Interim Action Plan for Marketing the West Olympia Commercial Property 1305 Cooper Point Road Southwest Olympia, Washington

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Prepared for

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ACRONYMS AND ABBREVIATIONS

1,4-DCB 1,4-dichlorobenzene
ARARs ..... applicable or relevant and appropriate requirements
CAP ..... corrective action plan
CERCLA ..... Comprehensive Environmental Response, Compensation, and Liability Act
City ..... City of Olympia
COC ..... contaminant of concern
Ecology ..... Washington State Department of Ecology
EPA ..... U.S. Environmental Protection Agency
GEI ..... GeoEngineers, Inc.
IA ..... interim action
LAI ..... Landau Associates, Inc.
LFG ..... landfill gas
LLDPE ..... linear low-density polyethylene
MARV ..... minimum average roll value
MFS ..... Minimum Functional Standards
MTCA ..... Model Toxics Control Act
ORCAA ..... Olympic Region Clean Air Agency
PCE ..... tetrachloroethylene
PLP ..... potentially liable party
RI/FS ..... Remedial Investigation/Feasibility Study
TCE ..... trichloroethylene
WAC ..... Washington Administrative Code
WARM ..... Washington Ranking Method
WOCP ..... West Olympia Commercial Property

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1.0 INTRODUCTION

This document describes an interim action (IA) plan to be implemented at the City of Olympia's (City's) West Olympia Commercial Property (WOCP), located at 1305 Cooper Point Road Southwest in Olympia, Washington (Figure 1). The WOCP is an undeveloped property, inclusive of the former West Olympia landfill that was operated by the City between the 1940s and 1968. The IA plan provides an approach for actions that will allow development of the WOCP after purchase or lease from the City.

The WOCP and surrounding area (the West Olympia Landfill Site [Site[1]]) are undergoing a Remedial Investigation/Feasibility Study (RI/FS) in accordance with the Washington State Department of Ecology's (Ecology) Model Toxics Control Act (MTCA) cleanup regulation (Washington Administrative Code [WAC] 173-340). The City is preparing this IA plan as part of its cleanup effort to address contamination at the Site and return the WOCP to full active economic use for community benefit. The IA satisfies the requirements in Agreed Order No. DE 13797, established between the City and Ecology on October 2, 2017. The intent is for the IA to be consistent with and incorporated into the final Site remedy developed through the RI/FS process and outlined in the Cleanup Action Plan. With Ecology's support of this IA plan, the property will be sold and developed, incorporating the IA remedy outlined herein.

1.1 Site Description and Background

The WOCP is a 12.33-acre parcel (Thurston County parcel number 12821240103), located within city limits. The City acquired the parcels that included the WOCP in two separate purchases in 1939 and 1942 (GEI/LAI 2018). Over time, portions of the original 27.5-acre property were subdivided by the City and sold in 1987, resulting in the current 12.3-acre WOCP portion of the Site. Before it was acquired by the City, the WOCP was used as a dumping ground by local residents. After acquisition, the City operated the WOCP as a municipal solid waste landfill for residential and industrial waste until 1968. Waste was routinely burned and buried at the WOCP during landfill operations. When landfill operations ceased in about 1968, the City used the WOCP to store construction debris, power poles, concrete pipe, and other non-hazardous materials.

Because solid waste regulations were introduced after landfill operations ceased in 1968, the solid waste facility was not permitted, or subject to Ecology's closure and post-closure processes. The Site was evaluated using the Washington Ranking Method (WARM), developed by Ecology and the Science Advisory Board. WARM uses data gathered during a site hazard assessment to estimate a site's potential threat to human health and the environment, with rankings made on a scale of one to five. A score of one represents the highest relative level of concern, five the lowest. Ecology ranked the site a four. The landfill does not pose an imminent threat to human health or the environment.

[1] MTCA defines a Site as any place where contaminants have been stored, deposited, or otherwise come to be located (WAC 173-340). For the purposes of this report, the Site is defined as Thurston County parcel 12821240103, inclusive of the former landfill area, and all places where contaminants have come to be located.

The Site has been subject to environmental monitoring and investigations from 1984 to present, with several environmental conditions and contaminants of concern (COCs) identified in soil, soil gas, and groundwater. Buried landfill waste within the WOCP boundaries ranges from 0 to 17.5 feet thick.

Primary COCs and exposure pathways include:

- **Soil:** Localized chromium and lead are present in shallow soils. Direct contact is the primary pathway of concern for localized chromium and lead concentrations.
- **Soil/Landfill Gas:** Localized trichloroethene (TCE), tetrachloroethene (PCE), 1,4-dichlorobenzene (1,4-DCB), and methane are present in site soil gas. If structures are built in an area where vapors could collect, inhalation is a potential pathway of concern for TCE, PCE, and 1,4-DCB. Given its flammable and potentially explosive nature, methane is also a COC requiring unique hazardous condition controls.
- **Groundwater:** TCE is present in shallow groundwater at, and downgradient of, the WOCP. Ingestion is the primary pathway of concern.

A summary of investigation activities and environmental conditions is presented in the draft RI Report (GEI/LAI 2018).

1.2 Basis for Interim Action

The WOCP is the last large, undeveloped tract in West Olympia; its location at the intersection of US Highway 101 and two major City arterials (Black Lake Boulevard and Cooper Point Road) make it prime for development. The WOCP is zoned General Commercial. Adjacent properties and other properties in the area are zoned High-Density Corridor, Professional Office/Residential Multi-Family, Medical Service, Residential Multi-Family, Single-Family Residential, and Residential Low-Impact. The WOCP currently attracts nuisance activities, including illegal dumping and homeless encampments. When developed, the WOCP will be converted to beneficial use, providing value to the City and its citizens and protecting the environment.

Section 430, Chapter 173-340 WAC defines an IA as "a remedial action that is technically necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance at a facility." The IA will reduce the threat to human health and the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance (WAC 173-340-430[1][a]). The IA will help the City achieve partial Site cleanup described in WAC 173-340-430(2) by:

- Limiting exposure to COCs with a landfill cap.
- Controlling soil gas emissions via installation of landfill gas (LFG)-collection and venting systems.
- Establishing surface water controls and reducing contact between infiltrated stormwater and landfill waste.

In accordance with MTCA requirements in WAC 173-340-430 (3)(b), the IA will "not foreclose reasonable alternatives for the cleanup action." The IA will be designed to be consistent with the most

likely final cleanup action. This IA is a partial cleanup because it will address direct exposure contamination at the landfill, but does not address any contamination (i.e., groundwater) emanating from the WOCP and extending to other nearby properties.

The intent is for the IA to be consistent with and incorporated into the final Site remedy cleanup action developed through the RI/FS process and outlined in the CAP. This IA plan outlines a preliminary conceptual design for actions that will support and facilitate cleanup and allow the WOCP to be leased or sold for development. Before development can be completed, additional plans, describing design, implementation, and monitoring of the IA, must be prepared and submitted for Ecology's review and approval. Plans should include:

- An Engineering Design Report for landfill cap, landfill gas control, and surface water control elements of the IA (WAC 173-340-400[4][a]).
- Construction plans and specifications for landfill cap, landfill gas control, and surface water control elements of the IA (WAC 173-340-400[4][b]).
- An Operation and Maintenance Plan for landfill cap and landfill gas collection elements of the IA (WAC 173-340-400[4][c]).
- Construction documentation, such as as-built plans (WAC 173-340-400[6]).
- A Compliance Monitoring Plan (WAC 173-340-410).
- A Sampling and Analysis Plan (WAC 173-340-820).
- A Quality Assurance Project Plan (WAC 173-340 and current Ecology guidelines).
- A Health and Safety Plan (WAC 173-340-810[2]).

1.3 Purpose of Interim Action

The purpose of this IA is to outline a remedial action that addresses the landfill waste and contaminated soil and soil gas at the Site, and allows for property development prior to completion of the RI/FS and CAP. The IA plan includes:

- A description of the IA and how it satisfies MTCA criteria identified in WAC 173-340-430(1), (2), and (3).
- A description of existing Site conditions and a summary of available data related to the IA.
- A description of the alternative IA approaches considered and a rationale for the selected approach.
- Information that supports applicable MTCA criteria for design and construction, identified in WAC 173-340-400(4), (6), and (8).

1.4 Report Organization

The IA plan has been developed in accordance with WAC 173-340-430 and consists of the following nine sections:

- **Section 1, Introduction** includes a description of WOCP features and a summary of environmental conditions, a regulatory framework, the basis for conducting the IA, and describes the purpose of the IA.
- **Section 2, Regulatory Considerations** includes a description of applicable or relevant and appropriate requirements (ARARs) (i.e., federal, state, and local requirements) that apply to the IA. This section also includes a list of regulatory agency guidance documents that should be considered, and the relationship of the IA to planned redevelopment of the property.
- **Section 3, Evaluation of Interim Action Alternatives** identifies the alternatives that were considered for the IA, and provides a basis for selection.
- **Section 4, Description of Interim Action** presents a summary of the IA work elements, including the impervious landfill cap, LFG control, and surface water control elements.
- **Section 5, Justification for Conceptual Design** presents the engineering justification used to select an IA alternative.
- **Section 6, Compliance Monitoring and Reporting** provides a summary of the compliance monitoring and reporting protocols for the IA.
- **Section 7, Limitations and Use of Report** presents Landau Associates, Inc.'s (LAI) standard limitations.
- **Section 8, References** lists documents cited in the IA plan.

2.0 REGULATORY CONSIDERATIONS

This section includes a description of regulatory considerations that apply to the IA, including ARARs (federal, state, and local requirements), agency guidance documents, and site development regulatory requirements.

2.1 Applicable or Relevant and Appropriate Requirements

Typically categorized as chemical-, location-, or action-specific requirements, ARARs are defined by statutes, regulations, and ordinances, and are used to develop cleanup actions. Chemical-specific requirements identify human health- or ecological-based cleanup levels for media of concern. Location-specific requirements apply to the geographical or physical position of the Site. Action-specific requirements refer to acceptable containment, treatment, storage, and disposal criteria and procedures as well as the permits and approvals required to implement the IA. Appendix A includes a list of known chemical-specific, location-specific, and action-specific ARARs for this IA.

Between 1940 and 1968, the WOCP was operated as a municipal solid waste landfill. Closure requirements for solid waste landfills were formally adopted in 1972, under WAC 173-301. The requirements were revised in 1985 as WAC 173-304 Minimum Functional Standards (MFS). Solid waste landfills operating after October 1991 are required to meet the landfill requirements in WAC 173-351, Criteria for Municipal Solid Waste Landfills. WAC 173-351 allows municipal landfills that stopped receiving solid waste prior to October 9, 1991 to use the closure and post-closure requirements in WAC 173-304. MFS are the minimum requirements for solid waste landfill closure under MTCA (WAC 173-340-710[7][c]). MFS will be the overarching regulatory ARARs for evaluation and selection of an appropriate IA alternative.

The U.S. Environmental Protection Agency (EPA) developed a “presumptive remedy” for CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) municipal landfill sites, intended to expedite RI/FS and closure processes (EPA 1991). Components of the EPA’s presumptive remedy include:

- Landfill capping (including stormwater controls).
- Landfill gas collection and treatment.
- Institutional controls that supplement engineering controls.
- Source area groundwater treatment or control to contain potential offsite migration of contaminated groundwater, if necessary.

