CWMNW)

17629 Cedar Springs Lane
Arlington, Oregon 97812

541 454 2030

https://www.wmsolutions.com/locations/details/id/247

WASTE MANAGEMENT®

THINK GREEN.®

APPENDIX C

Department of Environmental Quality Guidance

Field Sampling Reference Guide

State of Oregon
Department of
Environmental
Quality

Laboratory and Environmental Assessment Division
3150 NW 229th Avenue,
Suite 150
Hillsboro, OR 97124
Phone: (503) 693-5700
Fax: (503) 693-4999
Contact: Scott Hoatson
www.oregon.gov/DEQ

DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

Last updated: 07/05/2013
By: Scott Hoatson
DEQ86-LAB-0002-QAG
Version 8.0

This guidance document prepared by:

Oregon Department of Environmental Quality
Laboratory and Environmental Assessment Division
3150 NW 229th Ave, Suite 150
Hillsboro, OR 97123

Contact:
Scott Hoatson, Agency Quality Assurance Officer

(503) 693-5786

Table of Contents

List of Appendices

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1.0 INTRODUCTION

The goal of ***DEQ LEAD's Field Sampling Reference Guide*** is to provide agency staff with information they need to make knowledgeable and efficient use of the resources available from the Laboratory and Environmental Assessment Division (LEAD). Available LEAD services include: broad technical capabilities in qualitative and quantitative inorganic, organic, microbiological, microscopic, and biological sampling and analyses of air, water, soil, sediment, and tissue; quality assurance support for: data validation, statistical data analysis, analytical data interpretation and QA Plan review and approval; etc. **Note:** The user is responsible to review their specific sampling and analysis needs with the analytical chemistry managers well in advance of sample collection since methods do change and there may be specific sample matrices or analyses that require special handling not covered in this document.

The Division is divided into seven functional sections: Air Monitoring, Water Monitoring, Watershed Assessment, Inorganic Laboratory, Organic Laboratory, Technical Services, and Administration (including Quality Assurance). Each year the laboratory logs in, analyzes, and reports data on approximately 1400 separate sampling events, each consisting of from 1 to 75 samples. The DEQ Laboratory and Environmental Assessment Division is located at 3150 NW 229th, Suite 150, Hillsboro, OR 97124. It is located in the same building as the Oregon Public Health Laboratory.

***Note**: Hyperlinks are inserted throughout this document to connect to other documents that may be referenced; however, they may not work on all computers. Many of the hyperlinks are to documents located on DEQ's internal network and will only work if the user of this document is connected to DEQ's intranet. There are also many hyperlinks that link to various websites and will function on any computer connected to the internet.*

2.0 INFORMATION CONTACTS

LEAD must be informed as early as possible, prior to sample collection, to insure that both your needs and the LEAD's are met in a timely manner. Contact the Sample Coordinator for information on sample requirements, sampling equipment needs and availability, field preservation (also found in DEQs' Water Monitoring and Assessment Mode of Operations Manual (MOMs)) or filtration requirements, sample transport, and scheduling. Speak to the appropriate Section Manager about analytical capabilities that are available.

For parameters having a short holding time (24 hours, or less refer to APPENDIX I), schedule sample collection thoughtfully. Inform the sample coordinator of your intent to sample, approximate number of samples, what you are looking for, and when samples will be delivered to the laboratory. Analysts need to be made aware of your needs and expectations so schedules and workloads can be adjusted to accommodate the work.

2.1 Sampling and Analytical Information

(503) 693-5700

2.1.1. SAMPLE COORDINATOR

Shannon Swantek (503) 693-5784: Type of container for specific tests, general inorganic and organic sampling inquiries, sampling supplies, sample preservation, equipment, preliminary results.

2.1.2. ORGANIC LABORATORY MANAGER

Brian Boling (503) 693-5745: Organic and Physical Test laboratory capabilities, sample requirements, methods, data interpretation.

2.1.3. ORGANIC – LEAD CHEMIST

Sara Krepps (503) 693-5749: Analytical methods, data interpretation, and test requirements.

2.1.4. INORGANIC LABORATORY MANAGER

TBD (503) 693-5757: Inorganic laboratory capabilities, sample requirements, methods, data interpretation.

2.1.5. METALS – Metals Chemist

Karen Yates (503) 693-5769: Analytical methods, data interpretation, and test requirements.

2.1.6. NONMETALS – LEAD CHEMIST

Linda McRae (503) 693-5765: Analytical methods, data interpretation, and specific test requirements.

2.1.7. AIR MONITORING - MANAGER

TBD (503) 693-5719: Air and meteorological monitoring procedures, capabilities, data interpretation.

2.1.8. WATER QUALITY MONITORING MANAGER

Aaron Borisenko (503) 693-5723: Water sampling/monitoring procedures, sampling capabilities, data interpretation, biomonitoring. Surface, soils, sediments, estuaries, lakes, streams, rivers, etc.

2.1.9. TECHNICAL SERVICES MANAGER

Paul Seidel (503) 693-5781. Analytical data storage and retrieval, and requests that do not fall in one of the other sections, such as sampling plan design, data management, interpretation or support on specialized project needs. For status of analytical work in progress, LEAD can provide users with a desktop application allowing you to view the status of your work directly.

2.1.10. QUALITY ASSURANCE OFFICERS

- **Chris Redman Laboratory and WQ (503) 693 5706**
- **Scott Hoatson Agency and LQ (503) 693-5786**
- **Chris Moore Air Quality Monitoring (503) 693-5722**

General sampling and analytical QA/QC requirements and assistance, QA project plan development and approval, data quality needs, data quality assessment, split sample results, coordination of quality requirements, etc.

2.1.11. LEAD DIVISION ADMINISTRATOR -

Greg Pettit (503) 693-5705: Reassignment of work priorities, budgeting, cost recovery, overall laboratory administration.

3.0 SAFETY CONSIDERATIONS

Any field activity or complaint investigation can lead into the realm of the unknown. Approach any complaint investigation as a potentially hazardous event. Obtain the proper training to recognize, deal with, and protect yourself from hazardous chemicals. If you have any questions about what you might be dealing with, utilize existing resources (e.g. MSDS, literature, and laboratory staff) and contact the appropriate authority (e.g. DEQ Health & Safety Manager, Laboratory Managers, Safety Committee,

etc.). The DEQ Safety Committee continually reviews safety and health needs. The Health & Safety Manager can recommend and supply the most appropriate Personal Protective Equipment.

3.1 DEQ Safety Committee

DEQ has 3 safety committees: The Central committee has members across all of DEQ and work with agency-wide safety concerns. The Vehicle Inspection Program (VIP) and laboratory and Environmental Assessment Division (LEAD) both have safety committees dedicated to safety concerns specific to their operations. Below is the current list of Central committee members. The most up to date list and the list of VIP and LEAD committee members can be found on DEQ's intranet (Q-Net) at: /deq05/intranet/msd/HR/h&s/Committees/CommitteeMembers.htm

3.2 Portable "Sniffers"

Portable photoionization detectors (PID) (MicroTip™ and HNu™) are available to screen for the presence of toxic gases. The MicroTip™ is also capable of collecting an air sample in a bag for subsequent qualitative or quantitative analysis at the laboratory. LQ has an Organic Vapor Analyzer (OVA) and Regions possess Combustible Gas Analyzers (CGA-GasTek™). These are "sniffers," used to screen for hazards prior to site entry. Though they are used for screening, they should be calibrated periodically to ensure they are performing correctly. It should be noted that they cannot always discriminate one pollutant from the next, nor are they very quantitative.

3.3 Chemical Preservatives

In order to stabilize samples for certain tests it is necessary to add a chemical preservative, in addition to immediate cooling, storage, and transport on ice. Failure to add the proper preservative, or amount, could result in samples deteriorating to the point of being useless for analysis.

The DEQ laboratory supplies sample preservative chemicals that can be picked up by agency personnel on request (**Note**: chemicals cannot be shipped). Staff requesting these chemicals are expected to be familiar with and able to implement the necessary safety precautions, or to ask for LEAD assistance.

Liquid preservatives are provided in 50 milliliter ***Teflon*** bottles[1] having integral dropper spouts with tethered closures. Sodium hydroxide is supplied in screw-cap plastic bottles containing less than 25 grams of pure caustic pellets. Each bottle is labeled with the appropriate hazard warnings and sealed in a *Zip-Lock* plastic bag to contain leakage, should the bottle closure fail in transit. Any liquid observed inside the plastic bag should be assumed to be leakage from the bottle, in which case do not use the bottle and the bottle and bag should either be returned to the laboratory or disposed of properly. Solid sodium hydroxide pellets are *deliquescent*, that is, they absorb moisture from the air. This chemical is capable of absorbing enough moisture to put itself into solution. Make sure that lids are screwed down tightly!

3.3.1. Preservatives commonly provided

- **Concentrated** Sulfuric Acid, H_2SO_4, 95+ %
- **Concentrated** Nitric Acid, HNO_3, 70+ % (Trace Metal grade or better)
- **Concentrated** Phosphoric Acid, H_3PO_4, 85%
- **Concentrated** Hydrochloric Acid, HCL, 37%
- **Solid** Sodium Hydroxide, NaOH, 100%

Note: At the concentration supplied for sample preservation these chemicals are ***highly corrosive*** and ***capable of causing severe physical damage to skin, eyes, and clothing*** unless the proper precautions are observed. Treated with appropriate respect, and following a few simple rules, these chemicals should not cause injury.

[1] When these Teflon bottles become empty **DON'T** throw them away! They cost nearly $20 each. Return them to the Laboratory so they can be refilled.

a) Transport preservative containers in a restrained, upright position.

b) Wear appropriate protective eyewear. (Safety glasses or goggles)

c) Wear chemically resistant synthetic gloves (Nitrile or Silver Shield). Only use powder-free gloves as the powder is a common source of contamination.

d) Be prepared to deal with accidents

3.3.2. Safety Data Sheets (SDS)

One source of information on hazards associated with each of these chemicals, and the precautions that should be taken during use, are the **S**afety **D**ata **S**heets (SDS). Previously, these were known as Material **Safety Data Sheets (MSDS). In 2013, OSHA has implemented new regulation that change the name, content and format for the data sheets. MSDS/SDS's for each of the above chemicals may be obtained from the laboratory.** Location Specific MSDs can be found on the DEQ internal website (Q-Net) at http://deq05/intranet/msd/HR/h&s/HazardCommunication/SiteSpecificHazComResources.htm

When reading the MSDS or SDS keep in mind that you are dealing with less than 50 milliliters of liquid, and less than 25 grams of the solid. Many of the precautions cited (*e.g.* respiratory protection, self-contained breathing apparatus, etc) are intended for emergency response personnel dealing with bulk or industrial quantities of the material.

The primary hazards posed by laboratory chemicals in small quantities are:

Chemical burns to the skin and eyes.

Chemical damage to clothing and footwear.

The LEAD will provide, on request, protective eye wear, nitrile gloves, and "pH 6.9 buffer" which is useful to neutralize skin or clothing exposed to acid or caustic. We recommend that staff engaged in sample collection carry a portable eye wash station and, at minimum, a one-gallon jug of water in their vehicle for washing in emergencies.

Below is a chemical compatibility chart with recommended gloves and eye protection.

Table 1 Chemical compatibility of gloves

Manufacturer /Chemical	Glove to be Used (Material)	Eye Protection
Mallickrodt Baker Inc./ Sulfuric Acid (50-100%)	**Silver Shield** – Excellent rating for total hand immersion -OR- **Nitrile** – Fair protection rating for accidental splash or intermittent contact	Full coverage chemical goggles
Hach/ Dissolved Oxygen 3 Powder Pillows	**latex** (recommended by chemical manufacturer) **or Nitrile**	Safety glasses with top and side shields
Hach/ Starch Indicator Solution	**latex** (recommended by chemical manufacturer) **or Nitrile**	Safety glasses with top and side shields
Hach/ Sodium Thiosulfate Standard Solution	**latex** (recommended by chemical manufacturer) **or Nitrile**	Safety glasses with top and side shields
Fisher Scientific/.02 N Sulfuric Acid Solution	**Nitrile** – Excellent protection rating for total hand immersion	Full coverage safety goggles
Mallickrodt Baker Inc. / Nitric Acid (50-70%)	**Silver Shield** (**or Nitrile** if contact will be limited to small volumes and short duration)	Full coverage safety goggles
VWR Intl. EMD Chemicals/ PH 4 Buffer Solution Red	**Silver Shield** – Excellent rating for total hand immersion -OR- **Nitrile** – Fair protection rating for accidental splash or intermittent contact	Safety glasses with top and side shields

4.0 INVESTIGATIONS

Look for clues that suggest abnormal conditions, *e.g.*, stressed vegetation, dead or dying insects or animals, soil staining, fumes, crystals, oil, puddles of liquid, abandoned containers, unusual colors, odors, phase separations, etc.

Whether or not to collect a sample is your decision. You must make the judgment whether or not your observations warrant chemical characterization of the material in question. **If a sample is collected, it must represent the condition of the site as much as possible.**

If a sample is collected, fill the sample bottle. The laboratory needs a reasonable amount of sample to conduct tests. With the exception of samples for volatile organic analyses, for safety considerations, fill the bottle to the neck not to the cap (except for *volatiles which must be filled to the cap with no air space*).

Field observations should be documented, ***using waterproof ink in a permanently bound notebook***. Photographs should be taken, if possible. If you believe you have discovered a violation, it must be appropriately documented according to the “elements” of the violation, and according to your program policies. Violations must be appropriately documented for the file whether or not you are issuing a

Warning Letter or a Pre-Enforcement Notice. If you have any questions about the elements of the particular violation or need assistance in determining what evidence would support an enforcement action, contact your manager or the Environmental Law Specialist assigned to your program, or call Les Carlough in the Office of Compliance and Enforcement at 503-229-5422 for assistance. If you believe the violation may have been done deliberately, deceitfully, or deliberately, call the DEQ Environmental Crimes Coordinator (currently Susan Elworth at 503-229-5152).

Note: Appearance, odor, or nearby sources may suggest what to test for.

CAUTION:

Be very cautious of unfamiliar odors

AVOID opening unlabeled containers to make a preliminary assessment of sample.

(**Be especially wary** of containers that exhibit crystals around the cap; they could be extremely explosive perchlorates or organic peroxides. When exposed to light or air, ethers can form peroxides that can easily detonate!). If crystals are present and you don't know what they might be, evacuate the area and contact the local fire department…..

4.1 ORGANICS

Organic substances may appear as tar, wax, oil, crystalline or amorphous solids, colored or colorless liquids. Samples may be odorless or their smell may be sweet, sour, biting, or petroleum-like. Attempt to characterize the sample appearance and odor, and describe them on the Analysis Request Form. The more information you provide the better are the laboratory's chances of identifying an "unknown" contaminant, and successfully quantifying it.

Collect samples for organic analysis in DEQ laboratory-supplied containers **(**see **)** which have been specially cleaned to eliminate interference. Because organic analytical methods are expensive it is imperative that samples be collected in acceptable containers to avoid having the analysis invalidated as a result of container contamination. If you are caught in a bind without the correct containers, call the laboratory so we can work out an acceptable alternative.

In general, plastic containers should NOT be used to collect samples for organic analysis.

4.1.1. VOLATILE ORGANIC COMPOUNDS (VOCs)

VOCs are a large group of organic solvents, cleaners and degreasers that evaporate at ambient temperature. Although they can volatilize quickly, trace amounts tend to persist in soils and water. This persistency, coupled with their mobility, makes groundwater contamination a primary concern following a spill or release of VOCs into the soil. When requesting VOC analysis, it is important to convey the type of situation you are investigating (dry cleaner, UST, spill, etc.) and whether or not you are interested in specific chemicals or materials such as gasoline, kerosene, trichlororethylene or benzene. This information will help the laboratory choose an analytical method appropriate for your situation. The default VOC method is Method 8260, a GC/MS procedure that analyzes for roughly 65 volatile organics plus Tentatively Identified Compounds (TICs). Unfortunately not all VOCs can be analyzed using this method; hence our need to know as much as possible about the possible contaminant source.

4.1.2. SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs)

Semi-Volatile organic compounds (SVOC) (comprise a large group of chemicals that include several categories: phenols, chlorophenols, phthalates, pentachlorophenol, polynuclear aromatic hydrocarbons (PAH) , organophosphorus pesticides, etc. The phrase SVOC is also generically used to refer to GCMS methods for the analysis of Base Neutral and Acid (BNA) compounds (EPA 8270C, EPA 625, EPA525.2) approximately 85 specific analytes, and also provides provisional identification of additional analytes as Tentatively Identified Compounds (TIC's). As with VOCs the list of analytes is large, but not universal. If

the question arises whether or not a particular chemical can be tested for by this method, call the Organic Section at the laboratory.

4.1.3. CYANIDES

There are three basic forms of Cyanide analyses Total, Available, and Free Cyanide. Total cyanide analysis captures all forms of cyanide, where the available cyanide analysis captures only the easily dissociated forms and free cyanide is only the CN^- and HCN forms of cyanide. In many instances "free cyanide" is the regulated analyte, where this is the case, in addition to the free cyanide test methods DEQ also recognizes the available cyanide test methods for compliance purposes. Total Cyanide may also be use to demonstrate compliance if the results are below the needed action level.

Comment on "Free Cyanide": Technically, "Free" Cyanide is only the CN^- and HCN forms of Cyanide and there are available approved methods in 40 CFR part 136. However the term "Free" Cyanide" has been used to imply any of the following variations: Cyanide Amenable to Chlorination, Weak Acid Dissociable Cyanide, Reactive Cyanide as well as Free Cyanide. Amenable and weak acid dissociable cyanide are commonly used methods for the analysis of "free" cyanide as they are readily available and are less costly than the true free cyanide methods . **To avoid confusion, be specific,** ask for the Cyanide form you need either amenable cyanide or weak acid dissociable cyanide, or free cyanide.

It is usually less expensive to request a total cyanide method to demonstrate compliance to the Amenable, or WAD, or Free CN action levels (with Free Cyanide the most expensive). As long as the total cyanide results are below the action level, compliance has been demonstrated for the other forms. The analysis of the other forms is only necessary if the total cyanide is high.

Note: *the "Reactive" Cyanide method has been removed by EPA and is not available at DEQ*. Please request **Total Cyanide or *Cyanide Amenable to Chlorination*** when seeking to determine characteristic waste criteria under RCRA.

4.1.4. DIOXINS and FURANS

The analysis of these analytes requires the use of high-resolution gas chromatography and high resolution mass spectrometry (HRGC/HRMS) on purified sample extracts. The procedure provides the detection and quantitative measurement of polychlorinated dibenzo-p-dioxins (tetra- through octachlorinated homologues; PCDDs), and polychlorinated dibenzofurans (tetra- through octachlorinated homologues; PCDFs) in a variety of environmental matrices and at part-per-trillion (ppt) to part-per-quadrillion (ppq) concentrations

Safety Note:
Because of the extreme toxicity of these compounds, the analyst and sampler must take necessary precautions to prevent the exposure of laboratory and field personnel or others to materials known or believed to contain PCDDs or PCDFs

4.1.5. POLYCHLORINATED BIPHENYLS (PCBs) & CHLORINATED PESTICIDES

Both extracted by the same method, therefore a single container may be used to sample for these two analyses. Other organic tests require a separate container for each method of extraction. Analyses can be performed by Gas Chromatography (GC) or by GC Mass Spectrometry (GCMS)

4.1.6. EMERGING CONCERN CHEMICALS

There are several groups of emerging compounds (Semi-volatile organics) that have recently become of interest to the EPA and DEQ as they have been found in wastewater and surface waters. The DEQ laboratory has the capability to analyze for the following emerging chemical classes. Contact the Organic Manager at the laboratory for specific analyte lists.

- Flame Retardants (polybrominated diphenyl ethers, PBDEs)
- Pharmaceuticals, Steroids and Personal Care Products.
- PCB Congeners

- Emerging Pesticides (not on standard Organochlorine pesticide list)

4.1.7. PETROLEUM IN SOILS

Methods for analysis are designated in Oregon's Soil Matrix Rules for Petroleum Underground Storage Tank Cleanups (OAR 340-122-350). Petroleum products in soil are first identified and then quantified by the Total Petroleum Hydrocarbon (TPH) methods:

- NWTPH-HCIDis a qualitative screen to determine which petroleum products (if any) are present, and what subsequent quantitative methods may be required.
- NWTPH-Gx is the quantitative method for gasoline.
- NWTPH-Dx is the quantitative method for diesel and other heavy oils.

4.1.8. HEXANE EXTRACTABLE MATERIAL (HEM)

The HEM procedure has replaced the classical “Oil & Grease” method which measured the polar (animal fats, vegetable oils, etc.) and nonpolar (petroleum fuels, mineral oils, etc.) using a Freon™ extraction of the sample. It was sometimes used in conjunction with EPA's Total Recoverable Petroleum Hydrocarbon method to distinguish between polar and nonpolar components. These Freon based methods have been replaced by the more eco-friendly hexane based extraction method. The DEQ laboratory is using EPA Method 1664, n-Hexane Extractable Material (HEM), which can be used with silica gel cleanup to determine TPH or NWTPH Methods as appropriate.

4.1.9. OTHER ORGANICS

Other common analyses used to identify or characterize unknown organic contaminants include MBAS, Glycol/Fluorescein, Lignin-Tannin, Total Organic Carbon (TOC), Chemical Oxygen Demand (COD), Total Organic Halogens (TOX), and Formaldehyde.

Methylene Blue Active Substances (MBAS)

A nonspecific test for Methylene Blue Active Substances. Anionic surfactants, which may include LAS (Linear Alkylbenzene Sulfonates), other sulfonates and sulfate esters (colorimetric procedure). MBAS can detect the presence of detergents. This test is not performed by the DEQ laboratory.

Phenolics

A nonspecific test for phenolic-like compounds (colorimetric procedure in which sensitivity is inversely related to the number of substitutions on the aromatic ring). If specific phenols are required, see semi-volatile organic extractables. **This request will not measure pentachlorophenol**.

Fluorescein/Glycol (Antifreeze)

Fluorescein is the ingredient responsible for antifreeze's vibrant green color, and is also a dye used to monitor water flow. Unlike glycol, fluorescein is not considered harmful to the environment. Fluorescein is analyzed by HPLC with a UV/Vis detector.

Lignin Tannin

A non specific test for hydroxylated aromatic compounds found in lignin and tannin compounds (colorimetric procedure) characteristic of tree bark leaching.

Chemical Oxygen Demand (COD)

A nonspecific test to measure oxygen depletion potential of a water sample assuming all materials are chemically oxidized to their highest oxidation state: reported as mg oxygen per liter.

Total Organic Carbon (TOC)

A nonspecific test that measures organic carbon content of a water sample as milligrams of Carbon per liter.

Total Organic Halogens (TOX)

Measurement used to estimate the total quantity of dissolved halogenated (containing fluorine, chlorine, bromine, iodine) organic material in a water sample which is indicative of contamination by synthetic chemicals. This test is not performed by the DEQ laboratory.

4.2 INORGANICS

Inorganic contaminants tend to be crystalline, dissolved salts, or suspended solids in water. They include all combinations of elements, with the exception of compounds containing carbon, which are defined as Organics. Inorganic acids and some caustics have a sharp, irritating odor. Collect inorganic samples in laboratory supplied plastic containers described in .

Characterization of unknown inorganic contaminants includes physical measurements (Total Suspended Solids, Total Solids, Turbidity, Conductivity, and pH), metals, and nutrient analysis. Turbidity, pH and orthophosphate samples have very short holding times, thus these analyses must be started immediately upon sample receipt.

4.2.1. METALS

The choice of metals analyses is dependent upon the purpose of the sampling event and the data quality objectives (DQOs). **Dissolved metals** are water soluble, defined as passing through a 0.45 micron filter. **Total recoverable metals** include dissolved metals plus those metals that are more strongly attached to particulate matter and thus less available to the environment. Total Recoverable metals require an acid digestion to release the metals for analysis.

Dissolved metals samples must be filtered in the field with a 0.45 micron membrane filter, immediately after collection and before adding acid preservative **(**APPENDIX C**).** Total Recoverable metals may be either preserved in the field or delivered to the laboratory on ice and the laboratory can preserve the samples. If a request for analysis does not specify Dissolved or Total; Total Recoverable metals will be the test assigned.

Coordinate with laboratory staff prior to sample collection to select the appropriate analytical method for the project. There are three choices: Inductively Coupled Plasma (ICP), Inductively coupled Mass Spectrometry (ICPMS) and occasionally Graphite Furnace Atomic Absorption (GFAA). Though the ICP is able to obtain relatively low detection limits for a variety of metals, ICPMS is able to obtain even lower detection limits for trace metals and has almost entirely replaced the need for GFAA analyses. Reserve requests for GFAA to those situations where the method is specially required by the program such as a few drinking water metals as it is slower and more costly on a per/metal basis.

The analysis for Mercury uses a different digestion and analytical procedure than the other metals and a separate sample must be collected. Requests for mercury analysis must be specifically identified on the COC form, and separate samples collected, or it will not be performed.

4.2.2. NUTRIENTS

Nutrients include Total Organic Carbon (TOC), Chemical Oxygen Demand (COD), Nitrate-Nitrite(NO3+NO2), Total Kjeldahl Nitrogen (TKN), Ammonia (NH3), Dissolved (OPO4) and Total (TPO4) Phosphate. Depending on the requirements, Total Nitrogen (TN) is also sometimes included with the Nutrients). These analytes can occur naturally at low levels in the aquatic environments. Elevated values are frequently indicative and a source of problems. Discharges from industry, municipal wastewater treatment plants, municipal storm water and agricultural operations can increase certain nutrient levels. Nitrogen nutrients are reported as mg/L of equivalent nitrogen, and phosphate nutrients are reported as mg/L equivalent phosphorous.

There are a wide variety of chemical forms that phosphate can exist in the environment, and be analyzed[2]. Forms include Total, Total Reactive, Total Acid Hydrolyzable, Total Organic, Dissolved Reactive, Total Dissolved, Dissolved Acid Hydrolyzable, and Dissolved Organic. Notify the laboratory well in advance if any form other than Total or Dissolved Reactive phosphates are of interest. DEQ laboratory

[2] Table 4500-P1, Standard Methods for the Analysis of Water and Wastewater, APHA-AWWA, 21st Edition , 2005

uses the Molybdate-Ascorbic acid for Dissolved Reactive Phosphate (OPO4) on filtered samples, and Molybdate-Ascorbic acid proceeded by persulfate-autoclave digestion for Total Phosphate (TPO4). Methods used by other labs may vary, so data comparison could be difficult.

Total Organic Carbon (TOC)

A nonspecific test measuring organic carbon content of a water sample. Reported as milligrams of carbon per liter.

Chemical Oxygen Demand (COD)

The measure of the oxygen equivalent of organic matter contained in a sample that is subject to oxidation by a strong chemical oxidant.

4.2.3. BIOCHEMICAL OXYGEN DEMAND (BOD)

Biochemical Oxygen Demand (BOD) is a nonspecific test used to evaluate consumption of Dissolved Oxygen (DO) by biochemical processes when incubated at 20^{o}C over a period of 5-days. It is a bioassay procedure that is normally applied to water samples, although it can be applied to sediment as well. BODs conventionally are done over a 5-day period, however longer time periods are possible (e.g. 14-, 28-day). Special requests are necessary for any but the 5-day test.

BODs can evaluate the oxygen depletion caused by carbonaceous material and nitrogen species (BOD), such as TKN and ammonia, carbonaceous material alone (CBOD), or nitrogen species alone (NBOD). Special requests are necessary for any test other than BOD or CBOD.

Collect liquid samples in specially cleaned DEQ containers (refer to Table I). The laboratory must be notified prior to sampling. BOD samples for surface and receiving waters low in BOD are collected in special glass BOD bottles. It is desirable to determine Field DO on these samples, prior to sending to laboratory (see procedure in Appendix B). When Field DO measurements aren't made, DO is less than 5 mg/L, or DO exceeds 120% Saturation, specify the BODS2 test on the COC form to inform the laboratory analyst of the need to perform the initial DO or %Sat test.

The regulatory holding time for BOD is 48 hours between the time of collection and the start of the analysis. Make every effort to deliver the samples to the laboratory within 24 to give them time to start the analysis BOD samples will be accepted between 08:00 AM Tuesday and 12:00 AM Friday. Accepting BOD samples at any other time will require overtime work, and must be pre-approved by the Inorganic Section Manager. During the period following collection, and including transport to the lab, biological samples must be kept cool on ice (4°C).

4.3 MICROBIOLOGICALS

Bacteria (Coliform, E. Coli, Enterococcus etc.). samples are analyzed by the DHS Public Health laboratories'' microbiological laboratory Collect liquid samples in sterile bottles (refer to Table I). DEQ laboratory must be notified prior to sampling.

Bacterial samples will be accepted Monday through Thursday before 4pm. Bacterial samples may be held for a maximum of 24 hours (time elapsed from collection to analysis) as long as they are kept on ice (and not frozen). Once samples exceed the 24hr holding time the sample results are then qualified. Since PHL performs the micro analyses for DEQ, if other sampling days are needed, contact the DEQ laboratory for scheduling.

Note: The holding time for regulatory purposes varies based on the regulations. Example: the holding time on bacterial samples is 8 hours (NPDES) or (30 hours (SDWA) or 8 Hours (surface water treatment rule)! ***If a holding time of less than 24 hours is required for a project, it must be noted on the COC.***

4.4 TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)

TCLP extraction is used in RCRA to evaluate hazardous waste characteristics. It is used to assess the leachability of metals and certain organics under precisely controlled conditions. TCLP procedures are also used in DEQ's Soil Cleanup Rules. ***The Hazardous Waste Characteristic of TCLP is a method***

defined regulation, meaning that the regulation is dependent on the TCLP procedure being followed prescriptively.

When asking for TCLP on samples, be aware of the method's limitations. TCLP extraction is an involved and relatively expensive method to run, depending on the nature of the samples.

Samples having multiple phases (water-oil, water-solid, oil-solid, water-oil-solid) are difficult to deal with under this protocol. Sufficient sample must be collected to provide an adequate quantity of each phase for both inorganic and organic TCLP extractions: approximately 500 grams of solid, or at least 1 liter of liquid. More sample material is required as the ratio of aqueous to solid (other) phase increases. If a sample contains less than 150 grams solid (other) phase in the conventional sample size, a larger quantity of sample is necessary just to run the TCLP inorganic tests. If TCLP organics, duplicate, matrix spike, or matrix spike duplicate analyses are requested considerably more sample is needed. According the TCLP protocols the laboratory needs to have 100 grams of solid to perform the extraction. As a guideline, see the following table.

% Solid (other)	Desirable Sample
2%	7.5 liters
5%	3.0 liters
10%	1.5 liters
15%	1.0 liters (≈ quart)
20%	0.5 liters (≈ pint)

In general, a 1 gallon sample (≈ 3.8 liters) is a practical limit.

When requesting TCLP on a sample it is more efficient for the Organic section to analyze for Totals (e.g. Total VOCs) first, and then to perform TCLP on any sample where a Total is observed that exceeds the TCLP Regulatory Limit. It serves no purpose to do a TCLP extraction, followed by analysis of the TCLP extract, if there isn't enough regulated substance in the sample in the first place to exceed the TCLP standard. On the other hand, it is more efficient for the Inorganic section to perform the TCLP extraction right away. Submitting samples for inorganic Total Metals, with the instruction that samples having high levels of regulated metals should be subjected to TCLP, will take considerably longer than simply requesting TCLP.

4.5 FIELD ANALYSES FOR WATER SAMPLES

4.5.1. DISSOLVED OXYGEN (DO)

A significant indicator of stream health, low DO is frequently the primary cause for fish kills. Refer to APPENDIX B SAMPLING PROCEDURE FOR DISSOLVED OXYGEN for field analytical procedure. This analysis should be performed in the field because DO samples are not stable. Dissolved oxygen can change rapidly after sample collection, depending on temperature, barometric pressure, and other dissolved gases.

4.5.2. Alkalinity, Conductance, pH, etc

Other field analyses include alkalinity, conductance, pH, temperature, turbidity. Obviously sample temperature will change, but pH may also change over short periods of time. It is recommended that pH be measured in the field whenever possible. Meters must be calibrated and the calibration verified prior to use.

5.0 COMPLIANCE

5.1 NPDES[3], WPCF[4], Solid Waste Landfills,

Refer to DEQ or EPA inspection procedures or guidelines, and review Permit requirements. In addition, a Sampling and Analysis Plan (SAP) should be created for the sampling event using the template DEQ08-LAB-0009-TMPL as a guide. If the source is required to report self-monitoring test data to the agency, and you intend to investigate the source's analytical capability, collect split samples. Samples will be analyzed by both the source laboratory and DEQ laboratory, resulting in an inter-laboratory comparison. Leave a split-sample analysis form (Form I: DEQ10-LAB-0002-FORM or Form II: DEQ10-LAB-0003-FORM)[5] with the source. Request that they fill in their test results and return it to the DEQ QA chemist at the laboratory as soon as possible. It is not necessary to limit requested analyses to the parameters in permits. The DEQ laboratory will perform any reasonable analyses and prepare a split comparison report.

The laboratory would appreciate advance notice of split sampling. Inter-laboratory splits are a useful QC measurement for the DEQ lab, as well as the source's laboratory. The field inspector is responsible for insuring that the source reports their results to the laboratory QA chemist as quickly as possible, particularly when a comparison is wanted. LEAD would appreciate receiving a monthly forecast of compliance split sampling schedules.

5.1.1. SPLIT SAMPLING OF STPs FOR COMPLIANCE INSPECTIONS

Split samples are a special type of sample where two laboratories independently analyze the same sample. It is often done when sewage treatment plants maintain their own laboratories, or where landfill operators use contractor labs for leachate analysis. Split samples for sewage treatment plants (STPs) should be collected in a single large container, homogenized, and then poured into separate, clean sample bottles: one portion for the non-DEQ laboratory and one portion for the DEQ laboratory. Collecting one grab sample for the non-DEQ laboratory and a second, separate grab sample for the DEQ laboratory is **not** the same thing. To limit variance to analytical technique alone, it is imperative that both of the laboratories analyze samples that are as near identical as possible.

Common sewage treatment plant (STP) Split Sample parameters are Fecal Coliform (FC), E.Coli, Total Suspended Solids (TSS), pH, and Biological Oxygen Demand (BOD). Depending on the source's Permit, a sample for CBOD may be split also. The DEQ laboratory measures pH on all BOD samples, even though not all STP's follow this procedure. Because of limited holding time requirements these samples must be received at the laboratory as follows.

BACTERIAL samples (*fecal coliform, E.Coli*) must be received no later than 4pm on Thursday. For permit compliance samples and some LEGAL samples, the maximum holding time of 8 hours **must** be adhered to, whereas routine monitoring samples can be held up to a maximum of 24 hours. Bacterial samples are routinely analyzed using the Colilert® Quantitray or Membrane Filtration (MF) methods. When analysis for a "non-routine" organism (e.g. fecal strep) is required, notify the laboratory in advance so that special media can be prepared[6] for the test. ***If a holding time of less than 24 hours is required for a project, it must be noted on the COC.***

BOD samples must be received no later than NOON on Friday. If it is necessary to sample between noon Friday and noon Monday, the laboratory will have to schedule someone to come in the following weekend to complete the test. Special authorization is required, prior to collection and shipment of

[3] National Pollution Discharge Elimination System

[4] Water Pollution Control Facility

[5] Blank forms are available on Q-Net or through the QA section, DEQ LEAD.

[6] Microbiological analysis is performed by the Oregon Department of Human Services, Public Health Laboratory. Without advanced notice, when special media is required, the test may not be performed.

samples, which will be received by the laboratory after 12:00 on a Friday. Unauthorized samples that do not fit the routine time frame may not get analyzed.

Normal procedure is to collect a 24-Hr composite sample of the influent and a 24-Hr composite of the effluent for BOD_5, TSS, and pH. A grab sample of the effluent is taken, ***after the Chlorine Contact Chamber***, for Fecal Coliform (FC) and E.Coli. The Composite influent and effluent samples should be collected in 1000 mL polys, and the FC/EC grab sample should be collected in a sterile wide-mouth 125 mL sterile bottle containing sodium thiosulfate to destroy excess chlorine. Composite effluent samples cannot be used for FC/EC samples because of their lengthy chlorine exposure (up to 24 hours).

The STP staff should take their own samples from the *same* composite and grab sample as the DEQ inspector. The DEQ laboratory and the STP laboratory should begin testing at approximately the same time. Agree upon a time for test set-up, and make a note of it on the field sheet. Usually the inspector will arrange for test set-up at ten o'clock A.M. on the day following the sampling.

Write "Split" on the top of Chain of Custody form,

along with agreed upon set-up time.

Leave a copy of the "Split Sample Results Report" form (Form I or II) with the STP staff , with instructions to mail the completed form to DEQ laboratory QA Section as soon as they have completed their analyses.

Time of sampling must be noted on the Chain of Custody form for all samples, along with residual chlorine measurement.

5.2 SAMPLING AND ANALYSIS PLAN

A Sampling and Analysis Plan (SAP) is a combination laboratory analysis and field sampling plan. Basically, it should describe what you are going to do, who will do it, how many samples will be collected, where and when you'll do it, and how it will be done. A SAP should be developed before any samples are submitted to the lab, with the exception of complaint and routine compliance inspections. SAPs for projects on which DEQ laboratory performs analytical work must be approved and signed by a QA Officer. Contact the QA Section for assistance.

Note: To plan workloads the laboratory Sample Coordinator must receive a Sampling and Analysis Plan when:

- ***Sampler is requesting a complicated suite of tests on more than five samples,***
- ***Sampling event involves collection and analysis of more than ten samples, or***
- ***Multiple sampling events planned over a period of time (e.g. quarterly, monthly, etc.).***

At a minimum, the laboratory should be provided with a list of how many sampling sites there will be, what type of sample will be collected (e.g. soil, groundwater, sediment, etc), analyses that will be requested (e.g. VOCs, NO^-_3, TKN, TCLP, Total or Dissolved metals, TPH-?, BOD_5, etc.), when samples will be collected and when delivered to lab, Quality Assurance samples that are necessary, and when you need to have the data (e.g. ASAP, 2 weeks, 4 weeks, 6 weeks, etc.). The name of the Project Manager, phone number, and a Q-Time Fund Code assigned by the Business Office for the laboratory to charge work on the project must be included.

This can be accomplished in the form of either a single narrative page or a simple table, as in the example that follows.

Project:	FRED'S Koi Emporium
Project Manager:	Shirley U.Geste [503-693-57XX]
QTime-Fund Code:	42999
Sampling Date(s):	May 15-25, 2013

Delivery to laboratory: May 15, 2013 late in afternoon

Desired Turnaround: 4 weeks

Matrix	# Sample sites	Analytes	+ QA
Surface Water	3	BOD_5, NH_3, VOC, Pesticides, pH, Alkalinity, Conductivity	1 Duplicate 1 matrix spike transport blank
Sediment	4	Pesticides, VOC, TKN Total Arsenic & Lead	1 duplicate transport blank
Groundwater	5	VOC, pH, Dissolved Arsenic & Lead, pesticides	1 duplicate 1 matrix spike transport blank
Soil	3	Pesticides, TCLP and Total metals (As & Pb)	1 duplicate + 1 matrix spike for each TCLP

When the laboratory receives this information they can see what their schedule is like, and plan to accommodate your samples. The SAP also permits the Sample Coordinator to prepare the appropriate number and type of sampling containers you will need ahead of time. However, be forewarned: there are a limited number of instruments and analysts available to do certain types of testing (e.g. GC/MS-VOC, SVOC-Vols; ICP-metals; etc).

It is prudent to allow for some flexibility in the scheduling of your sampling event and specific turnaround times. If someone else has already booked up that time period the laboratory may ask that you reschedule your sampling event, or extend the turnaround time. There is also the possibility, however remote, that an unscheduled *Legal* case (case with known or high potential for litigation) might preempt your time slot. Depending on the situation, Legal cases may receive priority over ***all*** other pending work. In any event the lab will do their best to get the work done if it's too late to reschedule, and you will be kept informed of the progress of your project's analyses.

Request rapid turnaround time (1-2 weeks, or less) only when it is absolutely necessary. The laboratory recognizes that this may be appropriate on occasion, but it should not be employed routinely or as a matter of convenience.

6.0 ADVANCED NOTICE OF PLANNED SAMPLING ACTIVITY

Coordination with the laboratory is important to ensure that samples are analyzed properly and timely. The more notice the laboratory has, the better. Advanced notification of a sampling event can be sent to the sample coordinator by fax or email.

DEQ LEAD FAX number: (503) 693-4999

Once notification is received it will be filed in a central location, which everyone involved will check daily. Thus, if the regular liaison person is not available, the information will still reach those involved. This will provide the laboratory with the workload planning information it needs for the work requested. Once this information has been sent, if there are any changes, please send an update.

7.0 QUALITY ASSURANCE

The term quality assurance describes the system of activities intended to provide evidence to the producer or user of a product or service that it meets predefined standards of quality with a stated level of confidence[7]. It consists of related but independent activities: ***quality control*** and ***quality assessment***. Quality control describes those activities and procedures used internally (within the laboratory and in the field) to produce consistent and reliable data. Quality assessment deals with activities to independently evaluate data quality, after it's produced. Data quality is assessed according to the needs of the end data user. The quality needs of the end user should be clearly spelled out in a quality assurance project plan or a sampling and analysis plan.

Scientifically valid test data does not just happen. It results from hard work and considerable cost, in both time and money. Poor quality data can be particularly costly if bad decisions are made based on erroneous data. **It is the DEQ Laboratory's Policy to give higher priority to data quality[8] over data quantity**. Analytical data can only be as good as the samples collected. Thus, samples that are not representative of the matrix being assessed, those collected in insufficient amounts for the analytical method used, or samples contaminated by sampling or handling procedures cannot be made representative, increased in quantity, or uncontaminated by laboratory efforts. The laboratory must ***assume*** that everything in the sample container constitutes the sample, that the sample was collected and preserved properly, and that it does not contain extraneous contamination.

Due to the sophistication of today's measurement techniques, and their cost, considerable planning is necessary to insure that test data are meaningful. The goal is to collect an appropriate number of high quality samples which represent the environmental entity being tested. Reduced numbers of samples require even better planning to insure that gaps in the data set, caused by omissions or post-analysis data rejection, don't weaken conclusions or preclude decision-making.

7.1 DEQ Laboratory Sample Acceptance Criteria

7.1.1. Before Sampling

To ensure successful submission of environmental samples for laboratory analysis, the sample collectors must conform to the following sample collection protocols.

The sample collector/project manager must submit a *Quality Assurance Project Plan* (QAPP) or *Sampling and Analysis Plan* (SAP) to a QA Officer at least two weeks prior to sampling. SAP templates can be found on Q-Net. The QAPP and SAP are documents detailing the background, scope and goals of the project, the appropriate contact people, the sampling sites, the parameters to be analyzed and their required quantitation limits, types and quantities of QC needed, and other particulars specific to the project. This also provides the laboratory notice so they can ensure proper resources are available to perform the requested analyses within the analytical holding times. **Note:** There may be special circumstances when the QAPP or SAP cannot be completed before the sampling event takes place. In these cases the relevant QAO and/or LEAD section manager should still be notified to discuss some of the details to help ensure project is successful. **Note:** The QAPP or SAP must still be finalized and approved as soon as possible following the sampling event.

7.1.2. Sample Acceptance Criteria

All incoming work will be evaluated against the criteria listed below. Where applicable, data from any samples that do not meet the criteria listed below will be noted on the laboratory report defining the nature and substance of the variation and noting any adjustments to the data quality level (DQL) resulting from the variance. In addition, the sample collector/project manager will be notified after the receipt of the samples.

1. ***Samples must be submitted with the proper paperwork (e.g. Chain of Custody (COC)*** DEQ06-LAB-0054-FORM ***including***:

[7] Taylor, J.K., *Quality Assurance of Chemical Measurements*, (Chelsea, MI: Lewis Publishers, 1987).
[8] Quality refers to generating data of known and documented quality that meets the needs of the end users.

- Name and address of the project site,
- Project Q-time number,
- Name of contact person for the project,
- Name of sample collector,
- Latitude and longitude coordinates (in decimal degrees) or corresponding station ID for each sampling location. If station ID is not available, a new one should be created or if sample is not part of the regular monitoring network and will not be repeatedly sampled (e.g. legal, hazardous waste, asbestos), then a station id is not necessary, but Latitude and Longitude are requested
- Brief description of each sampling location,
- Sample matrices and QC type (e.g. Matrix: Soil, water, tissue, etc. / QC Type: Equip Blank, (EB) field duplicate (FD), etc.
- Date and time of sampling,
- Container ID numbers used at each location, and
- Requested analyses for each sample.
- The date and time that each person received or relinquished the sample(s), including their signed name.
- **Information must be legible**
- All information must be written on the field form in waterproof blue or black ink.