The EPA’s guidance does not include remedial actions for groundwater located beyond the source area (the landfill boundary), or specific requirements for long-term groundwater monitoring. The IA has been developed to address the first three bullets above of the CERCLA presumptive remedy for landfills. Treatment of groundwater contamination (e.g., *in situ* source area groundwater treatment) will be addressed as part of the Feasibility Study.

Per MTCA, containment of hazardous substances is the preferred remedy for sites historically used as landfills; MTCA uses MFS as an ARAR. In WAC 173-340-740(6)(f), MTCA states that containment will satisfy cleanup standards, provided:

> *(i) The selected remedy is permanent to the maximum extent practicable using the procedures in WAC 173-340-360;*
>
> *(ii) The cleanup action is protective of human health. The department may require a site-specific human health risk assessment conforming to the requirements of this chapter to demonstrate that the cleanup action is protective of human health;*
>
> *(iii) The cleanup action is demonstrated to be protective of terrestrial ecological receptors under WAC 173-340-7490 through 173-340-7494;*
>
> *(iv) Institutional controls are put in place under WAC 173-340-440 that prohibit or limit activities that could interfere with the long-term integrity of the containment system;*
>
> *(v) Compliance monitoring under WAC 173-340-410 and periodic reviews under WAC 173-340-430 are designed to ensure the long-term integrity of the containment system; and*
>
> *(vi) The types, levels, and amount of hazardous substances remaining onsite and the measures that will be used to prevent migration and contact with those substances are specified in the draft cleanup action plan."*

The IA will comply with the ARARs identified in Appendix A and MTCA's preferred remedy approach.

Pursuant to Section 090, Chapter 70.105D of the Revised Code of Washington (RCW), PLPs conducting a remedial action under an agreed order with Ecology are exempt from some State-administered procedural requirements as well as the procedural requirements of local laws, requiring or authorizing local government permits or approvals for the remedial action. However, implementation of the IA will comply with the substantive requirements of state and local laws.

2.2 Guidance Documents

In addition to the ARARs, guidance documents - including criteria, advisories, and standards issued by federal or state governments - may be used to design and implement the IA. Guidance documents are not ARARs, and compliance with the documents is not mandatory. Rather, the guidance documents are intended to complement ARARs to the extent they are consistent with legal requirements.

2.3 Relationship to Site Development

The IA will be implemented in conjunction with third-party development of the WOCP. The following City permits and approvals will likely be required to develop the WOCP:

- Environmental review under the State Environmental Policy Act.
- Master use permit, including conditional use approval.
- Grading permit.
- Drainage control plan.
- Building permits.
- Street use permit with transportation concurrency.
- Approvals for water, sewer, and electrical connections.

3.0 EVALUATION OF INTERIM ACTION ALTERNATIVES

MTCA requires that IA plans include an evaluation of IA alternatives and a rationale for selection of the proposed IA (WAC 173-340-430[7][b][ii]). Five preliminary cleanup alternatives for the Site were evaluated by the EPA (E&E 2017). The five preliminary cleanup alternatives included:

- Option 1A: Cap and passively vent landfill gas.
- Option 1B: Cap and actively vent landfill gas.
- Option 2A: Excavate and dispose of waste off site: 50 percent as hazardous waste, 50 percent as non-hazardous waste.
- Option 2B: Excavate and dispose of waste off site: 10 percent as hazardous waste, 90 percent as non-hazardous waste.
- Option 2C: Excavate and dispose of waste off site: 1 percent as hazardous waste, 99 percent as non-hazardous waste.

Based on recent Site characterization data and the conceptual site model presented in the draft RI report (GEI/LAI 2018), three alternatives were evaluated as part of the IA plan:

- Alternative 1. No action.
- Alternative 2. Excavation and offsite disposal of solid waste.
- Alternative 3. Landfill capping, landfill gas control, surface water controls, institutional controls, and compliance monitoring.

Each of these alternatives is described below. IA alternatives were evaluated based on current site conditions and assumed development activities.

3.1 Alternative 1. No Action

A no-action alternative typically is included to provide a basis for comparing the efficacy of other alternatives. Inclusion of this alternative helps to ensure that the consequences of taking no action are fully understood.

With Alternative 1, no measures would be taken to meet the landfill-closure requirements in WAC 173-304 MFS. This IA alternative would not provide short- or long-term protection of human health or the environment. Workers at the Site could come into direct contact with contaminants, and contaminant migration could impact nearby groundwater, air, surface water, and soil. With Alternative 1, site cleanup processes would not be monitored for mitigation of risks to human health and the environment.

3.2 Alternative 2. Excavation and Offsite Disposal of Solid Waste

With Alternative 2, solid waste and contaminated Site soil would be excavated and disposed of at a permitted solid waste management facility. Solid waste in the center of the Site may be at least 17.5 feet thick. Following soil excavation and confirmation testing, clean fill would be placed and

compacted to prepare the WOCP for development. After development, compliance groundwater monitoring would be performed to confirm the efficacy of the cleanup action.

3.3 Alternative 3. Landfill Cap, Landfill Gas Control, Surface Water Controls, Institutional Controls, and Compliance Monitoring

With Alternative 3, an impervious asphaltic concrete or membrane cap would be placed in areas where solid waste is present. This alternative also includes LFG control via a passive or active collection system, stormwater control, implementation of institutional controls, and compliance monitoring of IA effectiveness. Limited excavation of solid waste would likely be required to facilitate development activities, including grading, road and building construction, installation of the landfill cap, installation of the LFG control system, and installation of underground utilities. Solid waste and landfill cover material disturbed during IA activities would be interred below the landfill cap, or disposed of offsite in accordance with applicable regulations.

Surface water controls would be incorporated into the IA during development. As noted in the draft RI report, the shallowest aquifer (Qgo) provides a pathway, where soluble contaminants in fill and waste could come into contact with shallow groundwater (GEI/LAI 2018). Surface water controls would prohibit infiltration in areas of the Site where migration of contaminants is likely to occur. Where feasible, infiltration best management practices, or low-impact development techniques, are preferred.

Alternative 3 includes implementation of institutional controls that limit or prohibit activities that could interfere with the integrity of the IA, or that could result in exposure to hazardous substances. Institutional controls will be required if hazardous substances at the Site exceed applicable cleanup levels, or if a conditional point of compliance is established for site cleanup. The institutional controls may include fencing to limit site access, development and implementation of an Operation and Maintenance Plan for the landfill cap and LFG control system, and an environmental covenant on the property title restricting groundwater use and stipulating procedures if the landfill cap is penetrated. After installation of the landfill cap and LFG control system, compliance monitoring would be initiated to demonstrate efficacy of the IA.

3.4 Selection of the Preferred Alternative

Each of the alternatives were evaluated for the following criteria: permanency, capacity to protect human health and the environment, compliance with cleanup standards and other ARARs, and public concerns. Alternative 1 is not protective of human health and the environment, and was eliminated. Alternative 2 calls for waste to be removed from the site, and as such, is the most permanent remedy, but human health and the environment would be at risk during waste removal. Additionally, when compared with Alternative 3, the costs of Alternative 2 are disproportionate to the benefits. Costs in the 2017 site assessment report (E&E 2017) were based on excavation and offsite disposal of 160,000

bank cubic yards of contaminated material and site restoration with compacted clean material. Costs range from $42 million (assuming 1 percent of the excavation material is deemed RCRA hazardous waste, and 99 percent of the material will be disposed of at a Subtitle D facility) to $69 million (assuming 50 percent of the excavation material is deemed RCRA hazardous waste, and 50 percent of the material will be disposed of at a Subtitle D facility). The cost of Alternative 2 would exceed the value of the property, and inhibit cleanup through purchase and development.

Alternative 3 was selected as the preferred remedy for the following reasons:

- Provides long-term protection of human health and the environment by limiting the potential for direct contact with contaminants, minimizes the potential for ongoing groundwater contamination, and controls LFG migration.
- Allows for monitoring programs to be implemented to confirm operational requirements have been satisfied for each media of concern.
- Poses substantially less short-term risk to human health than Alternative 2, which could expose workers to contaminated solid waste or soil during removal.
- Is consistent with MTCA and CERCLA preferred and presumptive remedies for landfill containment and cleanup.

4.0 DESCRIPTION OF INTERIM ACTION

The WOCP will likely be developed with a parking area and one-story box store or series of stores based on the current zoning of the property as General Commercial. The IA as described herein is compatible with current zoning and similar commercial development approaches. Minor details in the containment and control approaches will vary based on actual development plans. These details will be documented in the Engineering Design Report, and further refined during preparation of construction plans and specifications by a third-party developer. Implementation of the IA plan and a cleanup schedule will depend on property lease or sale and development activities.

The selected IA alternative includes construction of a landfill cap and LFG control system, surface water controls, implementation of institutional controls, and compliance monitoring. Before the landfill cap is constructed, the WOCP will be graded as needed for redevelopment activities. The integrated cap and LFG control system will include vertical LFG wells for gas collection, an aggregate LFG-collection layer, piping for gas conveyance, and vents for gas dispersion. During site development, LFG control features will be incorporated into newly constructed buildings. A conceptual landfill cap and LFG control system layout is shown on Figure 2. Conceptual design details of the landfill cap and LFG control system are shown on Figures 3 through 7.

4.1 Landfill Cap

This section describes the design of the landfill cover systems that could be used throughout the WOCP. The layout of the cover systems will vary depending on the actual locations of buildings, parking lots, landscaping, etc. The landfill cover systems will be integrated to provide a continuous landfill cap where waste material is present. Conceptual landfill cap details are shown on Figure 3.

The following three cap designs are proposed:

- Asphaltic concrete cap over gently sloping areas, where pedestrian sidewalks, vehicle access, and parking will be installed.
- Geomembrane and soil cover cap in steep areas, landscaping areas, and/or areas where pedestrian walkways or vehicle access is not permitted.
- Low-permeability membrane cap (barrier) under building foundations to function as a methane-mitigation system and landfill cap.

The location of the landfill caps may change based on future site development plans.

4.1.1 Asphaltic Concrete Cap

The asphaltic concrete landfill cap is designed to address structural requirements, reduce stormwater infiltration, and mitigate risk to human health and the environment by preventing direct contact with solid waste. The cap will be constructed across a majority of the site, where final topography is approximately 6 percent or less. Sections of asphaltic concrete will likely be used in vehicle access and parking areas, and may be used for pedestrian walkways. The asphaltic concrete cap will be

constructed on a mixture of imported fill and soil cover; design should include surface water controls to provide durability, flexibility, and operational compatibility with future-use requirements. To maintain imperviousness, a maintenance program consisting of periodic inspections, resealing, and restoration will be included.

The asphaltic concrete cap will be composed of at least three layers:

- The deepest layer will consist of at least 12 inches of compacted structural fill. Depending on the area, the fill may include existing cover soil.
- The second deepest layer will consist of at least 8 inches of crushed rock base.
- The shallowest layer will consist of at least 4 inches of asphalt cover Washington State Department of Transportation Class B or Modified Class B (commercial) with an asphalt-impregnated geotextile between 2-inch compacted lifts.

The asphaltic concrete cap will be designed to accommodate structural loading. Protective measures, including placement of reinforcing fabric and/or additional crushed rock, will be used to prevent cracking where yielding soils are encountered during construction.