2. Samples must be properly labeled

- Use durable labels
- Include a unique identification number traceable back to the COC.
- Include preservative used (Container codes are acceptable if defined).
- Use waterproof blue or black ink
- **Information must be legible**

3. **Adequate quantity of samples must be collected in appropriate containers**, **and all relevant preservation measures must be followed.**

- Failure to use the lab-approved container types and/or the proper preservation measures may result in refusal of the submitted samples or flagging of all analytical data.
- Sufficient sample must be collected to allow for the analysis of matrix quality control samples (e.g. 2 additional 1 liter samples need to be collected per sampling event for extractable organic methods for a matrix spike and matrix spike duplicate e.g. EPA 1664 Oil and Grease, EPA 8270C, etc)

4. Samples must be preserved according to the requirements of the requested analytical method.

- Sample containers must be labeled with the preservation used (e.g. HNO_3, H_2SO_4, etc). The DEQ Laboratory will provide stickers to label sample bottles.
- Samples must arrive at the laboratory on ice for analyses with temperature preservation requirements.
- Coolers or other containers used for transporting samples must include a temperature blank[9]. These are available from the laboratory sample receiving section and can be picked up prior to sampling. Most analytical methods require chilling samples to 4^{o} C (other than water samples for metals analysis). For these methods, the criteria are met if the samples are chilled to < 6.0^{o} C and above freezing (0^{o} C). For methods with other temperature criteria (e.g. some bacteriological methods require < 10^{o} C), the samples

[9] Temperature blanks are water-filled sample bottles that stay in the cooler with the samples for measuring the temperature of the samples during transport to the lab

must arrive within $\pm$ 2° C of the required temperature or within the method specified range. Note: Samples that are hand delivered to the laboratory immediately after collection may not have had time to cool sufficiently. In this case the samples will be considered acceptable as long as there is evidence that the chilling process has begun (arrival on ice).

- Chemical preservation (pH) will be verified prior to analysis and the project manager will be notified if there is a discrepancy. ***If analyses will still be performed, all affected results will be flagged to indicate improper preservation***.

5. Special Requirements for Volatile Organic Analyses

- All samples submitted for Volatile Organic analyses must have a Trip Blank submitted at the same time. A trip blank is prepared from organic-free reagent water and carried throughout the sampling, storage, and shipping process.
- Residual chlorine must be neutralized prior to preservation except as noted below. If there is prior knowledge that the samples are not chlorinated, state it on the COC and preserve VOA vials with HCl only. (Note: there are provisions for the analysis of volatiles by 624 and 8260B from unacidified VOAs with shorter holding times.)
- VOA samples to be analyzed for 2-Chloroethyl vinylether (2-CVE), Acrolein and Acrylonitrile must NOT be acidified as the acid breaks down these analytes.

6. Parameter/Method Recommended Holding Time must not be exceeded

- Samples must be submitted with sufficient time remaining on the holding time for the laboratory to perform the analyses**.**

7. Minimum Sampling Plan submitted[10] when more than five (5) samples submitted, including

- Number of samples (by matrix), including QA (dupes, matrix spikes & duplicates, blanks, etc.),
- Project manager,
- Whom to report data to,
- Analyses (tests) requested, and
- Detection limit needed [qualitative screen, drinking water Maximum Contaminant Limit (MCL), Toxicity Characteristic Leaching Procedure (TCLP), NPDES permit compliance, etc.]

Documentation of any of these elements may be furnished at any time up to that time when the flagged data is released from the laboratory, preferably as soon as possible. If all acceptance criteria are consequently met, qualifying flag will be expunged from the report, on condition that data quality is not affected.

7.1.3. Recommendations for packing samples for shipment.

- Pack samples in ice rather than blue ice packs.
- Soil sample jars should be placed in plastic zip-lock bags. The containers often have dirt around the top and do not seal very well and are prone to intrusion from the water from melted ice.
- Water samples would be best if wrapped with bubble-wrap or paper (newspaper, or paper towels work) and then placed in plastic zip-lock bags.
- Fill extra cooler space with bubble wrap.
- Line bottom of coolers with styrofoam if available in case of cooler being dropped
- When not hand delivering samples to the laboratory, use UPS whenever possible for shipping. If necessary to send by Greyhound or Horizon, please contact the Sample

[10] Failure to submit a sampling plan could result in holding times being exceeded due to prior scheduled work in the laboratory.

Coordinator in advance. For assistance on UPS shipping contact the Technical Services office support specialist at 503-693-5780

7.2 Data Quality Objectives (DQO)

Data quality objectives are quantitative and qualitative statements describing the quality of data that is needed to support a specific environmental decision or action. These descriptors must be considered by a hierarchy of decision makers in order to determine whether data is appropriate for a particular application. Some basic questions that need to be asked are: Why collect these samples? What information is needed? How will data be used? What will data be used for? What resources are available?[11] Defining the use of the data to be collected in advance is a key component of any sampling program. If not thought through and considered during sampling design, the resulting data may not be suitable or adequate for project needs, and require expensive re-work or additional sampling.

After the sampling plan is developed, a field inspector or organizational policy controlling data usage should define what quality of data is needed for the specific application intended. Data quality is evaluated using standard Quality Control attributes including Precision, Accuracy, Representativeness, Comparability, Completeness, and Sensitivity (PARCCS). Each of these attributes has a component related to both sampling and analysis activities.

Many data quality definitions already reside in existing analytical methods, statutes, administrative rules, or discharge permits. If not, the data user should evaluate objectives and determine the appropriate method to obtain the needed data, and decide whether that method chosen produces the data quality to fit your needs.

Required detection limits (or reporting limits) are another data quality objective that must be defined during the DQO process. Project required limits should be below regulatory action levels where possible in order to provide some cushion in case there are some problems with the laboratory QC. Regulatory limits for under the drinking water program can be found in Appendix F. Oregon risk based concentrations (RBCs) for soil samples can be found on the Oregon DEQ website at http://www.deq.state.or.us/lq/pubs/docs/RBDMTable.pdf.

8.0 SAMPLE COLLECTION

Collecting a ***representative sample*** can be difficult, but it is the ***most crucial in the process of obtaining valid data***. It is now understood that most variability in the sampling and analytical process occurs during sampling. Therefore, success in obtaining a representative analytical result will primarily be determined by the sampling plan design and sample collection process. For more information or assistance with collecting representative samples, please contact the Technical Services Section at LEAD. Collection of duplicate or replicate samples is recommended to measure variability from sample-to-sample and some pre-defined frequency. This QA measure can substantiate your data by demonstrating that your samples are, indeed, representative of the population being measured. For water samples, this process is straightforward, for soil, sediment or other matrices, collection of true replicates can be complex, and should be considered during the sample design. Simple collection of a second nearby sample or spooning sample material from one container to another will not result in a true duplicate or replicates. If a high level of certainty is required to ensure true duplicates in solid matrices, details can be found in guidance from the Interstate Technology and Regulatory Council (ITRC 2102). http://www.itrcweb.org/ism-1/

An important factor in collecting a representative sample is the use of **proper sample containers** and **appropriate preservation**. Samples should always be collected in containers supplied by the laboratory; this ensures that the container has been properly cleaned. When the container is filled, the laboratory is ensured they will have enough sample to do the test requested. Samples submitted to the laboratory that are not in a laboratory supplied container (*e.g.* mayonnaise, pickle, or peanut butter jars) are likely to be

[11] Regional QA Management Office, "You and Quality Assurance in Region 10", ES-096, March 1988, pg. 5.

rejected for analysis. Samples must also be properly preserved or they may be rejected. Refer to Appendix "I" for appropriate sample containers, sample preservation and holding times. Apply appropriate preservation sticker to the sample bottles to indicate the preservative used.

It is important to only add sufficient preservative to achieve the required pH. Example: If you normally add 6 drops for a 1 liter bottle, you would only need 3 drops for a 500 mL bottle.

Collecting ***representative*** samples of liquid matrices requires deciding what it is you want to represent. Are you interested in the effluent itself, the impact of the effluent on its receiving water at the point where they mix (*mixing zone*), or the impact the effluent is having 100 meters downstream from its point of discharge? Should a "background" sample be collected upstream of the discharge point? Collecting a representative sample of a multiphase waste in a steel drum presents different problems than collecting a sample of "pure product." Does a representative soil sample[12] include rocks, vegetation or sticks? Considering these and similar questions before sampling will determine what your sample represents and should be documented in the sampling and analysis plan.

It is up to the sampler to determine what constitutes a "sample," and what it "represents." Unless the laboratory is told otherwise, whatever is in the container is the "sample" and represents the sampled unit in the field. **It is imperative** that the sampler inform the laboratory when interested only in specific fractions of a sample, and it's also necessary to make certain that there is sufficient quantity of the fraction of interest to successfully perform the analyses. If you're not sure, call the laboratory and ask.

For Example: if a sample is ½ liquid and ½ solid:

- do you want the entire sample mixed and analyzed?
- do you want just water fraction analyzed, (Filtered, unfiltered)?
- do you want the water decanted off and have the solid analyzed?

Samples "split" with a source or suspected violator must be as close to identical as it is possible to achieve. If the source or suspected violator intends to have the sample analyzed by their own laboratory it would be prudent to have their laboratory contact DEQ LEAD to agree on what portion each laboratory defines as the "sample." If one laboratory screens out and discards the large rocks, while the other retains them, the concentration of analyte in the two samples will be significantly different.

8.1 WATER SAMPLES

The Water Quality Monitoring (WQM) section collects samples for WQ, HSW, and WMC projects. WQM sampling procedures may be found in their **Mode of Operation Manual (MOMs) (DEQ03-LAB-0036-SOP),** which includes procedures for sampling rivers, streams, estuaries, lakes, groundwater wells, soil, shellfish, fish, and sediment. All sampling performed by DEQ personnel should have an approved SAP and/or Quality Assurance Project Plan (QAPP) or work plan.

8.1.1. Groundwater

Monitoring wells without dedicated pumps may be sampled using bailers. Some bailers are expensive and difficult to decontaminate. Disposable bailers are available from the laboratory Sample Coordinator on request.

Collect drinking water or irrigation well samples by first purging water lines. Fill sample container directly from tap, unless sample is to be split. Insure that split samples are homogeneous: fill large clean container, mix and pour into appropriate containers. Note: Samples collected in purge vials for VOC analyses cannot be split in this manner. They must be filled individually, directly from the tap or bailer (APPENDIX A SAMPLING FOR VOLATILE ORGANICS).

Groundwater wells must be properly "developed (purged and recharged)" prior to collecting a sample. All sub-samples from a given site should be representative. **Note:** Different programs may have differing standards. In general, unless low-flow techniques are implemented, a specific volume of water should be removed (3 borehole volumes, 3 well casing volumes, or until the well goes dry.) Field parameter testing

[12] DEQ LEAD has received samples containing large rocks, coins, unfired .22 rifle ammunition, etc.

(pH, specific conductivity, eH, temperature, etc.) of each well volume helps to identify when adequate purging has occurred. Groundwater samples should be representative of the aquifer being considered.

8.1.2. Surface water

Samples for many analyses may be collected using a stainless steel bucket. The collection container should first be rinsed with sample, to wash out previous sample. Collect a fresh sample. Avoid dipping bottle into sample, if possible; pour from collection container, with minimal agitation, into sample bottle. Residue from the outside surface of the container, or your hands, could contaminate samples and/or expose you to hazardous materials. If a stainless sampling container is not available, dip bottle directly into sample, install lid, and wipe off outside of container with paper towel.

8.2 AIR

The Air Quality Monitoring (AQM) section collects samples for AQ Program projects. The AQM Procedures Manual contains sampling procedures for pollutant gases (CO, SO_2, O_3, NO_x), PM_{10} and Suspended Particulate, and canister gas sampling. Air sampling/monitoring equipment is highly specialized, requires considerable logistic support, and is not generally available for use outside of AQM. Anyone interested in proposing a monitoring/sampling project, should contact AQM Supervisor.

DEQ LEAD has sampling capability for PUF and Bubbler samples, and subsequent analyses for PAH (TO-4), volatile toxics (TO-14), and carbonyls (aldehydes & ketones using TO-11).

Air particulate material can be analyzed for specific source-related chemicals, wood fiber, asbestos, etc.. Techniques for particulate sampling include Particle Fallout Samplers and “Sticky Paper.” Evacuated Stainless Steel canisters passively sample ambient air which is returned to the laboratory and subjected to gas chromatographic analyses for trace organics (e.g. solvents, gasoline, BTEX, etc).

8.3 SOIL/SEDIMENT

Use a stainless steel spoon or disposable plastic scoop to collect soil/sediment samples. The plastic scoops are useful for soft soils and those contaminated with organics which are difficult to clean off. It is common practice to composite several subsamples of soil to obtain a representative sample of an environmental condition. Composite sampling is achieved by collecting several roughly equal sub-samples and thoroughly mixing to form one sample. Soil samples should contain as few cobbles or stones as possible, unless the sampler wishes them to be included in the analysis.

It is important to note that traditional soil and sediment sampling methods do not address differences in particle sizes and spatial heterogeneity, even over short distances. These differences can result in substantial difference in chemical concentration to difference in spatial distribution of contaminants and differences in surface area on soil or sediment particles, which provide more adsorptive surface. These differences can result in significant differences in concentration, even on sub-samples within the same sample jar. This is important, because analytical results obtained from as little a few grams of extracted material from a sample jar are often used to make decisions on much larger areas in the field.

If certainty is needed that the soil or sediment sampled is representative of the chemical concentration in the area sampled in the field, then incremental sampling methods (ISM), which may be considered a type of compositing, is required to obtain this level of confidence. These sampling methods are required to obtain reproducible samples with high confidence that they represent the sampled unit. For detailed information on ISM, see the ITRC (Interstate Technology & Regulatory Council). 2012. Incremental Sampling Methodology. ISM-1 (http://www.itrcweb.org/ism-1/).

Note: Composite sampling, achieved by collecting several roughly equal sub-samples and thoroughly mixing in a jar to form one sample, is ***not acceptable for the analysis of volatile organics***. Sampling for VOCs in soil is recommended to be completed by USEPA SW-846 Method 5035A, to prevent volatilization prior to analysis. Note that the ITRC incremental sampling (ISM) guidance discussed

situations where ISM can be combined with Method 5035A if representative concentrations of VOCs are necessary for the project.

Subsurface soils can be collected while wells are being drilled, during excavation, or using a hollow-core soil drill. The laboratory has no special equipment to collect subsurface soils, beyond using augers and core samplers.

Hand augers can be used to collect soil samples to depths of approximately 10 feet. The sample is extruded into an aluminum or stainless steel pan followed by immediate placement into appropriate sample containers. It is possible to obtain samples from discrete depths by forcing the soil core from the auger and collecting from the depth of interest. The inspector shall assess whether a lined or stainless steel auger is necessary.

Soil Sampling Guidance documents:

A Compendium of Superfund Field Operations Methods (EPA/540/P-87/001)

ITRC (Interstate Technology & Regulatory Council). 2012. Incremental Sampling Methodology. ISM-1

8.4 SUSPECT Hazardous Waste CONTAINERS

Use a *disposable* bailer on bulk containers, such as 55 gallon drums, storage tanks, etc. At least one-half foot depth of product is required for the bailer to function. The laboratory also supplies *disposable* glass tubes (approximately 4 feet long) that may be used to "pipette" product out of large containers. Either process is messy. Take an ample supply of clean water and paper towels to clean off sample bottles. Wear nitrile or silver shield gloves to protect hands.

Decontaminate all sampling equipment, except disposable variety, before returning it to the laboratory. **Do not return or transport any contaminated sampling equipment in ice chests with samples.** Spraying with water is generally adequate. Carry a squirt bottle or water-filled pump-type garden sprayer to remote sites. Make your own arrangements to dispose of wastes generated during sampling (*i.e.* disposable equipment, wash water, surgical gloves, and paper towels). **The laboratory has no disposal facilities or resources to accommodate disposal of wastes that accumulate when you decontaminate equipment.** The laboratory will not accept, store or dispose of purge water.

9.0 SUBMITTING SAMPLES, REQUEST FOR ANALYSIS

In order to submit samples to the LEAD, the first step is to contact the Sample Custodian to schedule the analytical work and to clarify what paperwork needs to be submitted with the samples. Having this done in advance will help ensure that your samples will be analyzed in a timely manner.

Typically two forms are submitted with a batch of samples. Data that the sample collector measures in the field (such as temperature or turbidity) are recorded on a Field Data Record form. Sample bottle numbers for laboratory analysis are recorded on a Chain of Custody form.

The Chain of Custody form and the Field Data Sheet DEQ06-LAB-0054-FORM can be found on Q-Net at http://deq05/lab/qms/documents.asp . The forms are divided on separate tabs within the same excel workbook.

9.1 CHAIN OF CUSTODY FORM

The chain of custody form is a legal record documenting the sampling information, custody of the sample and the transfer to the laboratory. ***All sampling events require a chain of custody form***. The chain of custody form, properly filled out, is also critical for logging samples into the laboratory, and serves as documentation linking analytical data in LIMS with the appropriate project or monitoring event. The information on the form is absolutely necessary.

Include the following information on the ***Chain of Custody (COC)*** form (DEQ06-LAB-0054-FORM):

- Sampling Event name.
- Date and time collected
- Sampler's name and organization
- Project Manager or contact to call with questions on the sampling event.
- Program to be charged (QTime number)
- Purpose for sampling (QAPP or SAP number where available)
- Description for each discrete sampling location (Station Name) and LASAR Station ID number (when available). See SOP *Station Naming Conventions* DEQ06-LAB-0039-SOP.
    - **Note:** Submitting specific sample locations to the laboratory is not mandatory for legal samples to protect confidentiality. It is however, **mandatory** that the project manager or field sampler maintains documentation of the specific sample locations. It may be provided to the laboratory at the discretion of the project manager and it will be maintained in the laboratory workorder file. The information however will not be entered into the Laboratory LIMS system to maintain confidentiality.
- Container ID number(s) (in spaces provided).
- **If a QAPP or SAP is not yet available, request specific analysis by name, test group, or method in the Event Comment section of the COC.** For methods with long lists of analytes the laboratory will analyze their standard list of analytes for the test method unless otherwise directed.

To insure that the correct person receives the data report, enter one or more names in the upper right hand space labeled: “Report Recipients”. On a COC form without anyone listed, data will be reported to the sample submitter. Further instructions can be found on the back of the COC form

When a sampling event is only one of several within a project, make certain that the same project name is used on each Chain of Custody form for each sampling event. As each case is completed and reported out a database is updated which links the project name with appropriate case numbers and date of reporting. If several sampling events related to the same project are listed using different names, it may be impossible to connect them in the future.

The COC form usually contains the only information the laboratory has about sample origin, possible contaminants and sources, conditions of collection, etc. It would be helpful, when the field sampler has kept a field notebook, if pertinent information was transcribed onto these forms. Information, such as “suspect cyanide in samples,” “diesel spill,” “samples contain elemental mercury,” should be noted as a safety warning to the Sample Coordinator and Analysts that will subsequently be handling the samples.

Note: Please flag on the COC form samples known or suspected to contain sewage, cyanide, toxic solvents or heavy metals, etc. This is safety information for the Sample Coordinator and Analysts who will subsequently handle the container and sample material.

Always keep in mind that the holding time for a sample begins when the sample is collected, not when it arrives at the laboratory. This could lead to problems for samples having extremely short holding times,

such as nitrite, BOD_5 or turbidity (48 hours), and bacteria (e.g. coliforms) samples (8-24 hours). Should a sample be delivered so late as to exceed the holding time the test will be performed, but results will be reported with a qualifier to indicate holding time exceedance.

Each "item" should include a concise **Sampling Point Description (aka Station Name)** of where, or sample identification number, and when (time) sample taken. If this is a new sampling site, Latitudes and Longitudes MUST be included for the laboratory staff to create a new Station ID. Be specific, generalized locations (e.g. "in a field", "across the street", etc) cannot be used to identify a location. The sampler must also note the matrix (surface water, groundwater, soil, sediment, etc). The LEAD will create Station IDs if there is none available. For more information see SOP *Station Naming Conventions* (DEQ06-LAB-0039-SOP).

The complete sample description and container/preservation information number must be entered in the appropriate fields on the COC form.

The SAP and/or QAPP should contain a method and analyte list including each analyte, or analyte group, you are interested in having a sample item tested for. Try to be as specific as possible. The laboratory will assign methods appropriate to the analytes you are looking for.

Even though you (or your contractor) have provided a Sampling & Analysis Plan (SAP), it is still necessary for you to fill out the *COC form for all samples submitted*, based on the SAP/QAPP.

Record on "COC form" whether preservatives were added, which preservative, and the amount.

The DEQ LEAD Information Management System (LIMS) assigns a unique "work order" number to each batch of samples that are logged in. A work order number might be assigned to all samples from a specific project on a given sample day, or all samples collected during sampling event spanning more than one day. In no event will a work order number be assigned to include samples from different monitoring projects.

Work order numbers have seven digits. The first two digits represent the year, followed by two digits representing the month, and 3 digits that are assigned sequentially by LIMS and representing the order the cases were logged in during the month (YYMMxxx)

The container sizes, and materials are a result of the various chemical preservations and quantity of sample required to test for different analytes. Tests for several analytes, having identical preservation requirements, are frequently performed on a single bottle. It's obvious that a bottle preserved with nitric or sulfuric acid cannot be analyzed for nitrate, sulfate, pH, alkalinity, conductivity, etc.; however, those tests can be performed on a bottle (poly) where the only preservation is refrigeration at < 6°C.

Based on the analytes you request, and your Data Quality Objectives (DQOs) (when specified in QAPP/SAP), the laboratory will assign an appropriate analytical method (analysis code). Analytical procedures used by DEQ LEAD comply with requirements of the applicable federal regulations; [e.g. SDWA, NPDES, RCRA, etc.] and are EPA approved[13] methods. The lab procedures are referenced to current published literature. If DQOs are not specified the laboratory will employ their default method for the test. DEQ LEAD Methods are listed in the most recent laboratory Quality Manual (LQM).

Occasionally non-standard methods may need to be developed when a standard method is not available, or when interfering substances influence the performance of a standard method. Non-standard methods will be appropriately validated, documented, and noted on the laboratory report.

9.2 CHAIN OF CUSTODY PROCESS

The chain of custody process is a means of documenting who has control of the samples and may be different depending on the intended use of the data. First level chain of custody record is for samples unlikely to be used in litigation or enforcement action. The second level is for samples that may be used as evidence in legal processes. Two levels of *Chain-of-Custody* have been developed to eliminate some of the paperwork associated with maintaining a rigorous Chain-of-Custody. **PLEASE NOTE**: **A CHAIN**

[13] 40 CFR 136, SW-846, Standard Methods, etc.

OF CUSTODY FORM IS REQUIRED FOR ALL SAMPLING EVENTS REGARDLESS OF THE CUSTODY LEVEL, It should also be noted that the custody level **has no bearing whatsoever on analytical data quality;** it only documents who had the sample in their possession at any particular time.

9.2.1. FIRST CUSTODY LEVEL

The first custody level is intended for routine, ambient monitoring, and samples unlikely to become involved in litigation. The custody transfer to the LEAD is documented on the COC form at the time samples are relinquished to the DEQ LEAD facility. The sample custodian inspects the shipment and documents any discrepancies from the Sample Acceptance Policy prior to logging the samples into the LIMS. It is always appropriate to make written comments on the Chain-of-Custody form concerning the integrity or condition of samples when received.

Samples are treated routinely in the secure DEQ LEAD facility. This includes: analyses using EPA approved methods, replicate analyses and/or matrix spikes, and QC standards using method and EPA QC criteria at the method required frequency; comparison against historical data, if it exists; data review for consistency, completeness, precision and accuracy; QA review of duplicate sample data; and standardized reporting on the laboratory LIMS. **FIRST CUSTODY LEVEL** samples will be discarded upon completion of analyses and report of results.

9.2.2. SECOND CUSTODY LEVEL

The second level of custody is to be used if the sampling event is involved in litigation or has potential to be involved in litigation. The second level (also see Appendix E) includes everything in **FIRST LEVEL**, plus:

- Custody is thoroughly controlled throughout the sampling process with the use of custody seals and maintaining the samples under lock and key in the vehicle until the delivery to the laboratory.
- Custody is controlled in the laboratory by storing the samples in locked storage area and all transfers of the samples into and out of the storage area are documented in a logbook and witnessed. The samples once checked out for analysis are maintained in the secure laboratory environment. Depending on the situation, type of sample, type of equipment used, duration of the analysis, and other factors, the laboratory analyst may take additional steps to document the security of the samples through use of locks, security tape, or other means. Any extra steps taken should be documented on the COC form.
- Sample remaining after analyses are finished, or empty container when sample is exhausted during analyses, will be retained in secure storage until release is approved in writing by program or sampler. Disposal date will be documented on the custody transfer document.

9.2.3. SAMPLE SHIPMENT

Transport samples to the laboratory immediately after collection. Notify the Sample Coordinator (503) 693-5784) **prior to sample collection** to allow adequate time for scheduling analysis, advance preparation, and/or technical assistance. Ship samples[14], packed on ice in a sealed ice chest available from the LEAD, via UPS. For shipment of ***legal*** samples, refer to "Legal Chain-of-Custody Procedures" APPENDIX E.

Ship samples to:

DEQ laboratory and Environmental Assessment Division
3150 NW 229th, Suite 150
Hillsboro, OR 97124

[14] Samples ONLY, via public carrier. Not preservative chemicals, decon solvents, or other sanctioned hazardous materials.

If possible, hand-deliver samples to the facility. We are located off of Evergreen Pkwy just east of 229th in Hillsboro. Building is on the south side of Evergreen Street (Eastbound side). See Map http://www.deq.state.or.us/about/maps/lab01.pdf.

VOLATILE ORGANICS: To avoid cross-contamination of samples during shipment, seal samples and "Transport Blank" vials in ziplock bags.

BACTERIAL samples (*fecal coliform, E.Coli*) must be received no later than 1200 hours (Noon) on Thursday.

For ***Legal*** bacterial/microbiological samples, the maximum holding time of 8 hours (30 hours for drinking water) must be adhered to, whereas routine samples can be held for a maximum of 24 hours. Analysis for a "non-routine "organism (*E.coli, total coliform, fecal strep*) is required, notify the laboratory well in advance so that special media can be prepared for the test. Microbiological testing is currently performed exclusively by the Oregon Public Health laboratory in the same building as DEQ LEAD.

BOD: Samples must be received no later than 1200 hours on Friday.

If it is necessary to sample between 12:00 noon Friday and 12 noon on Monday, the laboratory will need to schedule someone to come in on the weekend. Special notification is required prior to collection and shipment of samples.

9.3 FIELD NOTEBOOKS

A bound field notebook ***should*** be maintained to provide a daily record of significant events, observations, and measurements during field investigations. (In lieu of a notebook, field data sheets may be used if they contain sufficient documentation and are submitted with the Sampling Event information.) This record should include field measurements, personnel, personal and weather observations, and physical conditions. All entries in field notebooks should be made, signed, and dated in ink. Field notebooks, inspection reports, or other documentation should be kept as a permanent record.

These notebooks are intended to provide sufficient data, observations, and documentation to enable participants to reconstruct events that occurred during an activity, and to refresh their memory when called upon to give testimony during legal proceedings.

9.3.1. CORRECTIONS TO DOCUMENTATION

All original data recorded in field notebooks, chain-of-custody records, and other forms must be written in waterproof (blue or black) INK that does not smear if it gets wet. None of these documents should be destroyed or thrown away, even if they are/become illegible or contain inaccuracies that require a replacement document.

If an error is made on a document assigned to an individual, that individual must make corrections by crossing a single line through the error, enter the correct information, and initial and date the correction.

10.0 GUIDANCE ON CONTRACTING LABORATORIES

This guidance applies to those that contract out laboratory services or to those receiving data from third party labs to support decision-making.

Whenever one uses a laboratory data for any purpose, they must have confidence in the quality of the data. Data of unknown quality should not be accepted without question. It is the responsibility of the user of the data to know where the data is coming from.

Laboratory accreditation is **STRONGLY RECOMMENDED FOR ALL ENVIRONMENTAL TESTING** even though it is only required in Oregon for Safe Drinking Water Act (SDWA) compliance testing and asbestos testing in schools. Keep in mind there are some tests that there is no accreditation available.

Unaccredited laboratories are not subject to oversight unless they have an internal auditing program or are accredited through another agency for another purpose.

Keep in mind that laboratory accreditation does not guarantee that the data will necessarily meet project needs. What accreditation does is to ensure that there has been some external review of the laboratory to help show they have the capabilities to meet project needs. Note; the thoroughness of that external review may vary from auditor to auditor but is significantly better than no review at all.

If the laboratory is not accredited for the tests being reported, it would be advisable to visit the laboratory to ensure they have the equipment and capabilities to perform the tests. Contact a DEQ Quality Assurance Officer or a DEQ LEAD laboratory Section Manager for assistance if you are unfamiliar with laboratories.

Other States require accreditation for various programs. Knowing where the laboratory is located and what type of accreditation they hold can add confidence to the analytical data. Ask the laboratory for a copy of their accreditations. Other agencies (e.g. DOD, DOE) approve labs for their agency use as well. These are good programs and laboratories operating under them have been inspected.

Laboratory participation in proficiency testing (PT) programs is also a good way to help assist in the evaluation of the performance of a laboratory,

Before selecting a laboratory there are many things to consider:

- If DEQ is selecting, make sure the laboratory selected is an approved vendor. DEQ has contracts with 3 preselected laboratories.
- What questions do you need answered?
- Reporting levels / Detection levels / Action levels
- Regulatory Compliance testing or monitoring?
- Methods and QC limits?
- Deliverables
- Are there difficult matrices?
- Does it have to be “Bullet Proof” (Stand up to any possible legal challenge)
- What are your liabilities if there is a problem?
- **Is there a Quality Assurance Project Plan (QAPP) involved?**
    - Get the laboratory in early on the process of creating the QAPP
    - **QAPP Pitfalls**
        - **Not giving the QAPP to the laboratory until the samples arrive.**
            - The laboratory may need to do additional work to meet your needs
            - Slows down the project
            - May cause Turnaround Times to fail?
        - **Not giving the QAPP to the laboratory until after the project is over or not at all.**
            - laboratory may or may not have met QAPP objectives
            - Have to backpedal to try and salvage data

Some recommended things to ask the laboratory.

- **Are they accredited?**
    - For what parameters, media, and test methods?

- By what agency or accrediting body?

- **Have they had an external audit by a state of federal agency?**
- Can you get a copy of the findings and the labs response? (don't let the number of findings be as much of a concern as the type of findings).
- **Quality Assurance Program**
  - Do they have a Quality Manual that describes their program?
  - Is management involved with the QA program (Quality starts at the top)
  - Separate QA officer (where practical, small labs usually can't afford a separate QA officer)
  - Proficiency Testing Samples
    - Which ones do they participate in and how often?
    - Request results.
  - How wide are the control limits? Do they meet your needs?
  - Are the Reporting Limits acceptable? Can they achieve the project DQO?
  - Do they have an internal auditing and corrective action process
  - Do they qualify the data for QC failures or sampling, preservation, or holding time variances?
- **Control Limits**
  - Do they meet your objectives?
  - How wide / narrow are they.
    - Note: Some analytes just don't perform well (examples: Benzidine, ketones, some phenolics. Etc.)
  - Does the laboratory control on all/most compounds or are do they use the minimum subset listed in a method?
    - **Note:** A larger spike list is a good thing.
  - Do they report the QC results in the laboratory report?
- **Reporting Limits and Detection Limits**
  - Within Calibration Range
    - EQL – Estimated Quantitation Limit
    - RL – Reporting Limit
    - CRDL – Contract Required Detection Limit
    - LOD - Limit of Quantitation
  - Below Calibration Range (Must be estimated)
    - MDL – Method Detection Limit
    - IDL – Instrument Detection Limit.
  - Try to avoid reporting to MDLs unless necessary. Need to know all results below the LOQ (reporting limit, etc) must be reported as "*Estimated*"
- **Corrective Action Process**
  - Does the laboratory have a means of tracking non-conformances

- Types
- Frequency

- Do they monitor for trends (Are there recurring problems?)
- **More importantly**, does the laboratory have a mechanism of correcting those problems?

- **Data Qualification**
  - Contrary to popular belief, every analytical run is not perfect.
  - Sample matrix may cause problems with analysis
  - Qualified Data often still supports the questions to be answered.

    Cautions

    - Data Qualifiers provide useful information to data users. The laboratory should not be hiding problems.
    - Not always bad. e.g. Tight control limits may lead to more qualifiers

- **Ethical Practices**
  - Do they have an Ethics Policy?
  - Do they have defined manual integration procedures for chromatography methods?
  - Do they perform self auditing and notify clients if there are problems with data? (Do they recall reports when needed?)
    - **Caution**: Watch out for labs that <u>never</u> recall data.
  - Do they perform ethics and manual integration training?
  - Do they use data qualifiers?

- **Customer Service**
  - Are they responsive?
  - Do they have the technical expertise needed for the work being performed?
  - How are they at meeting turnaround times and holding times?
  - How are they about correcting errors?

- **Evaluate laboratory Documentation**
  - At least **<u>once</u>** request a raw data package for all analyses –
    - **<u>Yes,</u>** there is most likely a charge – relative to what is at stake, it is more than worth it.
    - If you don't know what you are looking at… **ask.** You can ask the laboratory that provided the data for clarification or there are 3rd party validators as well that perform the service. **For DEQ staff, ask the DEQ laboratory and Environmental Assessment Division, laboratory Managers or QA staff for assistance.)**.
  - A raw data package should be requested one time after the analyses have been performed (but not too long after).

- **Verify laboratory Capacity**
  - Does the laboratory have the capacity to deliver what you need?
  - Provide the laboratory with as much information about the number and type of sample as possible.

- If samples are really dirty, it slows down the lab: They need to know.

- Is there a sampling schedule that was agreed upon?
  - Changes in sampling volume can significantly impact the laboratory and TAT.

APPENDIX A SAMPLING FOR VOLATILE ORGANICS

Contamination

Because of the sensitivity of the analytical technique (0.5 parts per billion), and potential for sample contamination, volatile organics sampling is somewhat complex. It is important that all steps be followed. Every effort must be made to avoid contamination, and to document where contamination might originate (e.g. field, transport, laboratory blanks).

I Water Samples

Preparation

Notify the Organic laboratory before collecting any volatile organic samples. The laboratory will prepare the following vials upon proper notification and scheduling:

A. **LABORATORY BLANK** Two vials filled by Sample Coordinator with purified water and kept in the Organic laboratory for later analysis

B. **TRANSPORT BLANK** Two vials filled with purified water to accompany samples throughout the sampling run. Do NOT open these vials in the field. Return to the laboratory with samples.

C. **TRANSFER BLANK** Two vials, filled with purified water by laboratory personnel, carried to the sampling site where the Sampler transfers the contents to two fresh vials.

D. **SAMPLE VIALS** Three vials: The Sampler is provided with sufficient triplicate numbered vials for TRIPLICATE sampling at each site. Triplicate vials are distinguished by “-A” and “-B” and “-C” to designate first and second and third sample, respectively.

Sampling and Documentation

1 The laboratory will provide the Sampler with pre-numbered vials for the Samples, laboratory Blanks, and Transport Blanks. These vial numbers must be listed on the "COC form".

2 Transport Blanks are NOT to be opened, and are to accompany the Samples at all times.

3 The Sampler is required to prepare two Transfer Blanks at the sampling site, using water supplied by the laboratory.

4 All samples are collected in TRIPLICATE, and immediately refrigerated.

Samples should be delivered to the laboratory without delay.

Sample Collection

Collect volatile organic samples in triplicate sets of 40 mL glass purge vials with Teflon-lined (non-reactive) septums in the lids, labeled “A” and “B” and “C”. **Fill the vials, in the order “A” followed by “B” and “C”,** from the same source with as little time-lapse as possible between them. **Do not rinse pre-preserved vials prior to filling**. Fill vials all the way to the top and a little above, generating a positive meniscus. No air bubbles should pass through the sample as the bottle is filled, or be trapped in the sample when the bottle is sealed. A positive meniscus at the top of the bottle will help ensure that no air is trapped inside when the cap is screwed on. If bubbles are present empty VOA take a new sample and repeat the check. Place the vials in a plastic bag, close the top, and put the bag in a cooler with ice. Ship the samples to the laboratory as soon as possible.

CAUTION!

Some purge vials from the DEQ LEAD are pre-acidified for preservation. Each vial contains 10 drops of concentrated hydrochloric acid. Acidified containers normally give off fumes, which should not be inhaled. If spilled on clothes or skin, flush immediately with copious amounts of water.

In addition to triplicate sample vials from each site, a sampling event should include vials for laboratory Transport, and Transfer blanks. When sampler desires *Matrix Spike(MS)* or *Matrix Spike Duplicate(MSD)* samples, he must collect one extra set of Triplicate Vials and submit the additional vials for analysis. The sample identified for MS/MSD should be noted on the COC along with vial numbers for the additional sample volume collected.

Note the number of each purge vial on the "COC form" with a site description, date and time sample was taken, as each sample is collected.

1 When sampling from a tap, open the tap and allow the system to flush until the water temperature has stabilized (usually 5-10 min.). Adjust flow to about 500 mL/min and collect duplicate samples from the flowing stream. The sampler should ensure that the tap is free of aerator, strainer, hose attachment or water purification device.

2 **When sampling a *chlorinated water supply* for volatiles** it is necessary to preserve the samples with 25 mg Ascorbic acid, then acidify with 2 drops 1:1 hydrochloric acid to destroy any chlorine that may be present. Do not use 40 mL vials that already contain HCl. If this is not done the free chlorine can react with some volatiles, producing chlorinated compounds that did not exist in the original sample.

3 When sampling from an open body of water fill a 1 quart bottle or clean beaker with sample, and carefully fill duplicate sample bottles from the container.

4 When sampling wells with a bailer the VOC sample should be collected from the first bailer-full after purging well. Precautions should be taken to prevent aeration of sample.

5 **Note:** VOA samples to be analyzed for 2-Chloroethyl vinylether (2-CVE), Acrolein and Acrylonitrile must NOT be acidified as the acid breaks down these analytes. Take a separate aliquot into an unacidified VOA vial.

Attention: Check VOC vials for Air Bubbles

Invert vial and tap on solid surface. If present, air bubbles will rise

II Soil Samples

Soil samples must be collected in accordance with EPA method 5035A to minimize the loss of volatiles. Bulk samples should not be collected in Jars or brass core sleeves. EPA method 5035A requires the use of special sampling devices (a modified syringe sampler or miniature core sampler, EnCore® or TerraCore®, or similar type device). Which preservation method is chosen will be dependent on the reporting levels that are required for a given Project Plan. Below are some options, check with the laboratory if you have questions:

a. The sample is extruded into a pre-tared VOA vial containing Methanol (for high level samples) where volatile Organics are solubilized in the Methanol and loss through volatilization is eliminated are at least minimized.

- Clean VOA vials containing Methanol must be pre-weighed before sampling and weighed again at the laboratory when received.
- A 5-10 gram portion of soil sample is added to the vial containing Methanol and the vial is quickly sealed.

- Use of a modified syringe sampler is recommended for this process as they are easier to use however the Encore® will work as well.

b. The sample is extruded into a pre-tared VOA vial containing sodium bisulfate preservation (for low level samples). The sodium bisulfate preservation retards microbial growth that can feed off of aromatic compounds, rapidly lowering their concentrations.

- Clean VOA vials containing dilute Sodium bisulfate must be pre-weighed before sampling and weighed again at the laboratory when received.
- A 5-10 gram portion of soil sample is added to the vial containing Methanol and the vial is quickly sealed.
- Use of a modified syringe sampler is recommended for this process as they are easier to use however the EncoreTM will work as well.
- **Note:** if 2-CVE, Acrolein, or Acrylonitrile are target analytes, another aliquot would need to be taken and placed in either an empty pre-tared VOA or a pre-tared VOA vial containing reagent water

c. The sample is extruded into an empty, clean, pre-tared VOA vial (for low level samples).

- Clean VOA vials must be pre-weighed before sampling and weighed again at the laboratory when received.
- A 5-10 gram portion of soil sample is added to the empty vial and the vial is quickly sealed.
- Use of a modified syringe sampler is recommended for this process as they are easier to use however the EncoreTM will work as well.
- The Sample must be shipped ASAP as the sample must be frozen within 48 of sampling in order to extend the holding time to 14 days by freezing the samples. It is recommended that Dry Ice be used to freeze samples during transportation to the laboratory.

APPENDIX B SAMPLING PROCEDURE FOR DISSOLVED OXYGEN (Winkler Method Only)

INTRODUCTION

Currently, the Water Quality Monitoring section primarily utilizes a luminescence dissolved oxygen (DO) probe for in situ analysis of DO. However, there are still occasions where the Winkler procedure may be utilized.

Use this procedure for field preservation of water and wastewater samples for dissolved oxygen analysis if using the Winkler method. The preservation method employs dry reagent pillows to "fix" the dissolved oxygen for later analysis. Manganous ion reacts with the dissolved oxygen present in the alkaline solution to form a manganese (IV) oxide hydroxide floc. Azide ion is added to suppress interference by nitrite, which reacts with the free iodine generated during analysis. Following acidification, reduce the manganese (IV) floc with iodide; then titrate the free iodine produced with sodium thiosulfate (or PAO) titrant.

See DEQ03-LABB-0036-SOP, *Water Monitoring and Assessment Mode of Operations Manual* (MOMs) for assistance on field analysis of Dissolved Oxygen.

SAMPLE COLLECTION

Collect water samples in a clean 300 mL BOD bottle to overflowing with minimal aeration. This ensures that there will be no air bubbles trapped in the bottle. Replace ground glass stopper until you are ready to add reagent pillows.

SAMPLE PRESERVATION

1) Remove glass stopper and add contents of one Manganous Sulfate Powder Pillow. Replace cap and invert several times to facilitate mixing.
2) Remove glass stopper and add contents of one Alkaline Iodide-Azide Reagent Powder Pillow. Insert stopper and invert bottle several times to mix. A flocculent precipitate will form. It will be brownish-orange if dissolved oxygen is present or white if oxygen is absent.
3) Allow the sample to stand until the floc has settled. Again invert the bottle several times to mix, and let stand until the floc settles.
4) Transport samples immediately to the laboratory. **Store in the dark** at 10-20^{o}C during transport. Preserved samples can be held for up to 8 hours prior to final titration.

NOTES:

a) If DO is for ***Initial D.O.*** measurement used in BOD determinations a second bottle must be collected simultaneously and sent to the laboratory in a cooler with ice (do not add anything to this bottle). The cooler must be carefully packed to protect the sample containers.

b) When collecting for laboratory BOD measurement, and BOD is expected to be greater than 5 mg/L, collect additional sample in a 1000 mL poly bottle for BOD dilution setups instead of the second BOD bottle. Samples that you suspect will have high BOD should be flagged so laboratory staff will know to prepare dilutions.

c) Remember to schedule DOs and BOD5s with laboratory so that personnel can be scheduled to perform analyses.

APPENDIX C FIELD FILTRATION PROCEDURE.

APPARATUS

The filtering apparatus consists of a wide-mouth jar, rubber stopper with filter funnel base and filter inserted, and removable magnetic filter funnel. Use a hand-operated vacuum pump to filter the sample. Filters used must be **0.45 micron** cellulose membrane (47 mm diameter).

OPERATION

1) Remove cap from clean 250 mL poly bottle labeled as “dissolved” or “filtered” ; place in center of filtering jar.
2) Place rubber stopper (with filter base) firmly in jar opening, with filter stem inside poly sample bottle. (Vacuum cannot be produced unless jar is securely sealed).
3) Place filter membrane on filter base grid. (Make certain that blue separator disk is not attached to membrane).
4) Place funnel over filter.
5) Pour approximately 250 mL of sample into the funnel. Evacuate the filtering jar (using hand vacuum pump) until sample begins to pass through filter. If sample is very turbid, filter several small volumes, replacing filter membrane as it becomes plugged, until container is full.
6) Remove poly sample bottle from the Mason filtering jar. Rinse filter grid and funnel between samples with distilled water
7) Label the sample container to designate that it has been filtered (The DEQ lab will provide stickers for this.

ALTERNATIVE

Alternatively filtration may be performed using a peristaltic pump and clean Tygon^{TM} tubing (cannot use if phthalates are a target analyte) and an in-line cartridge 0.45 micron filter. Use clean tubing for each sample or rinse with at least 1 liter sample before attaching the filter.

Contract DEQ lab staff for more detailed training and use of in-line cartridge filteration.