4.1.2 Geomembrane and Soil Cover Cap

A geomembrane and soil cover cap will be installed in landscaped areas and areas that are too steep to pave, such as landscaped buffers, planter islands, and gravel road shoulders. The geomembrane and soil cover cap will act as a barrier to infiltrating stormwater, and will mitigate risk to human health and the environment by preventing direct contact with solid waste. The cap system design should include drainage controls.

The geomembrane and soil cover cap will be composed of at least four layers placed in the following order from base to surface:

- The first layer will consist of at least 12 inches of compacted structural fill. Depending on the area, the fill may include existing cover soil.
- The second layer will consist of at least a 40-millimeter-thick, linear low-density polyethylene (LLDPE) geomembrane.
- The third layer will consist of a non-woven geotextile cushion, weighing 16 ounces per square yard.
- The fourth or top layer will consist of:
  - at least 8 inches of rounded gravel below a 3-inch-thick concrete sidewalk, or
  - 8-inch-thick cover soil below at least 4 inches of topsoil in unpaved areas.

The geomembrane will serve as the primary infiltration barrier, and a solid waste boundary marker. The LLDPE geomembrane will be textured on both sides for cover soil and slopes greater than 10 horizontal to 1 vertical (10H:1V), and will be anchored at the top of slopes, depending on final site topography and grading plans.

The geomembrane will be seamed with heat fusion or extrusion welding, and all welds will be tested for leakage. To reduce the potential for erosion, the geomembrane liner will be covered by a protective geotextile cushion, granular drainage and vegetative soil layers, and a substrate for grass landscaping. Drainage within this layer will be routed to a perforated pipe at the base of the slope. Collected water that percolates through the upper cover layers will be conveyed and discharged to the surface water controls. Drainage design and surface water-engineering details will depend on the final development plan.

4.1.3 Low-permeability Membrane Cap (Barrier) under Building Foundations

A low-permeability membrane cap installed under all buildings will function as a methane mitigation system. Each building will be designed with a separate membrane barrier consisting of a sub-slab vapor retarder (membrane) with a methane permeance rating determined by ASTM International standard test method D1434, or other industry-accepted testing methods selected during the design process. Sand or equivalent geotextile material will cushion the membrane barrier and protect it from penetration. The membrane will be sealed at building foundations and footings, utility membrane penetrations, and membrane seams in accordance with the manufacturer's recommendations. After installation and before cover, the membrane should be smoke-tested for leaks; if observed, leaks should be repaired.

4.1.4 Landfill Cap Transitions

Cover system transitions will occur at waste boundaries, at building locations, and in select areas around parking lots. At buildings, cover system transitions will be implemented by extending building system membranes at least 3 feet beyond the building footprint, creating an overlap with the asphalt concrete or geomembrane soil cap systems. Design details for landfill cap transitions will be presented in the Engineering Design Report.

4.2 Landfill Gas Controls

Two different mechanisms for LFG control are recommended:

- To prevent LFG migration and fugitive emissions:
  - Perimeter LFG control system consisting of vertical LFG collection wells, conveyance piping, monitoring instrumentation and controls, and venting apparatuses.
- To protect indoor air quality:
  - Individual LFG control systems for occupied buildings, including below-grade, horizontal LFG collection, piping within gravel trenches, or geocomposite LFG collection vents, conveyance piping, monitoring instrumentation and controls, and venting apparatuses.

The LFG control systems will be designed to operate in passive or active conditions. Passive ventilation is intended to provide an unobstructed pathway for gases to ventilate to the atmosphere, and to

allow ambient air into the subsurface through barometric pumping. Active extraction uses blower systems to remove gases from the subsurface. Hybrid systems, as proposed here, are designed to operate effectively under passive or active conditions. When designing the hybrid system, piping connections, materials, and perforation depths for passive and active conditions should be considered.

Passive extraction should be sufficient for the WOCP, and is likely to be preferred over active extraction following construction. However, active extraction should be included in the event more aggressive control is needed, given proximity to residences and at-grade buildings. Based on monitoring, the system may be converted to an active LFG control system, as described in Section 6.0. The location of each LFG control system may change based on future development plans.

4.2.1 Perimeter Landfill Gas Control System

To prevent offsite migration, a perimeter LFG control system will include a vertical LFG extraction well network, conveyance piping, monitoring instrumentation and controls, and ventilation apparatuses. The final positions of the vertical LFG collectors will be selected to protect the perimeter and avoid conflict with development features. The estimated extent, depth, and thickness of waste will influence the positions of the collectors. For preliminary planning purposes, 12 extraction wells are assumed, with an average spacing of 150 feet on center. A conceptual plan for the vertical extraction wells is presented on Figure 2.

Hollow-stem auger drilling or equivalent will be used to install the vertical LFG wells approximately 1 foot below the waste extents. Wells will be installed in 10-inch-diameter boreholes with 6-inch-diameter, high-density polyethylene (HDPE), perforated well casings. The waste depth will vary by location, but each well should be installed at approximately 15 feet below ground surface. Bentonite seals will be used to protect perforated well screens from the surface below the landfill cap. The conceptual vertical well collectors could have a 100-foot active radius of influence in deeper sections of the landfill, and a 60-foot active radius of influence in shallow waste areas.

Under passive operation, each vertical LFG well collector or well collector series will be surfaced with a wind vent apparatus that will ventilate accumulated LFG. LFG control vents likely will be directly discharged without emissions treatment. The ventilated LFG will be monitored as part of the compliance monitoring plan, and will meet the air quality requirements of the Olympic Region Clean Air Agency (ORCAA). A notice of construction will be filed with ORCAA, and if needed, emissions treatment will be added.

If additional collection and control are necessary, the system can be converted to an active collection system. An active manifold will be installed along the alignment of the passive perimeter LFG collection wells. To allow passive-to-active collection at discrete locations throughout the site, the manifold can be connected to a blower, and a vacuum can be used for LFG extraction. The vertical LFG collectors will be connected with piping and mains as necessary. The connector piping and LFG pipe

mains will be designed to account for flow, condensate, drainage, and differential settlement. Figure 4 shows conceptual perimeter LFG control system details, and Figure 6 shows horizontal landfill gas control system collection trenches.

4.2.2 Building Landfill Gas Control System

Each occupied building at the WOCP will have a standalone LFG control system, independent of the site-wide perimeter LFG control system. Building LFG control systems will include below-grade features to capture LFG, and conveyance piping to allow discharge above the roofline. Building LFG control systems will need to be incorporated into the building foundation elements during construction. The final positions of the building LFG control systems will be selected based on development plans, including building interior and foundation designs. Additional building protection is provided by the barrier system described in Section 4.1.3.

The collection system beneath buildings will include horizontal LFG collection piping within gravel trenches or a geocomposite LFG collection vent system and conveyance piping. Vertical piping will convey gases to the roof, and will include monitoring instrumentation controls and LFG vents. The building LFG control systems are designed to operate passively, but can be converted to active operation if additional LFG control is necessary. The passive system will include a conveyance pipe manifold connected to an LFG blower and controls that can be used to vacuum beneath the building. Figure 5 shows the conceptual building LFG control system design details, and Figure 6 shows horizontal landfill gas control system collection trenches.

4.3 Surface Water Controls

Surface water controls will prevent exposure to, and mobilization of, contaminants associated with solid waste. Surface water controls should also:

- Capture and convey stormwater runoff before it makes contact with buried solid waste.
- Satisfy stormwater regulatory obligations, including conveyance, quantity, flow, and quality.

Drainage elements of the landfill cap systems should be designed based on the location and implementation of each cap type. Stormwater controls will be designed in accordance with City standards at the time of development.

4.4 Site Development Considerations

Site development activities will be completed as part of the IA. The site will be graded for construction of buildings, vehicle and pedestrian access, utilities, and landfill cap and LFG control systems. Site regrading will allow control of stormwater flow, and minimize exposure to waste, pre- and post-construction.

4.4.1 Existing Groundwater Monitoring Wells and Soil Gas Probes

A network of existing groundwater monitoring wells and soil gas probes is currently in use at the site. To facilitate site development, some wells and probes will be decommissioned in accordance with applicable state regulations. Nine existing perimeter gas probes will be used for compliance monitoring, and eight groundwater monitoring wells will be maintained during the IA. Wells and probes that will be decommissioned or retained are identified in Table 1 and presented on Figure 2.

4.4.2 Site Grading

Site grading will expose refuse and cover soil. Brush, vegetation, and trees should be removed from the construction area. Deleterious material, such as grass, roots, topsoil, surface debris, organic fill, ash, and soft or loose soil, should be stripped from areas that will be occupied by structures and pavements. Stripping of deleterious material should extend at least 10 feet beyond the building pad or other structures, and 5 feet beyond pavements. At most parts of the property, stripping depth is estimated to be approximately 12 inches. Deeper stripping or excavation may be needed to remove ash layers, large debris, or root zones near the surface.

Following regrading and before placement of structural fill, the exposed subgrade should be compacted to a dense, unyielding condition. The upper 12 inches of exposed subgrade should be compacted in accordance with the design specifications for structural fill.

Solid waste and soil excavated during implementation of the IA will likely be re-interred on site with Ecology's approval. The proposed landfill cap will prevent human contact with reinterred solid waste or soil.

4.4.3 Ground Improvement

Long-term decay of organic material (putrescible material) and densification of the waste can lead to unacceptable total and differential settlements. Solid waste at the site contains smaller amounts of putrescible material than traditional municipal solid waste landfills; this is attributable to the age of the waste and reported, periodic burning of waste. Both short- and long-term settlement from densification and decay of putrescible material are estimated at 10 to 15 percent total waste thickness. The estimated total settlement is likely in the range of 12 to 18 inches, but differential settlement could be greater in transition areas between landfill waste and where dense native soil is present (LAI 2000).

Settlement could result in pavement distress, foundation settlement, and damage to utilities. To minimize the risk of settlement, ground improvement techniques will be required to support foundations. Selection of ground improvement techniques to facilitate development must specifically address concerns with long-term settlement at the WOCP due to the presence of waste fill.

4.4.4 Building Foundations

Different building foundation types will be required to address dynamic and static loads and will need to specifically address long-term settlement concerns due to the presence of waste fill. All building foundation systems will include a membrane barrier and passive subsurface gas collection system for LFG control. Conceptual development plans will be completed by a third-party developer. Under-slab design elements, including drainage and granular base course material, will be finalized in accordance with development plans. The final building foundation should be designed by geotechnical and structural engineers licensed in the State of Washington and possessing landfill and brownfield redevelopment experience. If deep foundations (e.g. piles, piers) are proposed, they must be designed to not penetrate contaminated soil and groundwater in a way that could potentially mobilize the pollutants downward and contaminate lower groundwater zones.

4.4.5 Retaining Walls

Retaining walls may be used for grade control along the edges of the WOCP. Walls should be founded on undisturbed native soil or compacted structural fill extending to such soil. Soft or loose soil or landfill waste should be removed from beneath the base of retaining walls. Retaining walls that cross transition areas between the landfill and dense native soil should be designed for differential settlement. Flexible wall systems, such as mechanically stabilized earth walls, are more suitable for transition zones than rigid systems, such as conventional concrete cantilever walls. A third-party developer will work with a geotechnical engineer to provide settlement information based on final development plans.

4.4.6 Utilities

There are no known utilities at the WOCP; if encountered during site grading or development, utilities or underground structures should be removed or abandoned. Abandoned utilities will be capped, and trenches will be filled with impermeable materials to eliminate potential migration pathways for LFG.