APPENDIX D EPA QUALITY ASSURANCE PROJECT PLAN OUTLINE[15]

A. PROJECT MANAGEMENT

1 Title and Approvals
2 Table of Contents
3 Distribution List
4 Introduction
5 Purpose
6 Project/Task Organization
    a. Funding Program and Anticipated Resources
7 Problem Definition/Background
8 Project/Task Description
9 Quality Objectives and Criteria
10 Special Training/Certification
    a. Safety
11 Documents and Records
12 Data Usage
13 Monitoring network design and rationale
14 Parameters and Frequency
15 Project Organization and Responsibilities

B. DATA GENERATION and ACQUISITION

2 Sampling Process Design
3 Sampling Methods
4 Sample Handling and Custody
    a. Field Notebook
    b. Corrections to Documentation
    c. COC
5 Analytical Methods
6 Quality Control
    a. Data Quality Objectives
        - Precision
        - Accuracy
        - Limits of Detection (LOD) and/or Quantitation (LOQ)
        - Representativeness
        - Comparability

[15] From *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5, March 2001)

- Completeness

b. Quality Control Procedures

7 Instrument/Equipment Testing, Inspection, and Maintenance

8 Instrument/Equipment Calibration and Frequency

9 Inspection/Acceptance of Supplies and Consumables

10 Non-direct Measurements

11 Data Management

C. ASSESSMENT AND OVERSIGHT

1 Assessments and Response Actions
   a. Performance and Systems Audits
   b. Corrective Actions
2 Reports to Management

D. DATA VALIDATION AND USABILITY

1 Data Review, Verification, and Validation
2 Verification and Validation Methods
3 Reconciliation with User Requirements

DEQ QAPP template (DEQ04-LAB-0029-TMPL) can be found on DEQ's intranet site *Q-Net*.

DEQ SAP template (DEQ11-LAB-0026-TMPL) can also be found on DEQ's intranet site *Q-Net*.

The detail of the contents is dependent on project needs. All components are not necessarily required for all projects.

Note: The QA Plan is to be developed and approved by the Project Manager and QAO prior to the start of the sampling event.

APPENDIX E LEGAL SAMPLE CHAIN OF CUSTODY (Custody Level 2)

Purpose

Sample integrity must be maintained throughout the collection, transport, storage, and analysis process. Consequently all field activities must be fully documented, the samples must be clearly identified, and custody procedures followed in both field and laboratory operations

Evidence for use in a legal action is subject to more stringent rules and criteria than that used for routine monitoring or assessment sampling events.

Written procedures must be available and followed whenever samples destined to become evidence are collected, transferred, stored, analyzed, or discarded. Their primary objective is to create an appropriate and accurate record that can be used to trace the possession of a sample from its collection, through analysis, until its introduction as evidence. A sample is considered to be *in custody* if it is:

a. In actual physical possession.

b. In view, after being in physical possession.

c. Locked up.

d. Kept in a secured area where access is restricted to authorized personnel.

Pre-sampling

Prior to any "Legal" sample collection, the project manager or field sampler should contact the Inorganic, Organic, and QA Managers at the laboratory to appraise the of the project's regulatory objectives, proposed sampling locations and procedures, matrices, analytical requirements, and Chain-of-Custody procedures to be followed. This is especially true for any project when non-routine sampling procedures are employed.

If legal action is contemplated the potential litigant also must be informed that samples are to be collected. Since analytical results may be used as evidence, the potential litigant is entitled to collect duplicate samples and have them analyzed by someone else, or observe the analysis being done by the DEQ laboratory. Contact your manager or the Environmental Law Specialist assigned to your program, or call Les Carlough in the Office of Compliance and Enforcement at 503-229-5422 for assistance. .

Field Documentation

Field records must be complete, dated, and initialed at the time the sample is collected. Fill out the *COC* form, providing at least the following information (Additional types of documentation may be relevant and should be identified in the site-specific SAP):

Location of sampling station (include latitude and longitude if there is no station ID)

Date and time sample collected

Case name and reference to QAPP or SAP where available.

Sample container number

Preservatives added and quantity

Number and type of samples shipped;

Number of shipping containers sent;

Analyses required (the COC is the official request for analysis for a laboratory, contact laboratory if unsure of what parameters are needed)

Pertinent field data (e.g., pH, temperature)

Name of sample collector(s)

Name of person performing field tests.

Site observations and photographs (where applicable and with written descriptions);

Equipment numbers and/or calibration information;

Field Sheets or other sample collection forms;

A separate, bound field log book is highly desirable. The necessity, and the specific information to be recorded therein must be determined prior to sampling, by the project manager.

Color photographs of the sampling location are recommended to facilitate identification and subsequent recollection by the sample collector(s). Sign and write date, time, and location on the back of each photo. Handle photographs according to Chain-of-Custody procedures. Keep and protect negatives (if appropriate) as part of the documentation.

Sample Identification

All sample containers must be uniquely identified.

Field Custody Procedures

To ensure proper custody while in the field, the following custody procedures will be followed:

- As few people as possible will handle the samples (each person that handles the samples becomes a potential witness and increases potential for errors);
- Coolers or boxes containing clean sample containers will be sealed with the appropriate custody seals until opened in the field;
- Sample bottles from containers that appear to have been compromised shall not be used;
- The sample collector will assume responsibility for the samples until transferred to another person (or shipping courier) following the appropriate chain-of-custody procedures;
- All sample data will be recorded in ink in a field notebook and on the appropriate field forms;
- A site team leader will assess if additional samples are required;
- All samples requiring thermal preservation will be shipped with an appropriate temperature blank, which will (at a minimum) consist of a 100-mL polyethylene bottle filled with clean water;
- Each cooler (shipping container) in which samples are packed will be sealed and accompanied by one copy of the chain-of-custody record that is sealed in a zip-lock bag and taped to the inside lid of the shipping container; **Note:** If hand delivered, the COC does not need to be inside the cooler.
- A separate chain-of-custody record will accompany each shipment of samples;
- Packaging, marking, labeling, and shipping of samples will comply with all regulations promulgated by the U.S. Dept. of Transportation, 49 CFR 171-177, and International Air Transport Association (IATA); and
- Freight bills and bills of lading will be maintained as part of the permanent project record.
- Written procedures for collection, preservation, and handling, specific for each sample type and analysis must be followed, and any deviations documented.

Custody Seals

Custody seals/tape must be present on all shipping containers. These seals are designed to show evidence of tampering or disturbance and must be present on the shipping container in as many places as necessary to ensure security. The seals must be dated and signed before application to the shipping containers. The seals may be covered in clear tape to prevent accidental damage during the shipping process. Custody seals on individual containers are not required in most cases as long as the samples are shipped the same day of sampling and are not left unattended. If samples are collected over multiple days and then shipped/delivered in a single shipment, then custody seals on individual sample containers would be recommended. On a case by case basis, DEQ's Office of Compliance and Enforcement (OCE) may also request that seals are placed in individual containers. If custody seals **are** to be placed on

individual sample containers, the containers must be protected from excessive moisture (ice water) that may cause the custody seals to be damaged or come off the container. Sealing the containers in zip-lock plastic bags is highly recommended.

Once sealed, a cutter is required to remove the tape, assuring the integrity of the samples to their delivery destination. A copy of the COC form should be retained by the sample collector. Copies of receipts from post offices, or bills of lading, will be retained by the laboratory as part of the permanent chain-of-custody documentation.

An effective ***security tape/seal*** is any material (e.g. tape) that cannot be removed without detection. Filament packing tape wrapped several times completely around the cooler makes for good sealing material. The tape should be signed or initialed and dated using a permanent marker pen across the tail-end of the tape.

The DEQ security seals available from LEAD, are generally effective as seals on individual glass and plastic sample containers (too much water may cause damage to the seals).

If samples are relinquished for transport to the laboratory, the transfer must be properly documented, i.e. signatures of both parties, date, and time of transfer recorded on the COC form Note: Shipment of a secure cooler/ice chest via third party transport does not require signature by the company agent.

The sample collector must complete a Chain-of-Custody form for all samples that are delivered directly to the laboratory. The sample collector will receive a copy to acknowledge receipt of the samples by the Sample Coordinator.

Transfer of Custody

When transferring possession/custody of samples the date and time of transfer must be recorded on the chain of custody form, and all persons involved must sign the record. The sample collector is responsible for proper packaging, security, and transport of samples to the laboratory for analysis, as well as providing all necessary sample documentation.

Laboratory and Environmental Assessment Division (LEAD) Custody

This section includes all of the routine practices stated in first level custody and the field.

The Sample Coordinator and Sample Custodian are the principal custodians of samples in LEAD.

Samples should be handled by a minimum number of persons.

If custody or evidence seals/tape are present, they are inspected for integrity on the sample coolers and/or individual sample containers. The presence/absence of seals on both coolers and sample containers and their condition are noted on the sample receipt checklist.

➢ Locked Storage

Sampling event numbers and container ID numbers for each sample are entered into the legal custody logbook binder and the all sample containers are placed into the locked storage refrigerator. The process is witnessed and time, date, and the initials of receiver and witness are also entered into the logbook.

All samples in the locked storage must be signed out and back in with the same information for each transfer of custody.

All empty containers are returned to the locked storage in the same fashion.

➢ Laboratory Custody

Once signed out to an analyst, they are responsible for the integrity of the sample until signed back in to the locked storage. The laboratory is considered a secure area for samples during processing as there is limited key card access. The original samples is processed and returned to secure storage.

Original samples and sample containers are retained until Office of Enforcement informs the sample coordinator that the samples are no longer needed and may be disposed.

Records Management

The Chain of Custody and Field Data Sheets are scanned into the electronic report and kept into the physical sampling event (case) file.

The sample receipt checklist is stored with the physical case file.

The custody log for the case is maintained in the logbook binder until the samples have been disposed. Once disposed, a copy of the log page(s) from the binder is placed in the physical file folder of the sampling event.

Sample Control maintains a locked refrigerator, with limited key card access, exclusively for storing **SECOND CUSTODY LEVEL** samples. The refrigerator is accompanied by a log book in which to record sample transfers. The Sample Coordinator, sample Custodian, QA Chemist, Inorganic and Organic laboratory Managers, and laboratory Division Administrator are the only staff that has key card access to the locked refrigerator.

It is always appropriate to make written comments on the Chain-of-Custody form concerning the integrity or condition of samples.

If the samples have been mailed or shipped to the laboratory, the Security Seal number must be recorded on the Chain-of-Custody form (if there is no number on the seal, document the presence/absence of an intact seal. Transportation receipts are attached to the copy for filing, and a second copy is given to the sample collector to acknowledge receipt.

SECOND CUSTODY LEVEL samples are distributed for analysis or secured in a locked refrigerator, as appropriate. A copy of the Chain-of-Custody form must be kept with samples. Samples are considered to be in a secure area upon custody transfer from the Sample Custodian to the laboratory staff.

All laboratory documentation and logs are filled out as usual, but the samples are identified as "LEGAL" to alert the analyst of the need to follow custody procedures.

The laboratory area is designated a secure area, and access is restricted to authorized personnel only.

Laboratory personnel are responsible for the care and custody of the sample, once it is in their possession. They should be prepared to testify that the sample was in their view, or secured in the laboratory area, at all times while in their custody. The samples may be stored in Key card-access refrigerators for short term storage until the samples are returned to sample control and signed back in.

Approved methods for laboratory analysis will be used and documented. All analytical results are recorded in bound notebooks or on bench sheets and are retained as a permanent record in the laboratory, as well as on LIMS.

When sample analyses are complete the unused portion of sample must be returned to secure storage until data is reported out of the laboratory.

Unused portion of samples logged into the laboratory under **FIRST CUSTODY LEVEL** will be discarded as soon as the analytical data is reported.

Unused portion of samples logged into the laboratory under **SECOND CUSTODY LEVEL** will be discarded/destroyed only by order of Legal Council or the Division Administrator after consultation with enforcement officials, when it is verified that samples are no longer required. The disposal of the samples is also documented (date, time, DEQ staff) in the custody logbook form. A copy of the internal custody logbook forms will be maintained in the case/event file.

References

NPDES Compliance Inspection Manual, U.S. EPA, 305-X-04-001, Office of Enforcement and Compliance Assurance Office of Compliance, July 2004 (Appendix J and H updated 2006)

Handbook for Analytical Quality Control in Water and Wastewater laboratories, U.S. EPA 600/4-79-019, EMSL - Cincinnati, Office of Research and Development, March, 1979.

APPENDIX F OSHD and EPA DRINKING WATER STANDARDS[16]

EPA PRIMARY STANDARDS mg/L

Goal: to protect human health in public drinking water supplies. MCLs are enforceable, MCLGs are not.

ORGANICS	MCL[17]	MCLG[18]
Disinfection By-Products (DBPs)		
a) Trihalomethanes		
Sum of 4 THM's below:		
Chloroform		0.07
Bromoform		zero
Chlorodibromomethane		0.06
Bromodichloromethane		zero
Total THMs	0.080	
b) Haloacetic Acids (HAAs)		
Sum of 4 THM's below:		
Dichloroacetic acid		zero
Monochloroacetic acid		0.07
Trichloroacetic acid		0.02
Bromoacetic acid		--
Dibromoacetic acid		--
Total HAA 5	0.060	
c) Bromate	0.010	zero
d) Chlorite	1.0	0.8
Pesticides & PCBs		
Alachlor	0.002	zero
Aldicarb	0.003	0.001
Aldicarb sulfoxide	0.004	0.003
Aldicarb sulfone	0.002	0.002

[16] From 40 CFR parts 141 and 142, July 2008

[17] Maximum Contaminant Level, mg/L

[18] Maximum Contaminant Level Goal, mg/L

Atrazine	0.003	0.003
Carbofuran	0.04	0.04
Chlordane	0.002	zero
Dibromochloropropane (DBCP)	0.0002	zero
Endrin	0.002	0.002
Ethylene dibromide (EDB)	0.00005	zero
Heptachlor	0.0004	zero
Heptachlor epoxide	0.0002	zero
Lindane	0.0002	0.0002
PCBs	0.0005	zero
Pentachlorophenol	0.001	zero
Toxaphene	0.003	zero
Methoxychlor	0.04	0.04

Chlorophenoxy Herbicides

2,4-D	0.07	0.07
2,4,5-TP (Silvex)	0.05	0.05

VOC's - regulated

	MCL	**MCLG**
Benzene	0.005	zero
Carbon tetrachloride	0.005	zero
1,2-Dichlorobenzene (ortho)	0.6	0.6
1,4-Dichlorobenzene (para)	0.075	0.075
1,2-Dichloroethane	0.005	zero
1,1-Dichloroethylene	0.007	0.007
cis-1,2-Dichloroethylene	0.07	0.07
trans-1,2-Dichloroethylene	0.1	0.1
Dichloromethane	0.005	zero
1,2-Dichloropropane	0.005	zero
Ethylbenzene	0.7	0.7
Chlorobenzene (mono)	0.1	0.1
Styrene	0.1	0.1
Tetrachloroethylene	0.005	zero
Toluene	1	1
1,1,1-Trichloroethane	0.200	0.20
1,1,2-Trichloroethane	0.005	0.003

Trichloroethylene	0.005	zero
Vinyl Chloride	0.002	zero
Xylenes	10	10

SOCs

	MCL	MCLG
Di(ethylhexyl)adipate	0.4	0.4
Di(ethylhexyl)phthalate	0.006	zero
Hexachlorobenzene	0.001	zero
Hexachlorocyclopentadiene	0.05	0.05
1,2,4-Trichlorobenzene	0.07	0.07
2,3,7,8-TCDD (Dioxin)	0.00000003	zero
Dalapon	0.2	0.2
Dinoseb	0.007	0.007
Diquat	0.02	0.02
Endothall	0.1	0.1
Glyphosate	0.7	0.7
Picloram	0.5	0.5
Simazine	0.004	0.004
Oxamyl (Vydate)	0.2	0.2

e) PAHs

Benzo(a)pyrene	0.0002	zero

INORGANICS

Asbestos	7 MFL[19]	7 MFL
Cyanide (CN)	0.2	0.2[20]
Fluoride (F)	4.0	4.0
Nitrate as N	10	10
Nitrite as N	1	1
Nitrate + Nitrite as N	10	10
Antimony (Sb)	0.006	0.006
Arsenic (As)	0.010	zero
Barium (Ba)	2	2

[19] Million fibers per Liter > 10 microns
[20] As Free Cyanide, Amenable Cyanide or Weak Acid Dissociable Cyanide

Beryllium (Be)	0.004	0.004
Cadmium (Cd)	0.005	0.005
Chromium (Cr)	0.1	0.1
Copper (Cu)	1.3[21]	1.3
Lead (Pb)	0.015[21]	zero
Mercury (Hg)	0.002	0.002
Selenium (Se)	0.05	0.05
Thallium (Tl)	0.002	0.0005

BACTERIOLOGICAL

Total Coliform Bacteria 2.2/100 mLs

OSHD & EPA SECONDARY Standards (quality) SMCL[23]'s (mg/L)

Goal: protection of aesthetics (taste & appearance) of Public Drinking Water supplies. **NOT Primary MCLs**.

Silver (Ag)	0.1 mg/L
Aluminum (Al)	0.05 to 0.02 mg/L
Beryllium (Be)	0.004 mg/L
Chloride (Cl)	250 mg/L
Copper (Cu)	1.0 mg/L
Fluoride (F)	2.0 mg/L
Iron (Fe)	0.3 mg/L
Manganese (Mn)	0.05 mg/L
Sulfate (SO_4)	250 mg/L
Zinc (Zn)	5.0 mg/L
Total Dissolved Solids (TDS)	500 mg/L
Total Hardness	250 mg/L
Surfactants (MBAS)	0.5 mg/L
pH	6.5 – 8.5 pH Units
Odor	3 threshold odor number
Color	15 color units
Corrosivity	non-corrosive

Calcium also monitored as a parameter for corrosivity.

[21] "Action Level", not MCL.
[23] Secondary Maximum Contaminant Limit

APPENDIX G DETECTION/QUANTITATION LIMITS

DL?RL ?MDL?PQL?LOD?LOQ?

M*ethod Detection Limit* and *Practical Quantitation Limit* are common terms used to describe detection levels and though there are technical differences from "Limit of Detection" and "Limit of Quantitation", they are generally used interchangeably (MDL/LOD and PQL/LOQ). Note many laboratories use the term Reporting Limit (RL) synonymously with PQL and LOQ.

Prior to development of sophisticated analytical instrumentation common today (GC, GC/MS, ICAP, ICP/MS, HPLC, etc), chemical analysis was "a kinder and gentler" field of expertise. Whereas chemists formerly separated, purified, and weighed an analyte of concern, analysts now measure an optical, electrical, or electromagnetic property of an analyte, or a discreet fragment thereof, assisted by a highly refined computer that controls the measurement system and statistically evaluates the instrument signal. At some concentration it becomes impossible to distinguish between signal from analyte, and that arising from electronic "noise."

M**ETHOD DETECTION LIMIT (MDL)** The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte (USEPA 40CFR136 Appendix B).

The MDL considers all operations performed on a sample (digestion, extraction, etc). A MDL is measured by analyzing a minimum of seven samples in a given matrix spiked at very low concentration levels (between 1X and 10X estimated MDL) using procedures in 40 CFR 136 Appendix B. The MDL is the standard deviation (s) of these replicate analyses multiplied by the Student's T value for 99% confidence with n-1 degrees of freedom.

A measured value is credible and meaningful only when it is larger than the uncertainty associated with it (e.g. an observation of 50 mg/L $\pm$ 100% is not as believable as 50 mg/L $\pm$ 20%).

As the measurement concentration increases the relative uncertainty decreases.. The **LIMIT OF QUANTITATION (LOQ)** or **PRACTICAL QUANTITATION LIMIT (PQL)** are defined as the concentration above which quantitative results may be obtained with a specified degree of confidence. For practical purposes, this is represented by laboratory control limits for the analyte of concern. The levels of the LOQ or PQL should be such that they are incorporated in the calibration range of the method.

METHOD DETECTION and PRACTICAL QUANTITATION LIMITS are NOT method constants; they depend on analyst expertise, quality control employed, and the matrix being measured. Although it is customary for labs to adopt MDLs and PQLs published in EPA methods, they should periodically be measured by each laboratory for each matrix they analyze. The PQL of an analyte in various matrices can range from 50 to 500 times higher than in groundwater.

Use of data reported as below MDL (< MDL) can be a problem. ACS and ASTM take the position that observations below MDL should be reported as "Not Detected" (ND), with the numerical MDL reported in parentheses; however EPA's position is that this data should be reported (only some programs). DEQ uses the convention of reporting values below a detection level, be it the LOD or LOQ as <LOD or <LOQ with a numeric value of the LOD/LOQ following the “<”. One problem with reporting <MDL as "ND" is that the data may be treated as "zero" in subsequent calculations. This type of censoring biases the summary statistics, and ignores important information about data variability at these low levels.

Two additional practices commonly used for treating values below the LOD data in calculations, besides treating "ND" measurement as zero, are: consistently treat the measurement as if it were AT the MDL (EPA preferred), rather than below it, or treat the measurement as if it were one-half the numerical value of the MDL. Thus <0.0005 becomes either 0.0005 or 0.00025 for calculation purposes. Whichever convention is chosen, some bias is inevitable. For Relative Percent Difference (RPD) calculation on QA Reports DEQ LEAD uses 0 for results < MDL. In these cases an absolute difference is used to evaluate precision. All of these conventions have their merits but whatever convention is chosen, it must be declared and consistently applied.

ON DEQ LABORATORY REPORTS

When diluting samples at the time of preparation or at the time of analysis the LOQ and LOD will be adjusted based on the dilution and the sample result will also be adjusted accordingly

APPENDIX H MATRIX QUALITY CONTROL (SPIKES AND DUPLICATES)

What is meant by ***Matrix Spike***? ***Matrix Spike Duplicate***? The concept can be very confusing.

Matrix Spike (MS) a matrix spike is the addition of a known amount of target analyte to a sample prior to preparation and analysis. A matrix spike is useful for assessing the ***performance of a method in a specific sample matrix.*** *I.e.* systematic errors arising from, sample extraction efficiency sample matrix effects and other interferences. Matrix spikes are generally not used as an indication of laboratory batch QC performance. It tells us how well suited a method is for a particular matrix.

Matrix Spike Duplicate (MSD) are just as the name describes: a duplicate of the Matrix Spike. MSDs are useful for assessing ***analytical precision and sample homogeneity***, *i.e.* random errors arising from instrument instability, variations in sample composition, faulty technique, tolerances, etc.. Analytical precision sample homogeneity can also be determined by analysis of two portions of the same sample, *e.g.* duplicate samples, without spiking. Analysis of *field* duplicate samples can be used to assess field sampling precision (representativeness of sample collection). Various methods developed under different programs (CWA, SDWA, & RCRA) require MSs and MSDs at a frequency from 5 to 10% of the samples collected.

Most analytical methods are developed using relatively clean samples under well controlled conditions. When the method is applied by a *real-world* analyst to a *real-world* sample matrix containing chemical compounds that interfere with the method, by either reducing or enhancing the recovery of the analyte of interest, we are said to have a bias. Although it may not appear logical, it is not uncommon to add an accurately known quantity of analyte to a sample, analyze it, and get back considerably less or more than 100% of what was added. In most cases bias is characterized by occurring in the same direction, *e.g*. for a given analyst-matrix-method combination the results are nearly always biased in the same direction, either high or low.

The degree of bias and precision in test data is a result of both systematic and random error in both the sampling and analytical phases of the project. Assessing which uncertainty is attributable to which activity is not a precise science, given the limited amount of data associated with each individual project and unique matrix.

Theoretically the sample, MS, and MSD analyses are performed on identical portions of homogeneous sample material originating in a single sample container. This is doable for some types of sample, *e.g*. aqueous, or very finely divided, dry solid (*e.g.* powdered sand), but it is not possible for every sample matrix or method. The key to this admonition is that the sampled material must be homogeneous, and there must be enough sample quantity to prepare and analyze several portions of the same sample.

The basis for this technique is that by analyzing a portion of the original sample, as it comes from the field, we determine the concentration of those analytes in all portions of that sample, including those portions we subsequently spike (MS and MSD) with a known concentration of analyte.

It is necessary to find the analyte concentration in the unspiked, original sample material before it is possible to calculate the recovery of the added (spiked) concentration. Matrix spike recovery is calculated as follows:

$$\textbf{Percent Spike Recovery} = 100 \times \frac{\textbf{Observed Concentration}}{\textbf{(Spike Concentration)} + \textbf{(Initial Concentration)}}$$

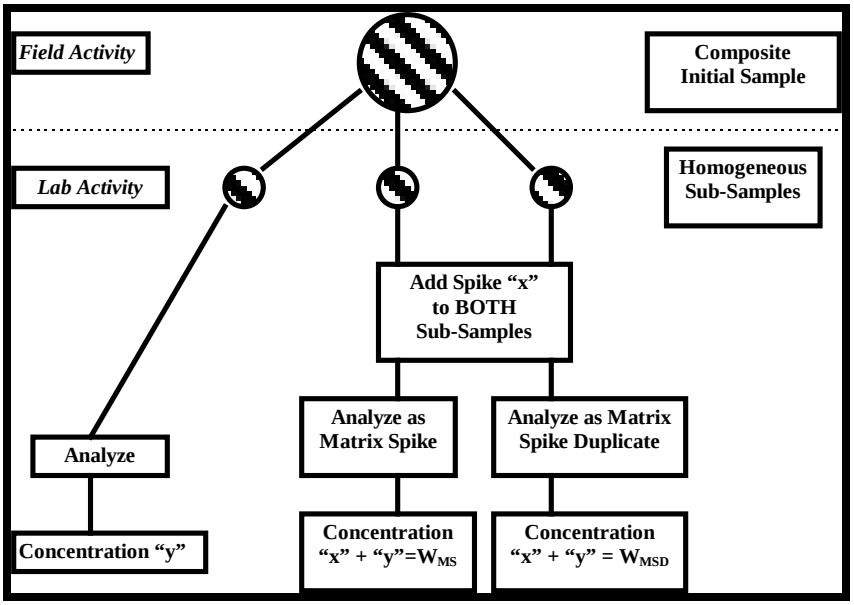
Where: ***Observed Concentration*** = concentration of analyte found in spiked sample

Spike Concentration = concentration of analyte spike added

Initial Concentration = concentration of analyte in unspiked sample

Uncertainty may be created when sample, MS, and MSD are collected as separate, discreet samples; a question of homogeneity arises, particularly for soils or solids, raising concerns about the relevance of MS & MSD analyses. The probability of collecting two or more soil grab samples, even out of the same hole, and have them be identical is practically non-existent. For valid samples for spiking collect multiple grab samples, mix them together to produce a homogeneous composite, and then sub-sample the composite. Although it would be best to send a single, bulk sample to the lab, if the composite is *thoroughly* mixed it could be packaged in multiple containers. This approach should work for semi-volatiles, pesticides, TPH, herbicides, PAH, and PCBs in soil as well as for all inorganic parameters.

Ideally the diagram below is the way MS & MSD samples should originate, not by collecting separate grab samples for each entity.



Mixing a composite of soil grab samples is generally not a valid approach for Volatile Organic samples; samples for VOCs should be disturbed as little as possible to preclude loss of volatiles. Instead it is better to collect several smaller grab samples and place them in the container undisturbed.

Where a MS/MSD (or Duplicate sample analysis) is needed for a project, please note the information on the Chain of Custody. The sampler may designate a specific sample on the COC or the lab may select one if a specific sample is not designated.

The quantity of sample submitted can hamper doing MS and MSD analyses. With soils it is less of a concern, because relatively small quantities of sample are necessary for analyses. However for aqueous samples most organic methods require a 1 liter sample for each analysis. This does not allow performing multiple analyses on a single container for semi-volatiles, pesticides, herbicides, etc., because it takes one full container for each analysis. In these cases additional sample must be collected and submitted in order for the laboratory to perform the MS/MSD. For most Inorganic analyses there is enough sample in a container to run the QC out of sample submitted without having to collect additional volume though if there are a lot of tests that come out of the same container, an additional one may still be needed. If you are coordinating with the laboratory ahead of time, they can help ensure you have sufficient containers for any additional QC samples.

In many organic analytical methods, ***Surrogate Spikes***[24] are added to each sample analyzed, as a quality control measure. A *Surrogate* is a stable compound that is chemically similar to the analytes

[24] Anywhere from one to six surrogate compounds may be used depending on the method.

being analyzed for, but either isotopically labeled or else does not occur as a natural or manmade substance normally observed in environmental samples. The surrogate spike performs a similar function as a matrix spike but is added to every sample. Percent recovery of these surrogates must fall within a specific range for the analysis to be considered “acceptable.” Examples include D6-Benzene (benzene with all six hydrogen atoms replaced by deuterium), bromofluorobenzene, various di- or tri-substituted fluorobenzenes, etc.

Problems can occur with surrogate recoveries on samples containing elevated concentrations of one or more analytes. Surrogate spikes are prepared at a concentration to function within the normal calibration range of the analytical instrument. Observation of very high concentrations of one or more analytes requires the sample be diluted to bring these elevated concentrations within the valid concentration range. Substantial sample dilution often results in dilution of the surrogate concentration to a level that is below their detection limit. Although surrogate recovery may appear bad, it may not be when all the facts are known.

APPENDIX I LABORATORY SAMPLE AND PRESERVATION REQUIREMENTS

ANALYTE	CONTAINER[25]	MIN. QUANTITY	PRESERVATION	HOLDING TIME[27]
Acidity	1L Poly	100 mL	Cool ≤ 6°C	14 days
Alcohols	1L Amber	50 mL	Cool ≤ 6°C	14 days
Alkalinity	1L Poly	100 mL	Cool ≤ 6°C	14 days
Asbestos (bulk)	Zip Lock Bag	200 g	None	N/A
BOD	1L Poly, BOD Bottle	300 mL	Cool ≤ 6°C	48 hours
BOD_5	1L Poly, BOD Bottle	300 mL	Cool ≤ 6°C	48 hours
CBOD	1L Poly, BOD Bottle	300 mL	Cool ≤ 6°C	48 hours
NBOD[28]	1L Poly, 2x BOD Bottle	600 mL	Cool ≤ 6°C	48 hours
Chloride	250mL, 500mL, 1L Poly	50 mL	None	28 days
Chlorine	1L Poly	50 mL	Cool ≤ 6°C	Immediate
Chlorophyll	Petri dish	1 filter	Field Filter, acetone w/ MgCl, dry ice Avoid light	28 days
COD	500mL Poly	50 mL	H2SO4 pH <2, Cool < 6oC	28 days
Color	1L Poly	50 mL	Cool ≤ 6°C	48 hours
Conductivity	1L Poly	50 mL	Cool ≤ 6°C	28 days

[25] Wide Mouth Jars (4, 6, or 8 oz) can be used for all soil analyses with the exception of Volatile Organics. Preservation for soil samples is Cool < 6°C in almost all cases, freezing may extend the HT for some parameters.

[27] Holding Time for water and soil samples may be different.

[28] Nitrogenous BOD determined by difference between BOD & CBOD.

ANALYTE	CONTAINER[25]	MIN. QUANTITY	PRESERVATION	HOLDING TIME[27]
Cyanide	1L Poly	500 mL	NaOH pH > 10 (dechloro if needed) Cool ≤ 6°C	14 days
Dissolved Oxygen (DO)	BOD bottle, P	300 mL	Cool ≤ 6°C	0.5 h, 8h/8h[29]
Ethylene Dibromide (EDB)	40 mL VOA x 2	2 x 40 mL	No Headspace Cool ≤ 6°C	14 days
Flash Point	500 mL glass jar	200 g	Cool ≤ 6°C	30 days
Fluorescein	1L Amber	1000 mL	Cool ≤ 6°C	30 days
Fluoride	DP	50 mL	None Required	28 days
Formaldehyde	1L Amber	1000 mL	Cool ≤ 6°C	30 days
Glycol	1L Amber	1000 mL	Cool ≤ 6°C	30 days
Herbicides	1L Amber	1000 mL	Cool ≤ 6°C	7d/40d
Hexane Extractable Material (formerly Oil and Grease)	1L Amber	1000 mL	H2SO4 pH <2, Cool < 6oC	28 days
Hydrocarbon ID	1L Amber	1000 mL	Cool ≤ 6°C	7d/40d
Ketones-Aldehydes (Air)	Cartridge DNPH	1	Cool ≤ 6°C	14d/30d
Lignin-Tannin	1L Poly	50 mL	Cool ≤ 6°C	N/A
MBAS	1L Poly	250 mL	Cool ≤ 6°C	48 hours
METALS				
Chromium +6	250 or 500mL Poly	100 mL	Cool ≤ 6°C	24 hours
Mercury	500mL Poly	100 mL	HNO_3 pH <2. Cool ≤ 6°C	28 days
Hardness (calc. Ca/Mg)	250 or 500mL Poly	100 mL	Field Filter, HNO_3 pH <2	6 months
Metals, Total.Recoverable	250 or 500mL Poly	100 mL	HNO_3 pH <2	6 months

[29] Analyze immediately. Winkler allows stabilization & holding for 8 hours until titration.

ANALYTE	CONTAINER[25]	MIN. QUANTITY	PRESERVATION	HOLDING TIME[27]
Metals, Dissolved	250 or 500mL Poly	100 mL	Field Filter, HNO_3 pH <2	6 months
Enterococci	Sterile Plastic Bac-T	100 mL	Cool $\leq$ 6°C	8 hours Legal, 30 hours routine
Fecal coliform, non-chlorinated	Sterile Plastic Bac-T	100 mL	Cool $\leq$ 6°C	8 hours NPDES compliance 24 hours non-compliance
Total coliform, chlorinated	Sterile Plastic Bac-T	100 mL	Sodium thiosulfate Cool < 6oC	8 hours NPDES compliance 24 hours non-compliance
Ammonia nitrogen	500mL Poly	50 mL	H2SO4 pH <2, Cool < 6oC	28 days
Nitrite nitrogen	DP, 1L Poly	50 mL	Cool $\leq$ 6°C	48 hours
Nitrate+Nitrite nitrogen	500mL Poly	50 mL	H2SO4 pH <2, Cool < 6oC	28 days
Total Kjeldahl Nitrogen	500mL Poly	50 mL	H2SO4 pH <2, Cool $\leq$ 6°C	28 days
Organotins (TBT, etc)	Polycarbonate 4-8 oz jar (soils)	1000 mL	Cool $\leq$ 6°C	7d / 40d (water), 14d / 40d (soil) 8wk / 40d (soil-frozen)
Ortho Phosphate	250 or 500mL Poly	100 mL	Field Filter, Cool $\leq$ 6°C	48 hours
Pesticides, Chlorinated or Nitro-Phos	1L Amber	1000 mL	Cool $\leq$ 6°C	7 days to extract, 40 days after
Pharmaceutical and Personal Care products	1L Amber (two bottles ea.)	2000 mL	Cool $\leq$ 6°C	7 days to extract, 40 days after

ANALYTE	CONTAINER[25]	MIN. QUANTITY	PRESERVATION	HOLDING TIME[27]
Polynuclear Aromatic Hydrocarbons (PAH)	1L Amber	1000 mL	Cool ≤ 6°C	7 days to extract, 40-days after
Polynuclear Aromatic Hydrocarbons (PAH) (Air)	Cartridge PUF	1	Cool ≤ 6°C	14d/30d
PCB	1L Amber, L	1000 mL	Cool ≤ 6°C	1 year to extract, 1 year after
Pentachlorophenol	1L Amber	1000 mL	Cool ≤ 6°C	7 days to extract, 40-days after
Percent Fat	Foil	1 fish	Freeze < 10°C	6 months
pH	1L Poly	100 mL	Cool ≤ 6°C	Immediate (24 hrs)
Phenolics	1L Poly ,1L Amber,	500 mL	H2SO4 pH <2, Cool < 6oC	28 days
Pheophytin	Chlorophyll tube	8 mL	Field Filter, acetone w/ MgCl, dry ice Avoid light	7 days
Phthalates	1L Amber	1000 mL	Cool ≤ 6°C	7 days to extract, 40-days after
Sediment moisture	glass jar	200 g	Cool < 6°C	28 days
Semivolatile Organics (PPOE, BNA)	1L Amber	1000 mL, 10 g	Cool ≤ 6°C	7 days to extract, 40-days after
Steroids and Hormones	1L Amber	1000 mL, 10 g	Cool ≤ 6°C	7 days to extract, 40-days after
Sulfate	250mL, 500mL, 1L Poly	50 mL	Cool ≤ 6°C	28 days
Sulfides	250 mL Poly	100 mL	10 drops 2N Zn Acetate NaOH pH >9 Cool ≤ 6°C	7 days
Percent Solids (soil/solids)	glass jar	200 g	Cool < 6°C	28 days

ANALYTE	CONTAINER[25]	MIN. QUANTITY	PRESERVATION	HOLDING TIME[27]
Solvents	40 mL VOA	40 mL	No Headspace, Cool ≤ 6°C	14 days
Solids(Dissolved, Total, or Suspended)	1L Poly	200 mL ea	Cool ≤ 6°C	7 days
TCLP	250mL, 500mL, 1L Poly, 1L Glass or Amber, glass jar	200 mL, 500g	Cool ≤ 6°C	7 days to extract 28 days to extract if metals only (6 mos. if Hg not target analyte).
Total Organic Carbon	500mL Poly	10 mL	H2SO4 pH <2, Cool < 6oC	28 days
Total Phosphate	500mL Poly	100 mL	H2SO4 pH <2, Cool < 6oC	28 days
Total Volatile Solids	1L Poly	200 mL	Cool ≤ 6°C	7 days
Total Organic Halides	250mL, 500mL Amber	100 mL	H2SO4 pH <2, Cool < 6oC	28 days
Turbidity	1L Poly	50 mL	Cool ≤ 6°C	48 hours
Volatile Aromatics	40 mL VOA x 2 L	2 x 40 mL, 5 g	HCL, No Headspace, Cool ≤ 6°C	14 days
Volatile Organics (Water)	40 mL VOA x 2	2 x 40 mL	HCL, No Headspace, Cool ≤ 6°C [30] No Headspace, Cool ≤ 6°C	14 days 3 days - Acrolein 7 days – Aromatics 14 days – Other VOCs
Volatile Organics (Soil)	40 mL VOA w/ Methanol 40 mL VOA	5 g	Cool ≤ 6°C Cool ≤ 6°C / Freeze - 10°C	14 days 48 hrs / 14 days

[30] If 2-CVE, Acrolein, or Acrylonitrile are target analytes a 2nd ' **DO NOT USE HCL, a separate unacidified sample is required**.

APPENDIX J DEQ LABORATORY ANALYTICAL TECHNIQUES and LOQ

INORGANIC ANALYSES

ANALYTE	ANALYTICAL TECHNIQUE	LOQ[31] (waters)
Aluminum	ICP	0.050 mg/L
Aluminum	ICP Mass Spectrometry	20.0 μg/L
Antimony	ICP	0.015 mg/L
Antimony	ICP Mass Spectrometry	0.30 μg/L
Arsenic	ICP	0.010 mg/L
Arsenic	ICP Mass Spectrometry	0.25 μg/L
Barium	ICP	0.0020 mg/L
Barium	ICP Mass Spectrometry	2.0 μg/L
Beryllium	ICP	0.00050 mg/L
Beryllium	ICP Mass Spectrometry	0.10 μg/L
Boron	ICP	0.020 mg/L
Boron	ICP Mass Spectrometry	20 μg/L
Cadmium	ICP	0.0050 mg/L
Cadmium	ICP Mass Spectrometry	0.10 μg/L
Calcium	ICP	0.10 mg/L
Calcium	ICP Mass Spectrometry	200 μg/L
Chromium	ICP	0.0020 mg/L
Chromium	ICP Mass Spectrometry	1.0 μg/L
Cobalt	ICP	0.0030 mg/L
Cobalt	ICP Mass Spectrometry	0.20 μg/L
Copper	ICP	0.010 mg/L
Copper	ICP Mass Spectrometry	1.5 μg/L
Lead	ICP	0.010 mg/L
Lead	ICP Mass Spectrometry	0.20 μg/L
Lithium	ICP	0.015 mg/L
Magnesium	ICP	0.10 mg/L
Magnesium	ICP Mass Spectrometry	50.0 μg/L
Manganese	ICP	0.0050 mg/L

[31] LOQ = Limit of Quantitation

ANALYTE	ANALYTICAL TECHNIQUE	LOQ[31] (waters)
Manganese	ICP Mass Spectrometry	2.0 μg/L
Mercury	Manual Cold Vapor	0.000005 mg/L
Molybdenum	ICP	0.004 mg/L
Molybdenum	ICP Mass Spectrometry	3.0 μg/L
Nickel	ICP	0.004 mg/L
Nickel	ICP Mass Spectrometry	1.0 μg/L
Potassium	ICP	0.50 mg/L
Potassium	ICP Mass Spectrometry	200 μg/L
Selenium	ICP	0.010 mg/L
Selenium	ICP Mass Spectrometry	2.0 μg/L
Silver	ICP	0.0020 mg/L
Silver	ICP Mass Spectrometry	0.10 μg/L
Sodium	ICP	0.30 mg/L
Sodium	ICP Mass Spectrometry	100 μg/L
Silica (SiO_2)	ICP	0.50 mg/L
Silica (SiO_2)	ICP Mass Spectrometry	0.32 mg/L
Strontium	ICP	0.020 mg/L
Strontium	ICP Mass Spectrometry	1.0 μg/L
Tin	ICP Mass Spectrometry	2.0 μg/L
Titanium	ICP Mass Spectrometry	15 μg/L
Thallium	ICP	0.015 mg/L
Thallium	ICP Mass Spectrometry	0.10 μg/L
Vanadium	ICP	0.0020 mg/L
Vanadium	ICP Mass Spectrometry	4.0 μg/L
Zinc	ICP	0.030 mg/L
Zinc	ICP Mass Spectrometry	5.0μg/L
Uranium	ICP Mass Spectrometry	0.10 μg/L
Alkalinity	Titration	1 mg/L
BOD_5	Winkler-Azide Modification/ LDO	2 mg/L
Bromide	Ion Chromatography	0.03 mg/L
$CBOD_5$	Winkler-Azide Mod./Inhib / LDO	2 mg/L

	ANALYTICAL	
ANALYTE	TECHNIQUE	LOQ[31] (waters)
Chloride	Ion Chromatography	0.5 mg/L
Chlorine	Amperometric Titration	0.02 mg/L
Fluoride	Ion Chromatography	0.1 mg/L
Ammonia-Nitrogen	Ion Chromatography	0.01 mg/L
Tot.Kjeldahl Nitrogen	S-Auto Block Digestion	0.2 mg/L
Nitrate-Nitrogen	Auto Cadmium Reduction	0.005 mg/L
Nitrate-Nitrogen	Ion Chromatography	0.05 mg/L
Nitrite-Nitrogen	Auto Colorimetric	0.005 mg/L
Nitrate+Nitrate-Nitrogen	Auto Cadmium Reduction	0.005 mg/L
Ortho Phosphate-P	Colorimetric Ascorbic Acid	0.005 mg/L
Total Phosphate-P	Colorimetric Ascorbic Acid	0.01 mg/L
Sulfate	Ion Chromatography	0.2 mg/L
DISINFECTION BY-PRODUCTS (DBP) (Drinking Water Samples)		
Bromate	Ion Chromatography	5 μg/L
Bromide	Ion Chromatography	30 μg/L
Chlorate	Ion Chromatography	30 μg/L
Chlorite	Ion Chromatography	12 μg/L
INORGANIC PHYSICAL PARAMETERS		
Color	Colorimetric Pd/Co	5 CU[32]
Conductivity	Wheatstone Bridge	1 μmho/cm[2]
pH	Electrometric	0.01 SU[33]
RESIDUES (SOLIDS)		
Filterable (TDS)	Gravimetric, 180°C	10 mg/L
Nonfilterable (TSS)	Gravimetric, 103-105°C	1 mg/L
Total (TS)	Gravimetric, 103-105°C	10 mg/L
Volatile (TVS)	Gravimetric, Ignition @ 550°C	10 mg/L
Turbidity	Nephelometric	1 NTU[34]

[32] CU = Color Units

[33] SU = Standard pH Units

[34] NTU = Nephelometric Turbidity Units

	ANALYTICAL	
ANALYTE	TECHNIQUE	LOQ[31] (waters)

ORGANIC ANALYSES

ANALYTE	ANALYTICAL TECHNIQUE	LOQ[35] (waters)
Adipates	Solvent Ext, GC/MS	0.001 mg/L
BTEX	GC/MS	0.0005 mg/L
Chlorinated Pesticides	Solvent Ext., GCMS	0.00002 mg /L (20 ng/L)
Chlorinated Herbicides	micro solvent extraction with derivitization, GC	0.0001 – 0.0006 mg/L
Cyanide Amenable to Chlorination (See 4.1.3)	Colorimetric Barbiturate	0.01 mg/L
EDB, DBCP	GC	0.05 µg/L
Flash Point		
Formaldehyde	HPLC/UV	
Hydrocarbon ID (HCID)	GC/FID	0.6 mg/L
Ketones & Aldehydes	HPLC/UV	
Lignin-Tannin		1 mg/L
PCBs	Solvent Ext., GCMS	< 0.001 µg/L
N-P Pesticides	LCMS	< 0.040 µg/L
Hexane Extractable Material (Oil and Grease)	Hexane Extraction, Gravimetric	5 mg/L
Organotins	Non-DEQ analysis	Non-DEQ analysis
PAHs	Solvent Extract, GC/MS / GCMS SIM	0.001 mg/L / 0.1 µg/L
Pentachlorophenol	Semi-Volatile GC/MS	0.0001 mg/L
Phenolics	Colorimetric, Automated 4-AAP with Distillation Not performed by DEQ Lab	0.005 mg/L
Phthalates	Extraction, GC/MS	0.001 mg/L
SemiVols (PPOE, BNA)	Extraction, GC/MS	0.001 mg/L