During development, water supply, sanitary sewer, storm drainage, electricity, natural gas, and communications utilities will be installed. Where practical, utilities will be routed beneath the asphaltic concrete cap and above the geomembrane cap in shared trenches. Settlement considerations will be incorporated into the utility design, and mitigation measures, such as soil compaction methods, will be implemented along utility trenches. Flexible couplings capable of accommodating settlement should be used in underground utilities. Utilities may be routed in pile-supported corridors to buildings. Utility corridors should be accessible with minimal disturbance to site operations. Conceptual utility corridor details are shown on Figure 7.

4.5 Institutional Controls

In accordance with MTCA (WAC 173-340-440), institutional controls will be implemented to limit or prohibit activities that may interfere with or diminish the integrity of the IA. Institutional controls may

include fencing to limit access, and development and implementation of an operation and maintenance plan. Institutional controls will be documented in an environmental covenant recorded on the property deed (RCW 60.47).

5.0 JUSTIFICATION FOR CONCEPTUAL DESIGN

This section discusses the engineering justification for the conceptual IA landfill cap and LFG control design. A more thorough justification, including design criteria, will be presented in an engineering design report that conforms to the specifications outlined in this IA plan. The design will be completed by the third-party developer that leases or purchases the property.

Landfill Cap

The three IA landfill cap designs satisfy the two primary functions required under the MFS. MFS for solid waste handling requires that a landfill cap be installed upon closure, per WAC 173-304. Under MFS, a landfill cap is intended to perform two functions:

- Minimize infiltration of stormwater into the solid waste, thereby minimizing the production of additional leachate and
- Mitigate risk to human health and the environment by preventing direct contact exposure with solid waste.

To achieve these functions, two designs are prescribed for landfill caps in WAC 173-304-460:

- Placement of at least 2 feet of low-permeability soil (permeability of less the 10^{-6} centimeter per second [cm/sec]) or
- Use of a geomembrane layer with a 50-millimeter (50-thousandth of an inch) thickness.

The proposed landfill cap designs for the WOCP will not satisfy the presumptive cover in WAC 173-304-460 (3)(e) of 2 feet of low-permeability soil or a 50-millimeter-thick geomembrane layer. Therefore, Ecology's concurrence is requested to vary from the closure methods, per WAC 173-304-700 and WAC 173-340-710(5), which allow for variances, or waiver, of provisions included in other applicable regulations. Allowing the landfill cap to vary from the provisions of the MFS is appropriate for the WOCP considering the following:

- The geomembrane soil cap proposed includes a minimum average roll value (MARV) of 40-millimeter-thick LLDPE geomembrane in lieu of a stiffer MARV of 50-millimeter-thick HDPE indicated in the above regulations. LLDPE is designed for landfill closures, as it is flexible, conforms to subgrade, and can handle large strains caused by differential settlement.
- The under building barrier cap will allow the building itself to be the barrier for infiltration of rainwater, and the gas barrier membrane, collection and removal system will prevent buildup of landfill gas under the buildings.
- Although the asphaltic concrete cap does not provide a minimum of 2 feet of low-permeability soil of less than 1×10^{-6} centimeters per second or a geomembrane layer, per the MFS, the asphaltic cap system is an equivalent very low-permeability surface that provides erosion protection measures and minimizes infiltration of stormwater into the solid waste.
- Landfill operations ceased in 1968 in accordance with applicable regulations at the time.
- The three landfill caps will serve the two primary functions of a landfill cap, per the MFS: effectively minimize stormwater infiltration, and prevent direct exposure to solid waste and affected media.

Components of the CERCLA landfill closure presumptive remedy include:

- A landfill cap (including stormwater controls).
- Leachate collection and treatment.
- Landfill gas collection and treatment.
- Institutional controls to supplement engineering controls.

The proposed IA alternative will address all four of the CERCLA presumptive remedy components. Leachate generation will be eliminated through installation of the landfill cap.

Although the parcel ceased to be used as a landfill prior to adoption of the MSF, the IA is designed to comply with the MFS. The MFS ensures that a landfill is closed in a manner that:

- Minimizes the need for further maintenance;
- Controls, minimizes, or eliminates threats to human health and the environment from post-closure escape of municipal solid waste constituents, leachate, landfill gas, and contaminated rainfall or waste decomposition products to the ground, groundwater, surface water, and the atmosphere; and
- Prepares the site for the post-closure period, allowing for continued facility maintenance and monitoring of air, land, and water as long as is necessary for the facility to stabilize and protect human health and the environment.

WAC 173-340-710(4)(f) allows for variances or waiver provisions in other regulations to be included in MTCA process. A variance from the prescribed landfill cap alternatives is requested as part of this IA plan. The request for a landfill cap variance is based on the conditions under which the landfill operated, the timeframe of discontinued operations, current Site conditions, and the effectiveness of the proposed landfill cap in this IA plan.

LFG Control Systems

The LFG control system design satisfies the LFG migration criteria required under the MFS defined in WAC 173-304-460 and the Thurston County Board of Health Article 5 Regulations. The operational goal of the LFG control systems is to protect human health and the environment and maintain compliance with MFS criteria by preventing:

- LFG migration off the WOCP resulting in methane exceeding 5 percent by volume (lower explosive limit [LEL] for methane).
- LFG in onsite buildings exceeding 1.25 percent by volume, or 25 percent of the LEL.
- LFG in offsite buildings exceeding 100 parts per million volume (0.01 percent by volume and 0.2 percent of the LEL).
- LFG surface emissions that would create an explosion, fire hazard, or odors.

LFG control is necessary to manage LFG that would accumulate beneath the impermeable cover system, migrate offsite, or cause concerns of vapor intrusion if not properly vented.

Decomposition of organic waste at the WOCP produces LFG, primarily as methane and carbon dioxide. Due to the age of the landfill material and the fact that waste was burned prior to being buried, only a small amount of LFG is expected to be produced at the WOCP. The conceptual design for LFG collection and control systems is based on the potential for methane generation estimated using EPA's LandGEM LFG emissions modeling and data culled from the RI (GEI/LAI 2018). The estimate is generated based on waste age, type, quantity of buried waste, and subsurface environment. For 2018, the total LFG generation rate was estimated at 7.2 cubic feet per minute. Although this rate of generation is minor in comparison to larger active landfills, the LFG must be provided a ventilation pathway, or it could accumulate and cause unsafe conditions.

The LFG control system is expected to operate passively based on the estimated LFG generation rate modeled, the historical use of the site, historical and current waste practices, historical and current methane monitoring results, and experience with similar landfill sites and LFG control system designs. The requirement for contingent active LFG systems is based on the inherent uncertainty in estimating LFG generation once the site is capped. The passive systems can be converted to active systems if necessary.

6.0 COMPLIANCE MONITORING AND REPORTING

Compliance monitoring will be conducted in accordance with the requirements of WAC 173-340-410. There are four types of compliance monitoring that will be required to implement the IA:

- Protection monitoring.
- Construction quality control monitoring.
- Performance monitoring.
- Confirmation monitoring.

Details of the compliance monitoring will be described in the engineering design report. General requirements of the compliance monitoring are summarized below.

6.1 Protection Monitoring

Protection monitoring will be conducted to confirm that human health and the environment are adequately protected during construction, and during the operation and maintenance of the IA. Protection monitoring will be addressed through implementation of a site-specific health and safety plan developed by the construction contractor to meet WAC 173-340-810 Worker Safety and Health Requirements and WAC 296-62-General Occupational Health Standards.

6.2 Construction Quality Control Monitoring

Construction quality control monitoring will be conducted to document that the caps, LFG system, and stormwater systems are constructed consistent with this IA plan and the Ecology-approved plans and specifications. IA construction will be conducted under the oversight of a professional engineer registered in the State of Washington. Monitoring will include observation and documentation of the construction of the landfill cap and LFG control systems, including startup commissioning. LFG control system monitoring for methane will be conducted monthly at LFG control system vents and select individual vertical LFG gas control wells during landfill cover construction. The landfill cap and soils beneath the cap will be monitored as follows:

- Subgrade preparation and acceptance.
- Measurement and observation of base surface preparations.
- Review of aggregate and asphaltic concrete quality characteristics.
- Observation of subsurface utility construction with trench plugs to prevent migration of LFG.
- Observation of asphalt surface placement and review of surface finish quality.
- Seam and leak testing.
- Material certification.
- Observation of seam and seal applications so no cracks or weak seams transmit infiltrating stormwater or short circuit the LFG collection system, or expose pathways to the soil beneath.

6.3 Performance Monitoring

Performance monitoring will be conducted to confirm that the IA has attained cleanup standards and, if appropriate, remediation levels. The primary IA performance monitoring task will be demonstrating compliance with MFS LFG migration control criteria discussed in Section 4.2. A performance monitoring plan will be prepared to document the location, frequency, and methods of monitoring.

LFG control performance monitoring will include LFG control system emission baseline monitoring to ensure compliance with national ambient air quality and emission standards, ORCAA notice of construction requirements, and ORCAA emission standards for toxic air pollutants. LFG control performance monitoring will be conducted to empirically demonstrate performance with the LFG migration criteria and will be integrated into the site performance monitoring as outlined herein.

6.3.1 Site Monitoring

Following installation and startup of the LFG control systems, the perimeter monitoring probes will be monitored using a Landtec GEM™2000 plus or equivalent instrument. If methane concentrations in the LFG control vents or collection wells exceed 5 percent by volume, the perimeter gas monitoring probes will be monitored for methane, oxygen, carbon monoxide, carbon dioxide, hydrogen sulfide, and pressure. Perimeter gas probe monitoring will be scheduled to occur after falling barometric pressure conditions. If methane is detected in excess of the LEL at the perimeter gas monitoring probes, additional monitoring will be conducted within the existing gas probes; corrective actions will be initiated; and the potential for switching to an active LFG control system will be examined.

Once the LFG control system has been installed and the first round of baseline monitoring completed, monitoring will be conducted at the open LFG control system vents and perimeter gas monitoring probes in accordance with the following schedule:

- Monthly for 3 months.
- Quarterly for at least four quarters and integrating the long-term monitoring schedule finalized in the CAP.

If adjustments are made to the LFG control system, the schedule will restart with monthly monitoring.

6.3.2 Building Monitoring

The system will be designed to minimize the need for building monitoring. Buildings constructed during WOCP development will include independent, low-permeability geomembrane vapor barriers and LFG control vent systems. In addition, vent systems will be constructed to operate passively with the potential for conversion to an active systems. Conversion into an active LFG control system will occur as a corrective action if compliance monitoring detects methane consistently above the LEL within the LFG collection and control vents.

Onsite building monitoring will be triggered if LFG control system vents contain methane levels above the LEL. The system is being designed to prevent offsite migration of LFG. The need for offsite building monitoring will be triggered based on identification of methane exceeding 5 percent by volume in adjacent perimeter gas monitoring probes during routine monitoring. If required, onsite and offsite building monitoring will be described in the engineering design report.

6.4 Confirmation Monitoring

Confirmation monitoring will be conducted to confirm long-term effectiveness of the IA once cleanup standards and remediation levels have been achieved. Confirmation monitoring for the IA will involve periodic inspections conducted in accordance with the procedures described in an Ecology-approved Operation and Maintenance Plan, which will be developed following LFG control system startup and commissioning. Landfill cap integrity and LFG control system efficacy will be evaluated through visual assessment and use of field monitoring instruments. The Operation and Maintenance Plan will include record drawings, operational reference materials, monitoring equipment information, and monitoring procedures, and will specify requirements for recordkeeping and reporting.