[35] LOQs vary by compound. The limits shown in the table are only a general expectation and do not necessarily reflect all compounds in a group. Contact the laboratory for compound specific reporting limits

	ANALYTICAL	
ANALYTE	TECHNIQUE	LOQ[35] (waters)
Trihalomethanes	Purge & Trap, GC/MS	0.0005 mg/L
Volatile Organic Compunds (VOCs)	Purge & Trap, GC/MS	0.0005 mg/L
COD	Spectrophotometric, Cr	5 mg/L
TOC	Wet Oxidation, IR Not currently performed by DEQ Lab	1 mg/L
TOX	Pyrollysis, μcoulometric titration Not performed by DEQ Lab	0.005 mg/L
UST/LUST SOIL CLEANUP [OAR 340-122- (0205-0360]		
TPH HCID	Capillary GC/FID	
TPH-Gx	Purge & Trap GC/FID	0.05 mg/Kg Gasoline
TPH-Dx	Sonic Extr., GC/FID	20 mg/Kg Diesel 50 mg/Kg Oil

APPENDIX K METHOD REFERENCES BY ANALYTE AND ANALYTE GROUP

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Inorganics-Metals			
Aluminum	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Aluminum	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Antimony	EPA 200.7 / 6010 C	EPA 6010 C	
Antimony	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Antimony	EPA 200.9	EPA 7010	EPA 200.9
Arsenic	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Arsenic	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Barium	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Barium	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Beryllium	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Beryllium	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Boron	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Boron	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Cadmium	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Cadmium	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Calcium	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Calcium	EPA 200.8 / 6020 A	EPA 6020 A	
Chromium (total)	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Chromium (total)	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Cobalt	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Cobalt	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Copper	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Copper	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Iron	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Iron	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Lead	EPA 200.7 / 6010 C	EPA 6010 C	
Lead	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Lead	EPA 200.9	EPA 7010	EPA 200.9
Magnesium	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Magnesium	EPA 200.8 / 6020 A	EPA 6020 A	
Manganese	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Manganese	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Mercury (inorganic)	EPA 245.1 / 7470A	EPA 7473	EPA 245.1
Molybdenum	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Molybdenum	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Nickel	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Nickel	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Potassium	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Selenium	EPA 200.7 / 6010 C	EPA 6010 C	
Selenium	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Selenium	EPA 200.9	EPA 7010	EPA 200.9
Silica	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Silica	EPA 200.8 / 6020 A	EPA 6020 A	
Silver	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Silver	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Sodium	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Strontium	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Strontium	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Thallium	EPA 200.7 / 6010 C	EPA 6010 C	
Thallium	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Thallium	EPA 200.9	EPA 7010	EPA 200.9
Tin	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Tin	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Titanium	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Titanium	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Vanadium	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Vanadium	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Zinc	EPA 200.7 / 6010 C	EPA 6010 C	EPA 200.7
Zinc	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Uranium	EPA 200.8 / 6020 A	EPA 6020 A	EPA 200.8
Inorganics-General Chemistry			

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Alkalinity	SM 2320 B		SM 2320 B
Ammonia	SM 4500-NH3 H		
Ammonia	SM 4500-NH3 G		
BOD	SM 5210 B/4500-O C		
Bromide	EPA 300.0/300.1	EPA 9056	EPA 300.0/300.1
Calcium Hardness	SM 2340 B		
CBOD	SM 5210 B		
Chloride	EPA 300.0/300.1	EPA 9056	EPA 300.0/300.1
Chlorophyll / Pheophyton	10200-H		
COD	SM 5220 D		
Color	SM 2120 B		SM 2120 B
Conductivity / Specific Conductance	SM 2510 B		SM 2510 B
Cyanide, total (see 4.1.3)	SM 4500-CN E / EPA 9014	EPA 9010 B/ 9014	SM 4500-CN E
Cyanide, Amenable to Chlorination (see 4.1.3)	SM 4500-CN G, E	EPA 9010 B/ 9014	SM 4500-CN G, E
Fluoride	EPA 300.0/300.1	EPA 9056	EPA 300.0/300.1
Fluoride	SM 4500-F E		SM 4500-F E
Nitrate (measured as Nitrogen)	EPA 300.0/300.1	EPA 9056	EPA 300.0/300.1
Nitrate (measured as Nitrogen)	SM 4500-NO3 F/EPA 353.2		SM 4500-NO3 F/EPA 353.2
Nitrate+Nitrite (measured as Nitrogen)	SM 4500-NO3 F/EPA 353.2		SM 4500-NO3 F/EPA 353.2
Nitrite (measured as Nitrogen)	SM 4500-NO2 B/EPA 353.2		SM 4500-NO2 B/EPA 353.2
Oil & Grease	EPA 1664	EPA 9071	
Orthophosphate as P	SM 4500-P E	EPA 9056	SM 4500-P E
pH	EPA 4500H+B	EPA 9040C / 9045D	EPA 4500H+B
Phenolics, total	EPA 420.1	EPA 9065	
Settleable Solids	SM 2540 F		
Sulfate	EPA 300.0	EPA 9056	EPA 300.0/300.1

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Total Dissolved Solids	SM 2540 C		SM 2540 C
Total Hardness	SM 2340 B		SM 2340 B
Total Kjeldahl Nitrogen	SM 4500 Norg D/EPA 351.2		
Total or Dissolved Organic Carbon	SM 5310 B / EPA 9060		SM 5310 B
Total Phosphorus as P	SM 4500-P E		
Total Residual Chlorine	SM 4500-CL D		SM 4500-CL E
Total Solids	SM 2540 B	SM 2540 G	SM 2540 B
Total Suspended Solids	SM 2540 D		SM 2540 D
Turbidity	SM 2130 B		SM 2130 B
Chlorine (as Cl2)			SM 4500-CL D
Residual Free Chlorine			SM 4500-CL G
Inorganic Disinfection Byproducts			
Bromate			EPA 300.1
Bromide			EPA 300.1
Chlorate			EPA 300.1
Chlorite			EPA 300.1
Herbicides			
2,4,5-TP (Silvex)	SM 6640B	SM 6640B	EPA 515.4
2,4,5-Trichlorophenoxyacetic acid	SM 6640B	SM 6640B	EPA 515.4
2,4-D	SM 6640B	SM 6640B	EPA 515.4
Dicamba	SM 6640B	SM 6640B	10.1.1. EPA 515.4
Dacthal (DCPA)	SM 6640B	SM 6640B	EPA 515.4
2,4-DP (Dichlorprop)	SM 6640B	SM 6640B	EPA 515.4
Dinoseb	SM 6640B	SM 6640B	EPA 515.4
MCPA	SM 6640B	SM 6640B	
MCPP	SM 6640B	SM 6640B	

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Pentachlorophenol	SM 6640B	SM 6640B	EPA 515.4
Picloram	SM 6640B	SM 6640B	EPA 515.4
2,4-DB			EPA 515.4
3,5-Dichloro benzoic acid			EPA 515.4
Acifluorfen			EPA 515.4
Polychlorinated biphenyls (PCBs)			
Aroclor 1016/1242	EPA 8082/608	EPA 8082	EPA 508 / 508A
Aroclor 1016	EPA 8082/608	EPA 8082	EPA 508 / 508A
Aroclor 1221	EPA 8082/608	EPA 8082	EPA 508 / 508A
Aroclor 1232	EPA 8082/608	EPA 8082	EPA 508 / 508A
Aroclor 1242	EPA 8082/608	EPA 8082	EPA 508 / 508A
Aroclor 1248	EPA 8082/608	EPA 8082	EPA 508 / 508A
Aroclor 1254	EPA 8082/608	EPA 8082	EPA 508 / 508A
Aroclor 1260	EPA 8082/608	EPA 8082	EPA 508 / 508A
Volatile Organics			
1,1,1,2-Tetrachlorethane	EPA 8260C/624	EPA 8260C	EPA 524.2
1,1,1-Trichloroethane	EPA 8260C/624	EPA 8260C	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 8260C/624	EPA 8260C	EPA 524.2
1,1,2-Trichloroethane	EPA 8260C/624	EPA 8260C	EPA 524.2
1,1-Dichloroethane	EPA 8260C/624	EPA 8260C	EPA 524.2
1,1-Dichloroethylene	EPA 8260C/624	EPA 8260C	EPA 524.2
1,1-Dichloropropene	EPA 8260C/624	EPA 8260C	EPA 524.2
1,2,3-Trichlorobezene	EPA 8260C/624	EPA 8260C	EPA 524.2
1,2,3-Trichloropropane (TCP)	EPA 8260C/624	EPA 8260C	EPA 504.1
1,2,4-Trichlorobenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
1,2,4-Trimethylbenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260C/624	EPA 8260C	EPA 504.1
1,2-Dibromomethane (Ethylene dibromide)	EPA 8260C/624	EPA 8260C	EPA 504.1

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
1,2-Dichlorobenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
1,2-Dichloroethane	EPA 8260C/624	EPA 8260C	EPA 524.2
1,2-Dichloropropane	EPA 8260C/624	EPA 8260C	EPA 524.2
1,2-Dimethylbenzene	EPA 8260C/624	EPA 8260C	
1,3-Dichlorobenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
1,3-Dichloropropane	EPA 8260C/624	EPA 8260C	EPA 524.2
1,3,5-Trimethylbenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
1,4-Dichlorobenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
1,4/1,3-Dimethylbenzene	EPA 8260C/624	EPA 8260C	
2,2-Dichloropropane	EPA 8260C/624	EPA 8260C	EPA 524.2
2-Butanone (MEK)	EPA 8260C/624	EPA 8260C	
2-Chloroethylvinyl ether	Special Request	Special Request	
2-Chlorotoluene	EPA 8260C/624	EPA 8260C	EPA 524.2
2-Hexanone	EPA 8260C/624	EPA 8260C	
4-Chlorotoluene	EPA 8260C/624	EPA 8260C	EPA 524.2
4-Isopropyltoluene	EPA 8260C/624	EPA 8260C	EPA 524.2
Acetone	EPA 8260C/624	EPA 8260C	
Acrolein	Special Request	Special Request	
Benzene	EPA 8260C/624	EPA 8260C	EPA 524.2
Bromobenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
Bromochloromethane	EPA 8260C/624	EPA 8260C	EPA 524.2
Bromodichloromethane	EPA 8260C/624	EPA 8260C	EPA 524.2
Bromoform	EPA 8260C/624	EPA 8260C	EPA 524.2
Bromomethane	EPA 8260C/624	EPA 8260C	EPA 524.2
n-Butylbenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
sec-Butylbenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
tert-Butylbenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
Carbon disulfide	EPA 8260C/624	EPA 8260C	
Carbon tetrachloride	EPA 8260C/624	EPA 8260C	EPA 524.2
Chlorobenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
Chlorodibromomethane	EPA 8260C/624	EPA 8260C	EPA 524.2
Chloroethane	EPA 8260C/624	EPA 8260C	EPA 524.2

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Chloroform	EPA 8260C/624	EPA 8260C	EPA 524.2
Chloromethane	EPA 8260C/624	EPA 8260C	EPA 524.2
cis-1,2-Dichloroethylene	EPA 8260C/624	EPA 8260C	EPA 524.2
cis-1,3-Dichloropropene	EPA 8260C/624	EPA 8260C	EPA 524.2
Dibromochloromethane	EPA 8260C/624	EPA 8260C	EPA 524.2
Dibromomethane	EPA 8260C/624	EPA 8260C	EPA 524.2
Dichlorodifluoromethane	EPA 8260C/624	EPA 8260C	EPA 524.2
Dichloromethane (Methylene chloride)	EPA 8260C/624	EPA 8260C	EPA 524.2
Ethylbenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
Hexachlorobutadiene	EPA 8260C/624	EPA 8260C	EPA 524.2
Isopropylbenzene (Cumene)	EPA 8260C/624	EPA 8260C	EPA 524.2
Methyl-isobutyl ketone (MIBK)	EPA 8260C/624	EPA 8260C	
Methy tert-butyl ether (MTBE)	EPA 8260C/624	EPA 8260C	EPA 524.2
Naphthalene	EPA 8260C/624	EPA 8260C	EPA 524.2
n-Propylbenzene	EPA 8260C/624	EPA 8260C	EPA 524.2
Styrene	EPA 8260C/624	EPA 8260C	EPA 524.2
Tetrachloroethylene	EPA 8260C/624	EPA 8260C	EPA 524.2
Toluene	EPA 8260C/624	EPA 8260C	EPA 524.2
trans-1,2-Dichloroethylene	EPA 8260C/624	EPA 8260C	EPA 524.2
trans-1,3-Dichloropropene	EPA 8260C/624	EPA 8260C	EPA 524.2
Trichloroethylene	EPA 8260C/624	EPA 8260C	EPA 524.2
Trichlorofluoromethane	EPA 8260C/624	EPA 8260C	EPA 524.2
Vinyl chloride	EPA 8260C/624	EPA 8260C	EPA 524.2
Xylenes (total) **m&p-Xylenes + o-xylene**	EPA 8260C/624	EPA 8260C	EPA 524.2
o-Xylene		EPA 8260C	EPA 524.2
m&p-Xylenes		EPA 8260C	EPA 524.2
Semivolatile Organics - Base Neutrals			

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
1,2,4-Trichlorobenzene	EPA 8270D/625	EPA 8270D	
1,2-Dichlorobenzene	EPA 8270D/625	EPA 8270D	
1,3-Dichlorobenzene	EPA 8270D/625	EPA 8270D	
1,4-Dichlorobenzene	EPA 8270D/625	EPA 8270D	
2,4-Dinitrotoluene	EPA 8270D/625	EPA 8270D	
2,6-Dinitrotoluene	EPA 8270D/625	EPA 8270D	
2-Chloronaphthalene	EPA 8270D/625	EPA 8270D	
3,3'-Dichlorobenzidine	EPA 8270D/625	EPA 8270D	
4-Bromophenyl-phenylether	EPA 8270D/625	EPA 8270D	
4-Chlorophenyl-phenylether	EPA 8270D/625	EPA 8270D	
Acenaphthene	EPA 8270D/625	EPA 8270D	
Acenaphthylene	EPA 8270D/625	EPA 8270D	EPA 525.2
Anthracene	EPA 8270D/625	EPA 8270D	EPA 525.2
Benzo(a)anthracene	EPA 8270D/625	EPA 8270D	EPA 525.2
Benzo(a)pyrene	EPA 8270D/625	EPA 8270D	EPA 525.2
Benzo(b)fluoranthene	EPA 8270D/625	EPA 8270D	EPA 525.2
Benzo(g,h,i)perylene	EPA 8270D/625	EPA 8270D	EPA 525.2
Benzo(k)fluoranthene	EPA 8270D/625	EPA 8270D	EPA 525.2
Bis(2-chloroethoxy)methane	EPA 8270D/625	EPA 8270D	
Bis(2-chloroethyl)ether	EPA 8270D/625	EPA 8270D	
Bis(2-chloroisopropyl)ether	EPA 8270D/625	EPA 8270D	
Bis(2-ethylhexyl) phthalate	EPA 8270D/625	EPA 8270D	EPA 525.2
Bis(2-ethylhexyl)adipate			EPA 525.2
Butylbenzyl phthalate	EPA 8270D/625	EPA 8270D	EPA 525.2
Chrysene	EPA 8270D/625	EPA 8270D	EPA 525.2
Dibenz(a,h)anthracene	EPA 8270D/625	EPA 8270D	EPA 525.2
Dibenzofuran	EPA 8270D/625	EPA 8270D	
Diethyl phthalate	EPA 8270D/625	EPA 8270D	EPA 525.2
Dimethyl phthalate	EPA 8270D/625	EPA 8270D	EPA 525.2
Di-n-butyl phthalate	EPA 8270D/625	EPA 8270D	EPA 525.2
Di-n-octyl phthalate	EPA 8270D/625	EPA 8270D	
Fluorene	EPA 8270D/625	EPA 8270D	EPA 525.2

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Fluoranthene	EPA 8270D/625	EPA 8270D	
Hexachlorobenzene	EPA 8270D/625	EPA 8270D	EPA 525.2 / EPA 508
Hexachlorobutadiene	EPA 8270D/625	EPA 8270D	
Hexachlorocyclopentadiene	EPA 8270D/625	EPA 8270D	
Hexachloroethane	EPA 8270D/625	EPA 8270D	
Indeno(1,2,3-c,d)pyrene	EPA 8270D/625	EPA 8270D	EPA 525.2
Isophorone	EPA 8270D/625	EPA 8270D	
Naphthalene	EPA 8270D/625	EPA 8270D	
Nitrobenzene	EPA 8270D/625	EPA 8270D	
N-Nitrosodiethylamine	EPA 8270D/625	EPA 8270D	
N-Nitrosodimethylamine	EPA 8270D/625	EPA 8270D	
N-Nitroso-di-n-propylamine	EPA 8270D/625	EPA 8270D	
N-Nitrosodiphenylamine	EPA 8270D/625	EPA 8270D	
Phenanthrene	EPA 8270D/625	EPA 8270D	EPA 525.2
Pyrene	EPA 8270D/625	EPA 8270D	EPA 525.2
Semivolatile Organics-Acids			
2,4,5-Trichlorophenol	EPA 8270D/625	EPA 8270D	
2,4,6-Trichlorophenol	EPA 8270D/625	EPA 8270D	
2,4-Dichlorophenol	EPA 8270D/625	EPA 8270D	
2,4-Dimethylphenol	EPA 8270D/625	EPA 8270D	
2,4-Dinitrophenol	EPA 8270D/625	EPA 8270D	
2,6-Dichlorophenol	EPA 8270D/625	EPA 8270D	
2-Chlorophenol	EPA 8270D/625	EPA 8270D	
2-Methylphenol	EPA 8270D/625	EPA 8270D	
2-Nitrophenol	EPA 8270D/625	EPA 8270D	
4,6-Dinitro-2-methylphenol	EPA 8270D/625	EPA 8270D	
4-Chloro-3-methylphenol	EPA 8270D/625	EPA 8270D	
4-Methylphenol	EPA 8270D/625	EPA 8270D	
Pentachlorophenol	EPA 8270D/625	EPA 8270D	
Phenol	EPA 8270D/625	EPA 8270D	

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Chlorinated Pesticides			
4,4'-DDD	EPA 8081B/608	EPA 8081B	
	EPA 8270D/625	EPA 8270D	
4,4'-DDE	EPA 8081B/608	EPA 8081B	
	EPA 8270D/625	EPA 8270D	
4,4'-DDT	EPA 8081B/608	EPA 8081B	
	EPA 8270D/625	EPA 8270D	
Aldrin	EPA 8081B/608	EPA 8081B	EPA 508
	EPA 8270D/625	EPA 8270D	EPA 525.2
alpha-BHC	EPA 8081B/608	EPA 8081B	
	EPA 8270D/625	EPA 8270D	
alpha-Chlordane	EPA 8081B/608	EPA 8081B	
beta-BHC	EPA 8081B/608	EPA 8081B	
	EPA 8270D/625	EPA 8270D	
Chlordane, technical	EPA 8081B/608	EPA 8081B	EPA 508
	EPA 8270D/625	EPA 8270D	
delta-BHC	EPA 8081B/608	EPA 8081B	
	EPA 8270D/625	EPA 8270D	
Dieldrin	EPA 8081B/608	EPA 8081B	EPA 508
	EPA 8270D/625	EPA 8270D	EPA 525.2
Endosulfan I	EPA 8081B/608	EPA 8081B	
	EPA 8270D/625	EPA 8270D	
Endosulfan II	EPA 8081B/608	EPA 8081B	
	EPA 8270D/625	EPA 8270D	
Endosulfan sulfate	EPA 8081B/608	EPA 8081B	
	EPA 8270D/625	EPA 8270D	
Endrin	EPA 8081B/608	EPA 8081B	EPA 508
	EPA 8270D/625	EPA 8270D	EPA 525.2
Endrin Aldehyde	EPA 8081B/608	EPA 8081B	
Endrin ketone	EPA 8081B/608	EPA 8081B	
gamma-BHC (Lindane)	EPA 8081B/608	EPA 8081B	EPA 508

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
	EPA 8270D/625	EPA 8270D	EPA 525.2
gamma-Chlordane	EPA 8081B/608	EPA 8081B	
Heptachlor	EPA 8081B/608	EPA 8081B	EPA 508
	EPA 8270D/625	EPA 8270D	EPA 525.2
Heptachlor epoxide (beta)	EPA 8081B/608	EPA 8081B	EPA 508
	EPA 8270D/625	EPA 8270D	
Methoxychlor	EPA 8081B/608	EPA 8081B	EPA 508
			EPA 525.2
Toxaphene	EPA 8081B/608	EPA 8081B	EPA 508
PAHs			
Acenaphthene	EPA 8270 SIM	EPA 8270 SIM	
Acenaphthylene	EPA 8270 SIM	EPA 8270 SIM	
Anthracene	EPA 8270 SIM	EPA 8270 SIM	
Benzo(a)anthracene	EPA 8270 SIM	EPA 8270 SIM	
Benzo(a)pyrene	EPA 8270 SIM	EPA 8270 SIM	
Benzo(b)fluoranthene	EPA 8270 SIM	EPA 8270 SIM	
Benzo(g,h,i)perylene	EPA 8270 SIM	EPA 8270 SIM	
Benzo(k)fluoranthene	EPA 8270 SIM	EPA 8270 SIM	
Chrysene	EPA 8270 SIM	EPA 8270 SIM	
Dibenz(a,h)anthracene	EPA 8270 SIM	EPA 8270 SIM	
Fluorene	EPA 8270 SIM	EPA 8270 SIM	
Fluoroanthene	EPA 8270 SIM	EPA 8270 SIM	
Indeno(1,2,3-c,d)pyrene	EPA 8270 SIM	EPA 8270 SIM	
Naphthalene	EPA 8270 SIM	EPA 8270 SIM	
Phenanthrene	EPA 8270 SIM	EPA 8270 SIM	
Pyrene	EPA 8270 SIM	EPA 8270 SIM	
Organophosphorus Pesticides (OPP)			
Azinphos-methyl (Guthion)	EPA 8270D	EPA 8270D	
Chlorpyrifos	EPA 8270D	EPA 8270D	
Diazinon	EPA 8270D	EPA 8270D	EPA 525.2

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Dichlorvos (DDVP)	EPA 8270D	EPA 8270D	
Dimethoate	EPA 8270D	EPA 8270D	
Disulfoton	EPA 8270D	EPA 8270D	
Ethoprop	EPA 8270D	EPA 8270D	
Ethyl Parathion	EPA 8270D	EPA 8270D	
Malathion	EPA 8270D	EPA 8270D	
Methyl Parathion	EPA 8270D	EPA 8270D	
Phosmet	EPA 8270D	EPA 8270D	
Stirophos	EPA 8270D	EPA 8270D	
Terbufos	EPA 8270D	EPA 8270D	
Carbamate Pesticides (EPA 8321M / DEQ11-LAB-0031-SOP)			
Baygon	EPA 8321M	EPA 8321M	
Bromacil	EPA 8321M	EPA 8321M	EPA 525.2
Carbaryl	EPA 8321M	EPA 8321M	
Carbofuran	EPA 8321M	EPA 8321M	
Diuron	EPA 8321M	EPA 8321M	
Methiocarb	EPA 8321M	EPA 8321M	
Methomyl	EPA 8321M	EPA 8321M	
Molinate	EPA 8321M	EPA 8321M	EPA 525.2
Oxamyl (vydate)	EPA 8321M	EPA 8321M	
Nitrogen Pesticides (EPA 8321M or EPA 8270D)			
Alachlor	EPA 8321M / EPA 8270D	EPA 8321M / EPA 8270D	EPA 525.2
Ametryn	EPA 8321	EPA 8321	
Atrizine	EPA 8321M / EPA 8270D	EPA 8321M / EPA 8270D	EPA 525.2
Butachlor	EPA 8270D	EPA 8270D	EPA 525.2 / EPA 508.1
Butylate	EPA 8270D	EPA 8270D	
Cyanazine	EPA 8270D	EPA 8270D	

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
EPTC (Eptam)	EPA 8270D	EPA 8270D	
Hexazinone	EPA 8270D	EPA 8270D	
Metolachlor	EPA 8321M / EPA 8270D	EPA 8321M / EPA 8270D	EPA 525.2 / EPA 508.1
Metribuzin	EPA 8270D	EPA 8270D	EPA 508.1
Napropamide	EPA 8321M / EPA 8270D	EPA 8321M / EPA 8270D	
Prometon	EPA 8321M	EPA 8321M	EPA 525.2
Prometryn	EPA 8321M	EPA 8321M	
Pronamide	EPA 8270D	EPA 8270D	
Propachlor	EPA 8270D	EPA 8270D	EPA 525.2 / EPA 508
Propazine	EPA 8321M / EPA 8270D	EPA 8321 / EPA 8270D	
Simazine	EPA 8321M / EPA 8270D	EPA 8321M / EPA 8270D	EPA 525.2
Terbacil	EPA 8270D	EPA 8270D	
Trifluralin	EPA 8270D	EPA 8270D	EPA 525.2 / EPA 508
Organic Dissinfection By Products Haloacetic Acids (HAA)			
Bromochloroacetic acid			EPA 552.2
Dibromoacetic acid			EPA 552.2
Dichloroacetic acid			EPA 552.2
Monobromoacetic-acid			EPA 552.2
Monochloroacetic acid			EPA 552.2
Trichloroacetic acid			EPA 552.2

Steroids and Hormones			
17a-Estradiol	EPA 1698	EPA 1698	
17a-Ethynyl Estradiol	EPA 1698	EPA 1698	
17ß-Estradiol	EPA 1698	EPA 1698	
Cholesterol	EPA 1698	EPA 1698	
Coprostanol	EPA 1698	EPA 1698	
Estriol	EPA 1698	EPA 1698	

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Estrone	EPA 1698	EPA 1698	
Pharmaceuticals and Personal Care Products (PCPs)			
Acetaminophen	EPA 1694	EPA 1694	
Codeine	EPA 1694	EPA 1694	
Caffeine	EPA 1694	EPA 1694	
Sulfamethoxazole	EPA 1694	EPA 1694	
Venlafaxine	EPA 1694	EPA 1694	
Diphenhydramine	EPA 1694	EPA 1694	
Carbamazepine	EPA 1694	EPA 1694	
Polybrominated Diphenyl Ethers (PBDE) - Flame Retardants			
PBDE-17	EPA 8270D	EPA 8270D	
PBDE 28	EPA 8270D	EPA 8270D	
PBDE 47	EPA 8270D	EPA 8270D	
PBDE 66	EPA 8270D	EPA 8270D	
PBDE-85	EPA 8270D	EPA 8270D	
PBDE-99	EPA 8270D	EPA 8270D	
PBDE 100	EPA 8270D	EPA 8270D	
PBDE 138	EPA 8270D	EPA 8270D	
PBDE 153	EPA 8270D	EPA 8270D	
PBDE 154	EPA 8270D	EPA 8270D	
PBDE 183	EPA 8270D	EPA 8270D	
PCB Congeners			
BZ-8	EPA 8270D	EPA 8270D	
BZ-18	EPA 8270D	EPA 8270D	
BZ-28	EPA 8270D	EPA 8270D	
BZ-44	EPA 8270D	EPA 8270D	
BZ-52	EPA 8270D	EPA 8270D	
BZ-66	EPA 8270D	EPA 8270D	
BZ-77	EPA 8270D	EPA 8270D	

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
BZ-101	EPA 8270D	EPA 8270D	
BZ-105	EPA 8270D	EPA 8270D	
BZ-110	EPA 8270D	EPA 8270D	
BZ-118	EPA 8270D	EPA 8270D	
BZ-126	EPA 8270D	EPA 8270D	
BZ-128	EPA 8270D	EPA 8270D	
BZ-138	EPA 8270D	EPA 8270D	
BZ-153	EPA 8270D	EPA 8270D	
BZ-170	EPA 8270D	EPA 8270D	
BZ-180	EPA 8270D	EPA 8270D	
BZ-187	EPA 8270D	EPA 8270D	
BZ-195	EPA 8270D	EPA 8270D	
BZ-206	EPA 8270D	EPA 8270D	
BZ-209	EPA 8270D	EPA 8270D	
Explosives by HPLC			
1,3,5-Trinitrobenzene	EPA 8330A	EPA 8330A	
1,3-Dinitrobenzene	EPA 8330A	EPA 8330A	
2,4,6-Trinitrotoluene	EPA 8330A	EPA 8330A	
2,4-Dinitrotoluene	EPA 8330A	EPA 8330A	
2,6-Dinitrotoluene	EPA 8330A	EPA 8330A	
2-Amino-4,6-dinitrotoluene	EPA 8330A	EPA 8330A	
2-Nitrotoluene	EPA 8330A	EPA 8330A	
3-Nitrotoluene	EPA 8330A	EPA 8330A	
4-Amino-2,6-dinitrotoluene	EPA 8330A	EPA 8330A	
4-Nitrotoluene	EPA 8330A	EPA 8330A	
Hexahydro-1,3,5-trinitro-1,3,5-triazine	EPA 8330A	EPA 8330A	
Methyl-,2,4,6-trinitrophenylnitramine (Tetryl)	EPA 8330A	EPA 8330A	
Nitrobenzene	EPA 8330A	EPA 8330A	

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	EPA 8330A	EPA 8330A	

Formaldehye			
Formaldehyde	EPA 8315	EPA 8315	
Formaldehyde	Hantzch Method	Titration (Product only)	

Fuels			
Gasoline Range Organics	NWTPH-Gx	NWTPH-Gx	
Diesel Range Organics	NWTPH-DX	NWTPH-DX	
Oil Range Organics	NWTPH-DX	NWTPH-DX	
Hydrocarbon ID	NWTPH-HCID	NWTPH-HCID	
Hexane Extractable Material	EPA 1664	EPA 1664	

Aldehydes and Ketones in Air by EPA TO-11			
2,5-Dimethylbenzaldehyde	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA
Acetaldehyde	NA	NA	NA
Acetone	NA	NA	NA
Benzaldehyde	NA	NA	NA
Butyraldehyde	NA	NA	NA
Crotonaldehyde (2-Butenal, (E))	NA	NA	NA
Formaldehyde	NA	NA	NA
Hexaldehyde	NA	NA	NA
Isovaleraldehyde	NA	NA	NA
m-Tolualdehyde	NA	NA	NA
o-Tolualdehyde	NA	NA	NA
Propionaldehyde	NA	NA	NA
p-Tolualdehyde	NA	NA	NA

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Valeraldehyde	NA	NA	NA
Semivolatile Organics in Air by EPA TO-13			
Acenaphthene	NA	NA	NA
Acenaphthylene	NA	NA	NA
Anthracene	NA	NA	NA
Benzo[a]anthracene	NA	NA	NA
Benzo[a]pyrene	NA	NA	NA
Benzo[b]fluoranthene	NA	NA	NA
Benzo[e]pyrene	NA	NA	NA
Benzo[g,h,i]perylene	NA	NA	NA
Benzo[k]fluoranthene	NA	NA	NA
Chrysene	NA	NA	NA
Coronene	NA	NA	NA
Dibenz[a,h]anthracene	NA	NA	NA
Dibenzofuran	NA	NA	NA
Dibenzothiophene	NA	NA	NA
Fluoranthene	NA	NA	NA
Fluorene	NA	NA	NA
Indeno[1,2,3-cd]pyrene	NA	NA	NA
Naphthalene	NA	NA	NA
Perylene	NA	NA	NA
Phenanthrene	NA	NA	NA
Pyrene	NA	NA	NA
Volatile Organics in Air by EPA TO-15			
1,1,1-Trichloroethane	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA
1,1-Dichloroethylene	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
1,2,4-Trimethylbenzene	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA
1,2-Dimethylbenzene	NA	NA	NA
1,3,5-Trimethylbenzene	NA	NA	NA
1,3-Butadiene	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA
1,4/1,3-Dimethylbenzene	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA
2,2,4-Trimethylpentane	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA
2-Hexanone	NA	NA	NA
3-Chloropropene	NA	NA	NA
4-Ethyltoluene	NA	NA	NA
4-Methyl-2-Pentanone (MIBK)	NA	NA	NA
Acetone	NA	NA	NA
Acrylonitrile	NA	NA	NA
Benzene	NA	NA	NA
Bromodichloromethane	NA	NA	NA
Bromoform	NA	NA	NA
Bromomethane	NA	NA	NA
Carbon Disulfide	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA
Chlorobenzene	NA	NA	NA
Chloroethane	NA	NA	NA
Chloroform	NA	NA	NA
Chloromethane	NA	NA	NA
cis-1,2-Dichloroethylene	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA

Parameter	Method Reference **Non-Potable** Water	Method Reference **Solids and Tissue**	Method Reference **Potable** Water (SDWA)
Cyclohexane	NA	NA	NA
Dibromochloromethane	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA
Dichlorotetrafluoroethane	NA	NA	NA
Ethylbenzene	NA	NA	NA
Hexachloro-1,3-Butadiene	NA	NA	NA
Isopropanol	NA	NA	NA
Methylene Chloride	NA	NA	NA
MtBE	NA	NA	NA
n-Heptane	NA	NA	NA
n-Hexane	NA	NA	NA
Styrene	NA	NA	NA
Tetrachloroethylene	NA	NA	NA
Tetrahydrofuran	NA	NA	NA
Toluene	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA
Trichloroethylene	NA	NA	NA
Trichlorofluoromethane	NA	NA	NA
Trichlorotrifluoroethane	NA	NA	NA
Vinyl bromide	NA	NA	NA
Vinyl Chloride	NA	NA	NA

Method References

- *Standard Methods for the Analysis of Water and Wastewater*, APHA, AWWA and WEF: 21st Edition, 2005. (Methods with prefix "SM")
- *Methods for the Determination of Metals in Environmental Samples*, EPA/600R–94/111, Supplement I May, 1994 (EPA 200 Series Methods).
- *Methods for the Determination of Inorganic Substances in Environmental Samples,* EPA-600/R-93-100, Revised August 1993. (Note: EPA Method 300.1 Update 1997). (EPA 300 Series methods)
- *Methods for the Determination of Organic Compounds in Drinking Water,* USEPA December1988, revised July 1991; Supplement I, July 1990; Supplement II, August 1992 (EPA 500 series Methods)

- *Test Methods for Evaluating Solid Wastes, SW 846* USEPA Office of Solid Waste, 3rd Edition (1986) including Update I (1992) Update II, IIA, IIB (1993-1995) Update III, IIIA, IIIB (1996-2004) and Update IV (2007) (EPA 1000, 6000, 7000, 8000, 9000 series Methods).
- Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, USEPA, EPA/625/R-96/010b, January 1999. ("TO" Methods)
- Some other methods not otherwise referenced can be found on EPA's Office of Water website http://www.epa.gov/waterscience/methods/method/

APPENDIX L ICP and ICPMS TEST GROUPS

The Inductively Coupled Argon Plasma (ICP) and Inductively Coupled Plasma Mass Spectrometer (ICPMS) instruments are capable of simultaneously scanning a single sample for multiple trace metals. To simplify logging in samples to LIMS for multiple trace metals a number of *Test Groups* have been designated to meet the needs of different program objectives (*e.g.* landfill monitoring wells, groundwater, surface water, drinking water, etc.).

The major difference between the ICP and ICPMS is their sensitivity. The ICPMS more sensitive and is designed to analyze clean matrix samples for ultra-trace level constituents. In almost all cases, the ICPMS has replaced the graphite furnace Atomic Absorption technology that was used for extremely low level analyses. The ICP is better suited for trace metals analysis of dirtier water matrices or soil matrices where sub-μg/L reporting is not a necessity.

It is frequently more cost-effective to analyze for a Test Group, than to analyze for a single metal. Some common "test Groups" are listed below. Contact the laboratory to develop a list for your project. The Quantitation limits for the analytes below and additional analytes are listed in APPENDIX J:

PPM=Primary Pollutant Metals #1 DW = Drinking Water TAL = EPA Target Analyte List

	Cations	PPM[a]	DW[a]	TAL[a]	RCRA/TCLP[a]	Other
Aluminum	X		S[b]	X		
Antimony		X	X	X		
Arsenic		X	X	X	X	
Barium		X	X	X	X	
Beryllium		X	X	X		
Boron	X					
Calcium	X			X		
Cadmium		X	X	X	X	
Chromium		X	X	X	X	
Cobalt		X		X		
Copper		X	X	X		
Hardness as $CaCO_3$						X
Iron	X			X		
Lead		X	X	X	X	
Lithium	X					
Magnesium	X			X		
Manganese	X		S[b]	X		
Molybdenum		X				
Nickel		X	X	X		
Potassium	X			X		
Selenium		X	X	X	X	

	Cations	PPM[a]	DW[a]	TAL[a]	RCRA/TCLP[a]	Other
Silica (SiO_2)	X					
Silver		X	X	X	X	
Sodium	X			X		
Strontium						X
Thallium		X	X	X		
Titanium						X
Uranium		X				
Vanadium		X				
Zinc		X	X	X		
Zirconium						X

[a] Mercury is also in the PPM, TAL, DW and RCRA/TCLP List must be requested separately.

[b] S = Supplemental Drinking Water parameter

APPENDIX M UNITS & CONVERSIONS

Metric System

The basic units of measurement in the metric system are the **meter, gram, and liter,** all of the rest are multiples of these quantities using an exponent of 10.

Prefix	Symbol	Multiple	Decimal	Name
tera	T	10^{12}	1,000,000,000,000	trillion
giga	G	10^{9}	1,000,000,000	billion
mega	M	10^{6}	1,000,000	million
kilo	k	10^{3}	1,000	thousand
hecto	h	10^{2}	100	hundred
Basic unit:			Meter (m), gram (g), liter (L)	
centi	c	10^{2}	0.01	hundredth
milli	m	10^{-3}	0.001	thousandth
micro	µ	10^{-6}	0.000,001	millionth
nano	n	10^{-9}	0.000,000,001	billionth
pico	p	10^{-12}	0.000,000,000,001	trillionth

1 liter = 1000 milliliters = 1,000,000 microliters = 1000 cm^3

1 kilogram = 1000 grams = 1,000,000 milligrams = 1,000,000,000 micrograms

Conversions

Unit	Metric Equivalent	English Equivalent
Acre	0.40468564 hectares	43560 square feet
Acre	40468564 meters	4840 yards
Acre	0.0040468564 sq.kilometers	0.0015625 sq.miles
Barrel (petroleum)	158.98729 liters	42 gallons
Bushel	35.23907 liters	4 pecks
Chain (surveyor's)	20.1168 meters	66 feet
Cord (wood)	3.624556 cubic meters	128 cubic feet
Cup	0.2365882 liters	8 ounces liquid (US)
Degree (temperature)	$^oC=(5/9)(^oF-32)$	$^oF=^oC(9/5)+32$
Fathom	1.8288 meters	6 feet
Foot	30.48 centimeters	12 inches
Foot	0.3048 meters	0.333333 yards
$Foot^2$	929.0304 cm^2	144 in^2

Unit	Metric Equivalent	English Equivalent
Foot^3	28.316846 liters	7.480519 gallons (US)
Foot^3	0.028316846 meter^3	1728 in^3
Gallon, liq.(US)	3.785411784 liters	4 quarts, liq.(US)
Grain	64.79891 milligrams	0.00228571 ounces (advp)
Gram	1000 milligrams	0.03527396 ounces (advp)
hectare	10000 meters^2	2.4710538 acres
inch	2.54 cemtimeters	0.08333333 feet
inch^2	6.4516 centimeters^2	0.00694444 feet^2
inch^3	16.387064 cm^3 (or milliliters)	0.0346320 pints, liq.
Kilogram	0.001 metric ton	2.204623 pounds
Kilometer	1000 meters	0.62137119 miles
Kilometer^2	100 hectares	247.10538 acres
knot (nautical)	1.852 kilometers/hr	1.151 miles/hr
league (nautical)	5.559552 kilometers	3 nautical miles
liter	1000 milliliters (or cm^3)	1.056688 quarts, liq.
Meter	100 centimeters	1.093613 yards
Meter^2	10000 cm^2	1.195990 yards^2
Meter^3	1000 liters	1.307951 yards^3
micron	0.000001 meter	0.0000394 inch
mil	0.0254 millimeters	0.001 inch
mile, nautical	1.852 kilometers	1.1507794 miles
mile, statute	1.609344 kilometers	5280 feet or 8 furlongs
ounce, advp	28.349523125 grams	437.5 grains
ounce, liquid	29.57353 milliliters	0.0625 pint, liquid
pace	76.2 centimeters	30 inches
pint, liquid	0.473176473 liter	0.5 quart, liquid
point (typographical)	0.3514598 millimeter	0.013837 inch
pound, advp	453.59237 grams	16 ounces, advp
quart, liquid	0.946352946 liter	2 pints, liquid
rod	5.0292 meter	5.5 yards
section (US)	2.5899881 kilometer^2	1 mile^2
tablespoon	14.78676 milliliters	3 teaspoons
teaspoon	4.928922 milliliters	0.33333333 tablespoons

Unit	Metric Equivalent	English Equivalent
ton, metric	1000 kilograms	2204.623 pounds
ton, short	907.18474 kilograms	2000 pounds
yard	0.9144 meter	3 feet
$yard^2$	0.83612736 $meters^2$	9 $feet^2$
$yard^3$	764.554857984 liters	27 ft^3 or 201.974 gallons

Perspective

part-per-million	ppm	1 mg/kg,	1 mg/L
part-per-billion	ppb	1 µg/kg,	1 µg/L
part-per-trillion	ppt	1 pg/kg,	1 pg/L

1,000,000 ppt = 1,000 ppb = 1 ppm

One **ppm**: 1 inch in 15.782 miles or 1 second in 11.57 days

One **ppb**: 1 inch in 15782 miles or 1 second in 31.71 years

One **ppt**: 1 inch in 15,782,828 miles or 1 second in 31,710 years

Percentage

Percent means parts-per-hundred. Seldom used as a unit of environmental analytical measurement, because it is too large.

Percent, %	ppm
1	10,000
0.1	1000
0.01	100
0.001	10
0.0001	**1**
0.00001	0.1

APPENDIX N LIST OF ACRONYMS

AQ	Air Quality
AQM	Air Quality Monitoring
BOD	Biochemical Oxygen Demand
CN	Cyanide
COD	Chemical Oxygen Demand
CWA	Clean Water Act
DEQ	Department of Environmental Quality
DQO	Data Quality Objective
EPA	Environmental Protection Agency
ER	Eastern Region
FID	Flame Ionization Detector
GC	Gas Chromatograph (or Chromatography)
GCMS	Gas Chromatograph Mass Spectrometer (or Spectrometry)
HEM	Hexane Extractable Material
HPLC	High Pressure Liquid Chromatography
HQ	Headquarters
HR	Human Resources
HRGC	High Resolution Gas Chromatograph
HRMS	High Resolution Mass Spectrometer
IC	Ion Chromatography
ICAP	Inductively Couple Argon Plasma
ICP	Inductively Couple Plasma
ISE	Ion Selective Electrode
LEAD	Laboratory and Environmental Assessment Division
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LQ	Land Quality
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MOMs	Mode of Operation Manual
MSDS	Material Safety Data Sheet
NPDES	National Pollution Discharge Elimination System
NWR	Northwest Region
NWTPH	Northwest Total Petroleum Hydrocarbons
OCE	Office of Compliance and Enforcement

OSHD	Oregon State Health Department
OVA	Organic Vapor Analysis
PBDE	Polybrominated Diphenyl Ethers
PCB	Polychlorinated Biphenyls
PCDD	Polychlorinated Dibenzo-Dioxins
PCDF	Polychlorinated Dibenzo-Furans
PID	Photoionization Detector
PPM	Priority Pollutant Metals
PQL	Practical Quantitation Limit
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RBC	Risk Based Concentration
RCRA	Resource Conservation Recovery Act
SAP	Sampling and Analysis Plan
SDWA	Safe Drinking Water Act
SMCL	Secondary Maximum Contaminant Level
STP	Sewage Treatment Plant
SVOC	Semi-volatile Organic Compounds
SW	Solid Waste
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TOX	Total Organic Halogen
TS	Total Solids
TSS	Total Suspended Solids
TVS	Total Volatile Solids
VIP	Vehicle Inspection Program
UPS	United Parcel Service
VOC	Volatile Organic Compounds
WAD	Weak Acid Dissociable (cyanide)
WPCF	Water Pollution Control Facility
WR	Western Region

APPENDIX O REVISION HISTORY.

Revision	Date	Changes	Editor
7.0	November 2009	Updated method references, clarification of Cyanides, Analyte groups updated to reflect current practices, added section on third party labs, updated custody procedures and contact information. Simplified detection limit discussion. Added VOC soil sampling guidance and additional info for soil sampling. Added acronym definitions. Reformatted entire document.	SCH
8.0	July 2013	Removed references to LASAR throughout (it still refers to an external database, we just don't know what it will be called in the future). Updated information based on Element LIMS system, including container and preservation table. Updated method references to reflect changes in 40 CFR 136 (e.g. addition of Free Cyanide, 8 hr HT for micro methods). Additional discussion on sampling and incremental sampling (section 8)	SCH