6.5 Corrective Actions

During implementation of the IA, monitoring of the LFG control systems, perimeter gas monitoring probes, and ambient air in buildings will be performed in accordance with the monitoring summary outlined in Section 6.3.1. If exceedances occur, corrective actions may need to be initiated to comply with regulatory requirements at the landfill perimeter and at structures on and off the WOCP. If necessary, corrective actions will be initiated to address issues noted during monitoring or subsequent inspections, to ensure design controls are functional, and to determine whether the system can mitigate exposures or potentially explosive atmospheres associated with methane hazards. Corrective actions will require notifications to property owners and regulators, and may include targeted cover system or foundation sealing, penetration sealing, LFG control system adjustment, system augmentation, or conversion from passive LFG venting to active collection.

6.6 Reporting

Reporting for the IA compliance monitoring program will include preparation of an IA Construction Report, documentation of construction of IA elements, and annual monitoring reporting. Annual reporting will transition to a schedule developed for site-wide long-term reporting identified in the CAP.

7.0 LIMITATIONS AND USE OF THIS REPORT

This IA plan has been prepared for the exclusive use of the City of Olympia Public Works for specific application to the West Olympia Commercial Property in Olympia, Washington. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of LAI. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either expressed or implied.

8.0 REFERENCES

ASTM. 2006. ASTM D2488-06: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). ASTM International. West Conshohocken, PA.

City of Olympia. 2016. *Drainage Design and Erosion Control Manual.* City of Olympia Public Works. December.

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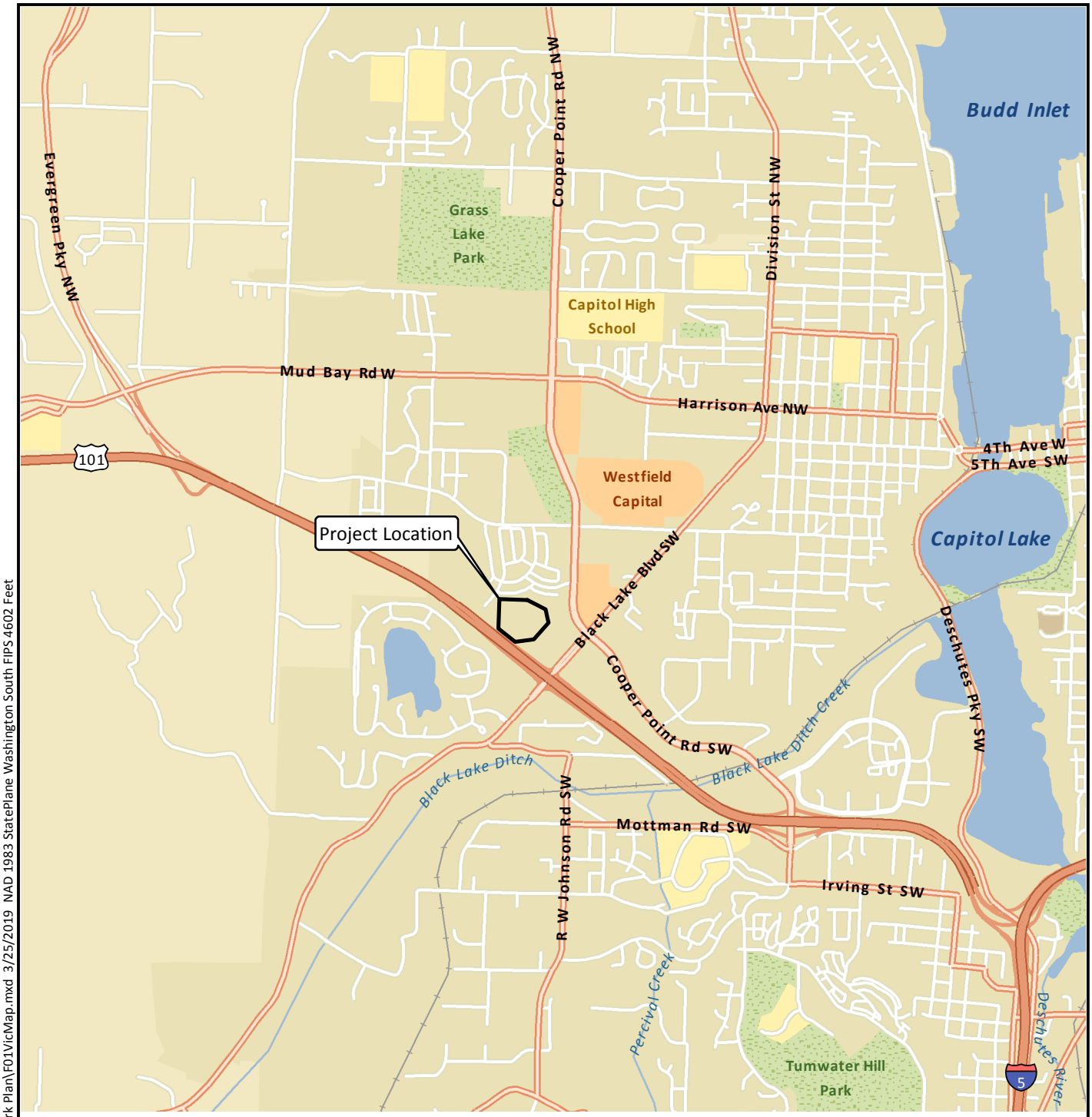

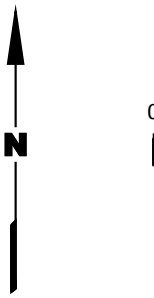

Data Source: Esri 2012

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West Olympia Commercial Property Interim Action Work Plan Olympia, Washington	**Vicinity Map**	Figure 1

Legend

- Gas Monitoring Probe - Retained during Site Develpment
- Gas Monitoring Probe - Decommissioned during Site Development
- Monitoring Well - Retained during Site Development
- Monitoring Well - Decommissioned during Site Development
- Subject Property
- Approximate Extent of Waste

LFG Control System Legend

- Vertical LFG Collection Well
- LFG Collection Manifold
- Approximate Landfill Cap Extent

Notes

1. The locations of all features shown are approximate.
2. Projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
3. Data Sources: Thurston County GIS; Esri World Imagery.

LFG Control System Notes

1. LFG Control system is conceptual only; The final LFG control system will be modified to accommodate the development plans for the WOCP.
3. Depending on final site development plans, other gas monitoring probes and/or groundwater monitoring wells may be retained or decommissioned for compliance monitoring.

G:\Projects\258\052\030\033\Interim Action Work Plan\F02ConceptPlan.mxd 4/19/2019

0 140 280

Scale in Feet

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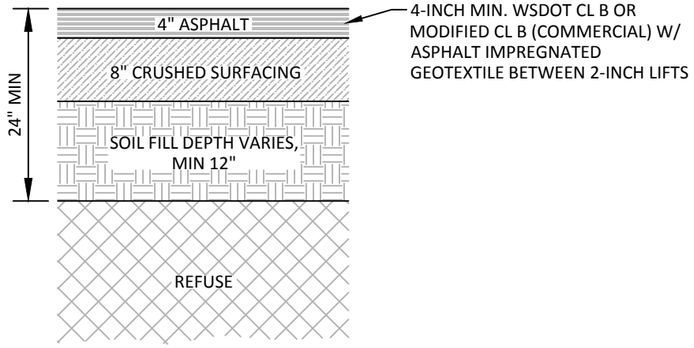
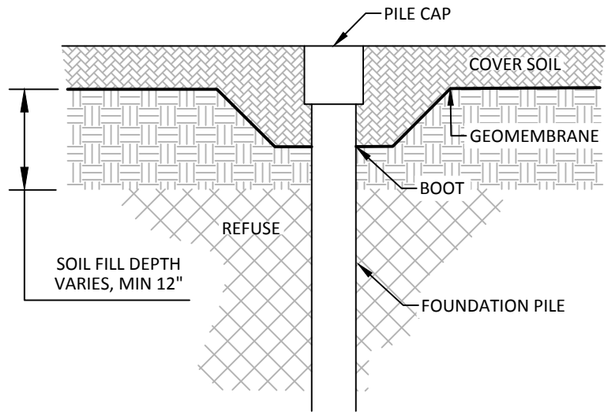
West Olympia
Commercial Property
Interim Action Work Plan
Olympia, Washington

Concept Landfill Cap and LFG Control System Layout

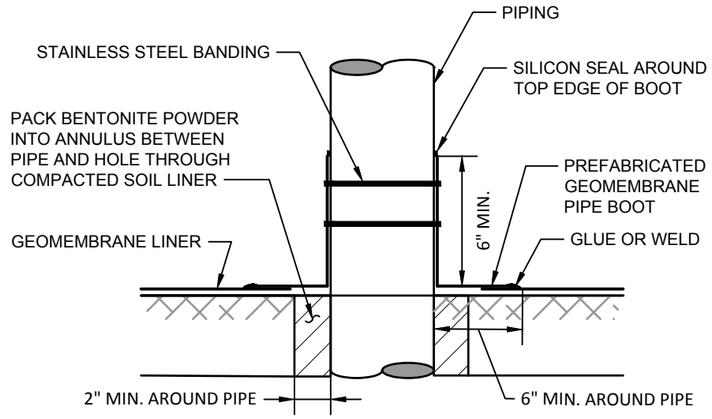
Figure 2



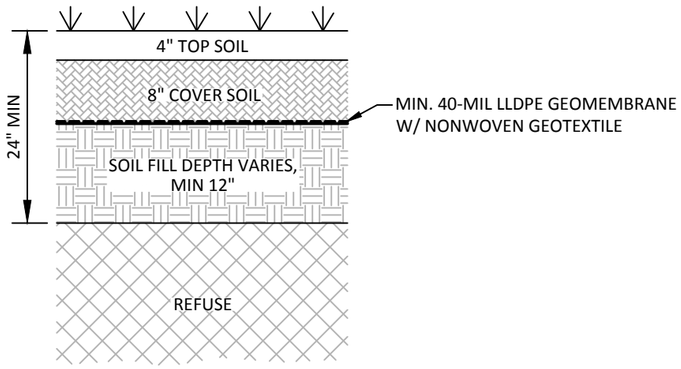
1 ASPHALTIC CONCRETE CAP



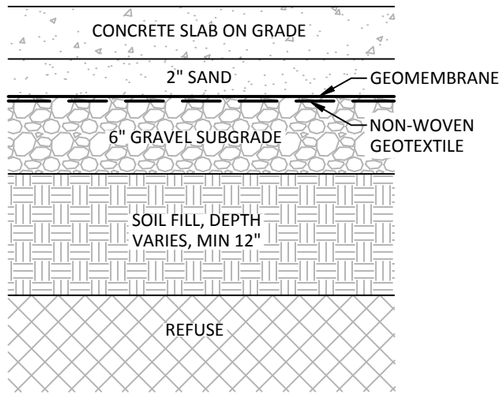
3 GEOMEMBRANE LINER UNDER PILE CAPS



5 LINER PENETRATION BOOT DETAIL



2 GEOMEMBRANE WITH SOIL COVER CAP



4 GEOMEMBRANE LINER UNDER SLAB ON GRADE

Notes

1. Landfill cap details are conceptual only. Final landfill cap design will be determined based on the development plan.
2. Drawing not to scale.

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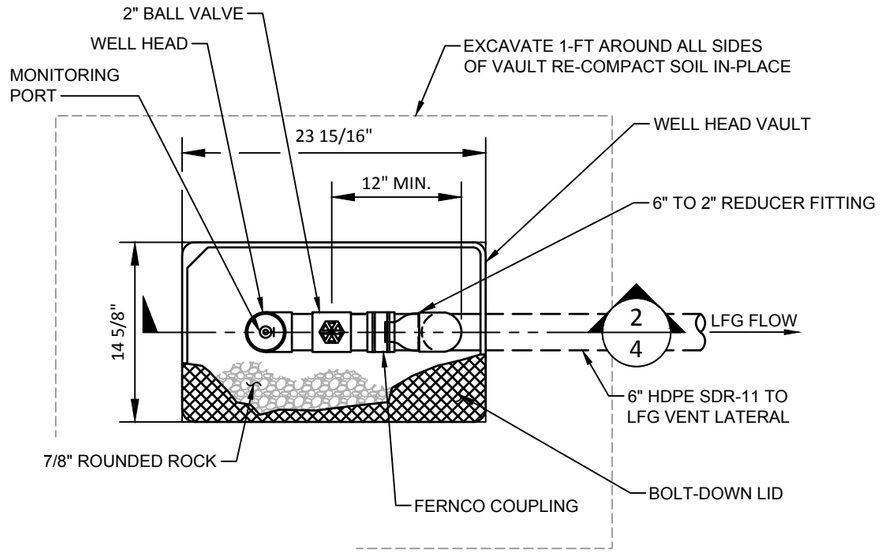
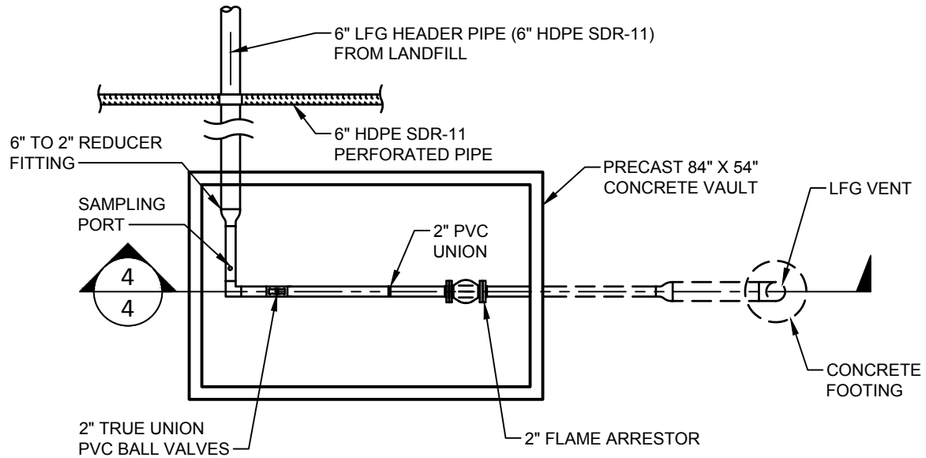
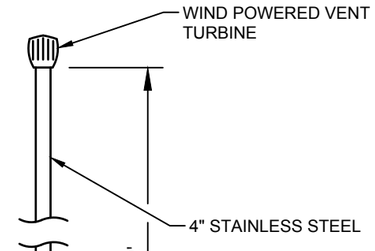
West Olympia Commercial Property Interim Action Work Plan Olympia, Washington	**Conceptual Landfill Cap Details**	Figure 3

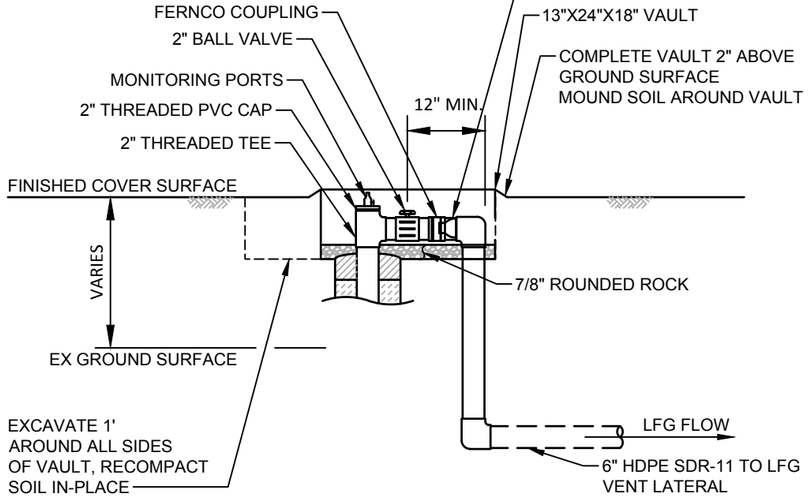


1 LFG PASSIVE COLLECTION WELL COMPLETION

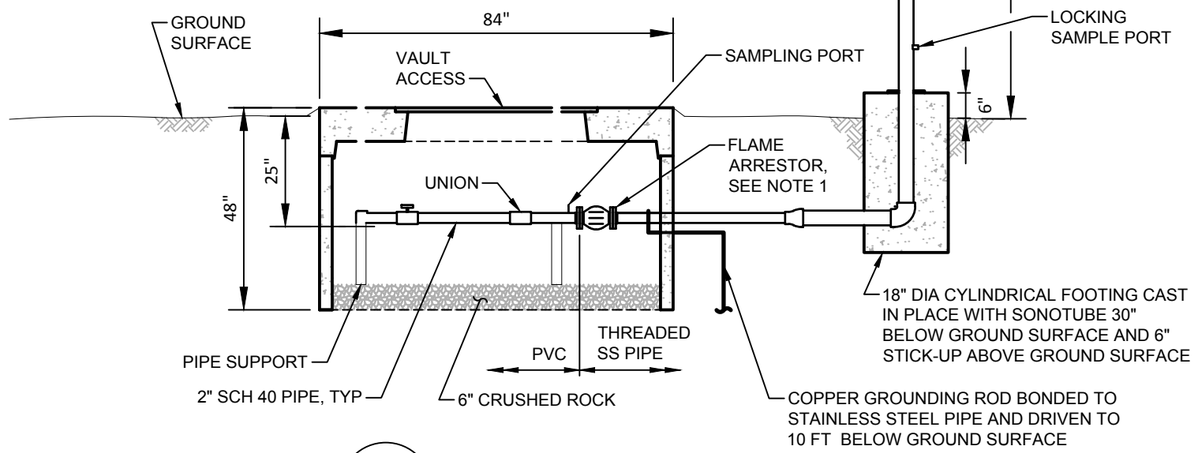


3 LFG VENT





2 LFG PASSIVE COLLECTION WELL COMPLETION SECTION



4 LFG VENT SECTION

Notes

1. LFG control system details are conceptual only. Final LFG control system design will be determined based on the development plan.
2. Drawing not to scale.

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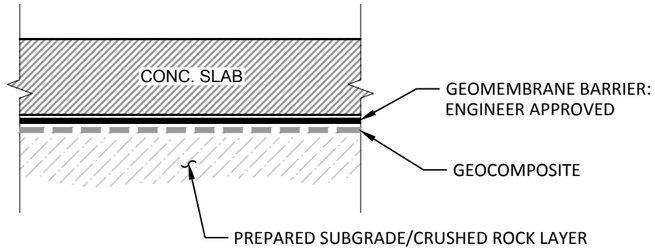
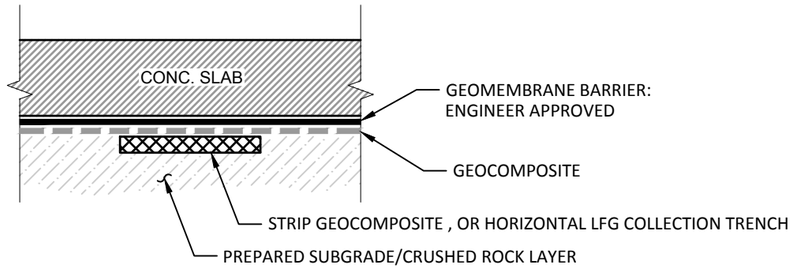
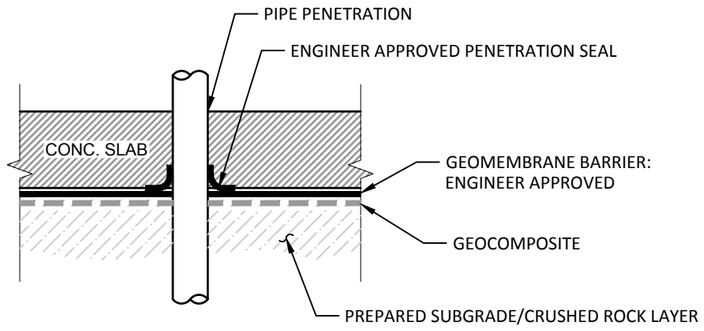
West Olympia Commercial Property Interim Action Work Plan Olympia, Washington	**Conceptual Perimeter LFG Control System Details**	Figure 4



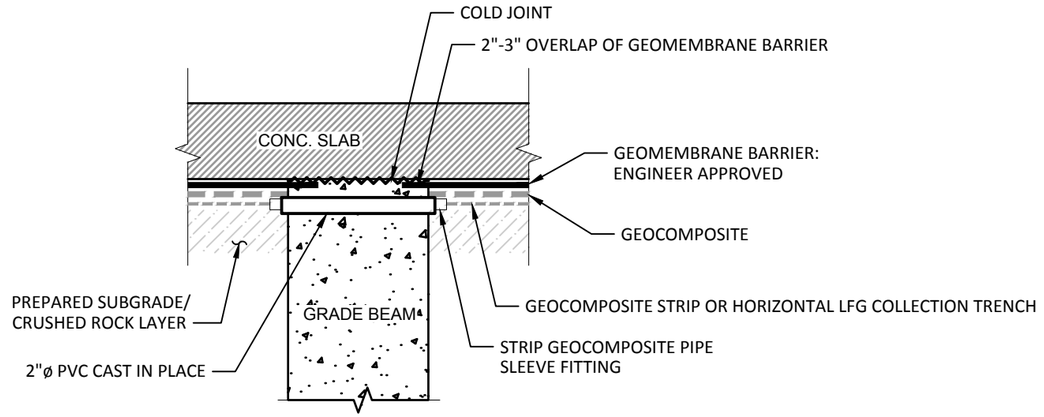
1 TYPICAL LFG VENTILATION LAYER AND BARRIER BELOW SLAB



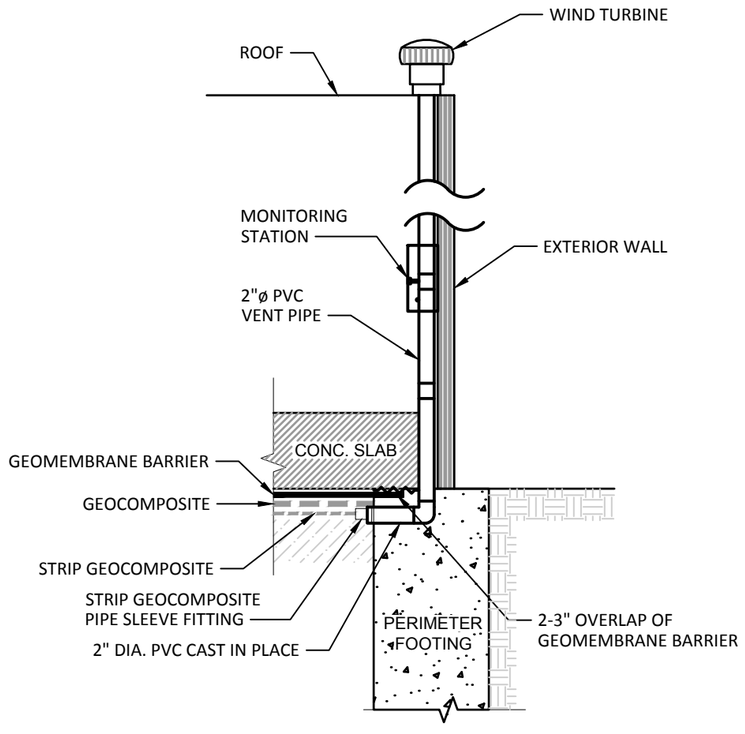
2 TYPICAL LFG VENTILATION AND BARRIER WITH STRIP GEOCOMPOSITE



3 TYPICAL VAPOR BARRIER PENETRATION



4 TYPICAL LFG CONDUIT PENETRATION AT GRADE BEAM



5 TYPICAL VENT PIPE PENETRATION

Notes

1. LFG control system details are conceptual only. Final LFG control system design will be determined based on the development plan.
2. Drawing not to scale.

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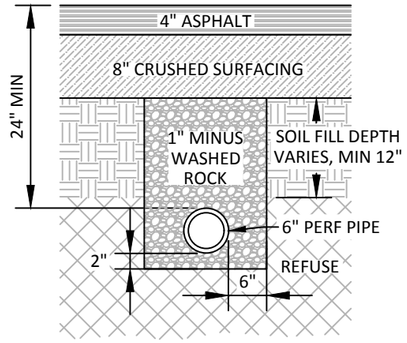
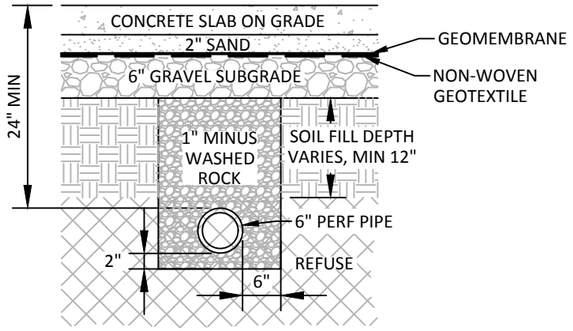
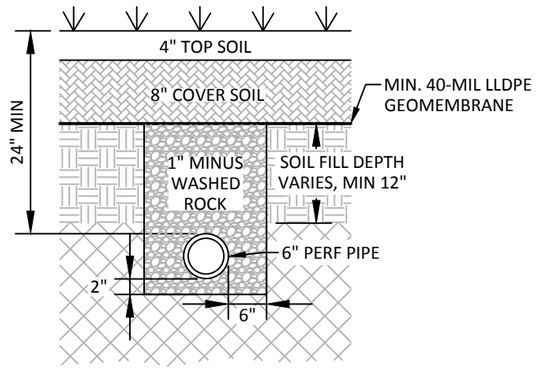
West Olympia Commercial Property Interim Action Work Plan Olympia, Washington	**Conceptual Building LFG Control System Details**	Figure 5



1 ASPHALT COVER WITH SHALLOW INTERNAL LFG TRENCH



3 BUILDING COVER WITH SHALLOW INTERNAL LFG TRENCH



2 MEMBRANE COVER WITH SHALLOW INTERNAL LFG TRENCH

Notes

1. LFG control system details are conceptual only. Final LFG control system design will be finalized based on the development plan.
2. Drawing not to scale.

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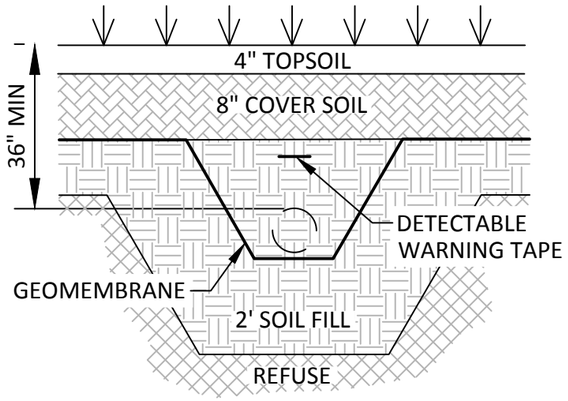
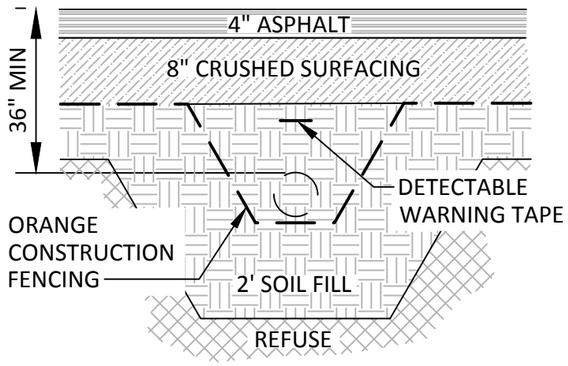
West Olympia Commercial Property Interim Action Work Plan Olympia, Washington

Conceptual LFG Control System Details

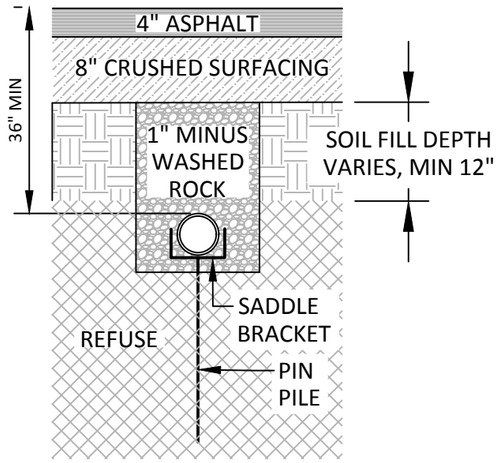
Figure 6



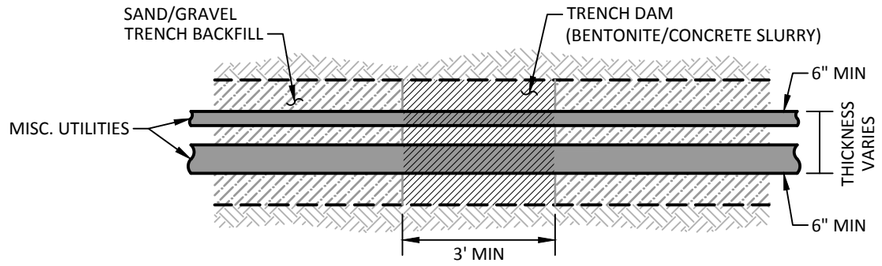
1 UTILITY CORRIDOR WITH SOIL COVER



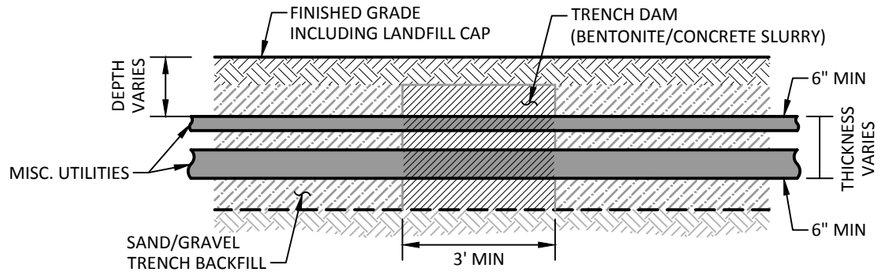
2 UTILITY CORRIDOR WITH ASPHALT COVER



3 PILE SUPPORTED UTILITIES



PLAN VIEW



ELEVATION VIEW

4 TRENCH DAM DETAIL

Notes

1. Utility corridor details are conceptual only. Final utility corridor design will be determined based on the development plan.
2. Drawing not to scale.

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West Olympia Commercial Property Interim Action Work Plan Olympia, Washington	**Conceptual Utility Corridor Details**	Figure 7

Table 1
Groundwater Monitoring Well and Soil Gas Probe Decommissioning Plan
West Olympia Commercial Property
Olympia, Washington

Exploration	Type of Exploration	Consultant	Completion Date	Exploration Depth (ft)	Retain/ Decommission
LAI-1	Monitoring Well	Landau Associates	7/20/2000	76.5	Retain
LAI-2	Monitoring Well	Landau Associates	7/20/2000	71.5	Retain
LAI-3	Monitoring Well	Landau Associates	7/19/2000	73.0	Decommission
LAI-MW-1	Monitoring Well	Landau Associates	6/7/2004	55.5	Retain
LAI-MW-2	Monitoring Well	Landau Associates	6/7/2004	65.4	Retain
LAI-MW-3	Monitoring Well	Landau Associates	6/8/2004	66.0	Retain
LAI-MW-4	Monitoring Well	Landau Associates	6/9/2004	70.5	Decommission
LAI-5d	Monitoring Well	Landau Associates	9/23/2005	156.0	Retain
PGG-1	Monitoring Well	Pacific Groundwater Group	6/21/2006	83	Retain
PGG-2	Monitoring Well	Pacific Groundwater Group	6/20/2006	82	Retain
GP-1	Gas Probe	Pacific Groundwater Group	6/19/2006	16	Retain
GP-2	Gas Probe	Pacific Groundwater Group	6/21/2006	13	Decommission
GP-3	Gas Probe	Pacific Groundwater Group	6/19/2006	14.5	Retain
GP-4	Gas Probe	Pacific Groundwater Group	6/20/2006	17	Decommission
GP-5	Gas Probe	Pacific Groundwater Group	6/20/2006	16	Decommission
GP-15	Gas Probe	Landau Associates	2/1/2018	7.0	Decommission
GP-16	Gas Probe	Landau Associates	2/1/2018	7.0	Decommission
GP-17	Gas Probe	Landau Associates	2/2/2018	7.0	Retain
GP-18	Gas Probe	Landau Associates	2/2/2018	7.0	Retain
GP-19	Gas Probe	Landau Associates	2/2/2018	7.0	Decommission
GP-20	Gas Probe	Landau Associates	2/2/2018	7.0	Retain
GP-21	Gas Probe	Landau Associates	5/17/2018	6.8	Retain
GP-22	Gas Probe	Landau Associates	5/17/2018	7.2	Retain
GP-23	Gas Probe	Landau Associates	5/17/2018	7.1	Retain
GP-24	Gas Probe	Landau Associates	5/17/2018	7.0	Retain

Abbreviations and Acronyms:

ft = feet

APPENDIX A

Applicable or Relevant and Appropriate Requirements, Interim Action West Olympia Commercial Property

West Olympia Commerical Property
Interim Action Work Plan
Applicable or Relevant and Appropriate Requirements

Comprehensive ARARs	Source	Description/Rationale
MTCA Cleanup Regulations	WAC 173-340	The overall ARAR applicable to the WOCP cleanup and interim action. Washington's hazardous waste cleanup law (MTCA) mandates site cleanups protect human health and the environment, and establishes regulatory requirements for the Interim Action at WOCP.
State Minimum Functional Standards for Solid Waste Handling	WAC 173-304-460	This regulation applies to facilities that dispose of solid waste in landfills, with the exception of inert, demolition, and wood waste landfills. It limits methane concentrations at the property boundary and in onsite and offsite structures, and requires compliance with ambient air quality standards and emission standards at the property boundary. This regulation applies only to solid waste landfills that operated after 1985, but it is a minimum requirement for solid waste landfill cleanups under MTCA.
State Environmental Policy Act	WAC 173-11-268	The interim action will have to comply with SEPA. SEPA mandates an environmental review of the project to prevent or eliminate damage to the environment. The SEPA review is typically integrated with MTCA requirements. The lead agency, either Ecology or the City of Olympia, will make a SEPA determination based on information in the IAWP, engineering design report, and required supplemental material (if any) to determine significant environmental impacts of the project.
Potential Chemical Specific ARARs[(a)]	**Source**	**Description/Rationale**
National Ambient Air Quality Standards	40 CFR 50	Specifies primary and secondary National Ambient Air Quality Standards, National Emission Standards for Hazardous Air Pollutants, and performance standards for new and existing stationary sources. National Ambient Air Quality Standards are applicable to those elements of the Interim Action pertaining to the collection and management of LFG.
State Dangerous Waste Regulations	WAC 173-303	Establishes regulatory requirements for the generation, handling, storage, transport, treatment, and disposal of dangerous wastes in the State of Washington under the provisions of the Washington State Hazardous Waste Management Act. These regulations apply to waste deemed dangerous or extremely hazardous to public health or the environment. The regulations would apply to material generated during the Interim Action that is found to be contaminated with dangerous waste, and requires treatment and offsite disposal.
Olympic Region Clean Air Agency (ORCAA) Notice of Construction	Regulation 6	ORCCA is the governing air emissions regulatory agency implementing the statues of the Washington State Clean Air Act and US EPA Clean Air Amendments. Requires a Notice of Construction and Application for Approval before constructing or modifying an air-contaminant source. This would apply to the Interim Action due to potential emissions of LFG.
ORCAA Emission Standards for Toxic Air Pollutants	Regulation 8	Implements at a regional level the National Emission Standards for Hazardous Air Pollutants. It requires best available control technology for sources of toxic air contaminants, and requires that toxic air contaminants be quantified and compared with acceptable source impact levels for each contaminant. ORCAA Emission Standards for Toxic Air Pollutants are applicable to air emissions from the LFG collection system.
Thurston County Board of Health Regulations	Article 5	The requirements established in this regulation govern solid waste handling and solid waste facilities and meet or exceed the requirements established by the Washington State Minimum Functional Standards for Solid Waste Handling.
Potential Location Specific ARARs[(a)]	**Source**	**Description/Rationale**
Federal Archeological Resource Preservation	RCW 27-53	This law addresses the discovery, identification, excavation, and study of archaeological resources, and the communication of information to state and federal agencies regarding the possible impact of construction activities on Washington State archaeological resources. The Interim Action Area has been extensively disturbed during operation of the landfill; this law could be applicable during implementation of the Interim Action.
State Permits for Archeological Excavation and Removal	WAC 25-48	Establishes application and review procedures for the issuance of archaeological excavation and removal permits, and for the issuance of civil penalties for violations. This law is potentially applicable in the event that archaeological resources are identified during implementation of the Interim Action.

West Olympia Commerical Property
Interim Action Work Plan
Applicable or Relevant and Appropriate Requirements

Potential Action Specific ARARs[(a)]	Source	Description/Rationale
City of Olympia Review (OMC title and chapter)		
Street/Right-of-Way Use	OMC Title 12/16	Requires a written permit for any proposed activities that use Olympia street ROW, including construction activities and movement of equipment. It will be necessary to conduct work in the ROW to implement the Interim Action. City of Olympia review requirements are applicable for elements of the interim action.
Water Connection	OMC Chapter 13.04	Specifies an application and approval process for connecting to the City of Olympia water supply system. Water connection is potentially needed for dust control during grading.
Sewer Connection	OMC Chapter 13.08	Requires connection of all sources of polluted water with the nearest accessible sanitary sewer. Sewer connection will potentially be needed for discharge of LFG condensate.
Electrical Service Connection	OMC Chapter 16.24	Specifies an application and approval process for obtaining electrical service from PSE and City inspection. Electrical service may be needed to power active LFG control elements, including LFG condensate controls and blower motors.
Building Codes	OMC Title 16/Title 18	Includes a number of requirements applicable to the Interim Action, including electrical, mechanical, fire, and energy codes and regulations for grading, stormwater, drainage, and erosion control.
Stormwater, Drainage, and Erosion Control	OMC Chapter 13.16	Specifies a drainage control review and approval process for projects that involve land-disturbing activities or new or replaced impervious surface. The Interim Action will require a Drainage Control Plan and a Construction Stormwater Control Plan.
Grading	OMC Chapter 16.48	Specifies a process for application and approval of a grading permit for earth-moving activities. Grading must preserve natural drainage patterns, and not create unstable slopes or contribute to increased turbidity or other forms of pollution in a watercourse.
Noise Control	OMC Chapter 8.32	Specifies maximum permissible noise levels for construction activities and facility operation in commercial zones, depending on the zoning designation of receiving properties.
Environmentally Critical Areas	OMC Chapter 18.32	Specifies development standards for actions affecting environmentally critical areas, including wellhead protection areas, streams and riparian zones, wetlands, geological hazard areas, landslide areas, and erosion or seismic hazard areas.
Monitoring and Maintenance		
Federal Occupational Safety and Health Standards	29 CFR 1910.120	Requires that employers develop and implement a written safety and health program for employees involved in hazardous waste operations. The program must be designed to identify, evaluate, and control safety and health hazards, and should provide emergency response for hazardous waste operations. This regulation is applicable to the implementation of the Interim Action.
State Occupational Health Standards	WAC 296-62	Establishes rules designed to protect the health of employees and to create a healthy work place. Requirements for chemical hazard communication programs, workplace lighting levels, and exposure records are in the safety and health core rules of this chapter. This regulation is applicable to the implementation of the Interim Action.
Well Construction Standards	WAC 173-160	Regulation defines minimum standards for the construction and decommissioning of the water resource protection and LFG control wells that will be installed or decommissioned as part of the Interim Action. The standards defined in this regulation are applicable to the Interim Action compliance monitoring program.
Groundwater Monitoring Plan	WAC 173- 304-490	This regulation addresses groundwater monitoring requirements for solid waste landfills, including provision for a minimum of one upgradient and two downgradient monitoring wells. The monitoring plan must specify procedures for sample collection, preservation and shipment, laboratory analysis and associated quality control protocols, and health and safety. Although this requirement applies only to landfills that operated after 1985, these monitoring requirements will be incorporated into the groundwater monitoring program that will be conducted as part of the RI/FS.
Accreditation of Environmental Laboratories	WAC 173-50	Regulation requiring persons submitting analytical data to use accredited environmental laboratories. Applies to all analytical data collected for the Interim Action and during the Interim Action compliance monitoring
Uniform Environmental Covenants Act	RCW 64.70	Regulation that addresses recording environmental covenants on the WOCP. The interim action strategy is containment, which will require the use of institutional controls and an environmental covenant on the WOCP as part of the Interim Action or future cleanup during the CAP.
Grading, Excavation, and Filling		
State Particulate Matter Standards	WAC 173-470	Establishes maximum acceptable levels for particulate matter in ambient air based on the criteria developed by the US Environmental Protection Agency. This regulation establishes requirements for monitoring, measuring, and reporting particulate matter data. It applies to dust-producing activities during implementation of the Interim Action, particularly excavation and site grading.
ORCAA Fugitive Dust Standards	Regulation 8	Establishes emission standards for fugitive dust. Applies to dust-producing activities, including construction and site grading.

West Olympia Commerical Property
Interim Action Work Plan
Applicable or Relevant and Appropriate Requirements

Potential Action Specific ARARs[(a)]	Source	Description/Rationale
Treatment, Discharge, and Disposal		
NPDES Permit	WAC 173-220	Establishes a state individual permit program, applicable to the discharge of pollutants and other wastes and materials to the surface waters of Washington State, operating under state law. Permits issued under this chapter are designed to satisfy the requirements for discharge permits under both the Federal Water Pollution Control Act and Washington State Water Pollution Control Act. This requirement is applicable to the control, collection, management, and discharge of stormwater runoff during and after construction of the Interim Action.
State Waste Discharge General Permit Program	WAC 173-226	Establishes a state general permit program, applicable to the discharge of pollutants, wastes, and other materials to waters of the state, including discharges to municipal sewerage systems. Permits issued under this regulation are designed to satisfy the requirements for discharge permits under the federal Water Pollution Control Act and the Washington State Water Pollution Control Act. Although this permit may not be required because of MTCA's permit exemption, it will be obtained as part of the Interim Action, because an NPDES permit is required, and Ecology typically issues a combined NPDES/state waste discharge permit.
Industrial Waste Discharge to LOTT Sewer System	LOTT Discharge and Industrial Pretreatment Regulations	Establishes rules and regulations applicable to water pollution-abatement activities, including the disposal of sewage or LFG condensate into the sewer system. Authorizes LOTT to develop and implement such procedures and to take any other actions necessary to ensure that local public sewers and private sewers discharging or proposing to discharge into the metropolitan sewer system are constructed and developed in accordance with applicable laws, regulations, and plans. This authorization may be required if LFG condensate requires discharge.
Thurston County Board of Health Regulations	Article 5	The requirements established in this regulation meet or exceed the requirements established by the Washington State Minimum Functional Standards for Solid Waste Handling, and are applicable to the Interim Action for compliance monitoring programs and as performance standards for the design of Landfill Cap and LFG control systems.

Notes:

(a) The above list of ARARs does not preclude subsequent identification of applicable federal, state, and local laws (WAC 173-340-360 (10)(a)(vii).

1. Pursuant to Section 090 of Chapter 70.105D of the Revised Code of Washington (RCW 70.105D.090), PLPs conducting a remedial action under an agreed order with Ecology are exempt from some state-administered procedural requirements and the procedural requirements of any local laws requiring or authorizing local government permits or approvals for the remedial action. However, the substantive requirements of state and local laws requiring permits or approvals shall be complied with.

2. Pursuant to WAC 173-340-710(9), the state agencies and local governments that have potential permits subject to the permit exemption have been consulted. The substantive requirements of the permits that are exempt, to the extent they are currently known, have been incorporated into this Interim Action Work Plan. Therefore, the substantive requirements of state and local laws subject to the permit exemption will be met during the Interim Action.

Abbreviations and Acronyms:

ARARs Applicable or relevant and appropriate requirements
CAP corrective action plan
CFR Code of Federal Regulations
IAWP Interim Action Work Plan
LFG landfill gas
MTCA Model Toxics Control Act Cleanup
NPDES National Pollutant Discharge Elimination System
OMC Olympia Municipal Code
ORCAA Olympic Region Clean Air Agency
PSE Puget Sound Energy
RCW Revised Code of Washington
RI/FS Remedial Investigation/Feasibility Study
ROW right-of-way
WAC Washington Administrative Code
WOCP West Olympia Commercial Property